

# Structural Capabilities in Small- and Medium-Sized Patient-Centered Medical Homes

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**T**he patient-centered medical home (PCMH) is gaining traction as a promising model for reforming primary care. Some experts believe that PCMHs have the potential to improve the quality, coordination, and efficiency of healthcare and to alleviate the impending manpower crisis in primary care.<sup>1-3</sup> The PCMH has been supported by mounting evidence in 3 areas. First, there is abundant evidence from the United States and other Western countries that links primary care with better health outcomes, lower costs, and greater equity in care.<sup>4,6</sup> Second, there is a growing body of evidence around individual components of primary care—particularly those embodied in Wagner’s Chronic Care Model—linking the use of practice systems with improved quality of care, quality of life, and cost savings for some high-risk populations.<sup>7-9</sup> Third, there is early evidence around the PCMH model itself that suggests it has the potential to enhance patient experience, improve some aspects of clinical quality, and reduce avoidable emergency utilization, although the impact on avoidable hospital utilization is, to date, mixed.<sup>10-12</sup>

Interest in the PCMH is high, but to achieve maximum potential benefits, primary care practices may be required to invest substantially in structural capabilities associated with this model of care. For example, a population registry can help primary care practices group patients by diagnosis, to facilitate appropriate follow-up; performance management can help providers compare their data with benchmarks and motivate quality improvement; and referral tracking and care management can improve coordination among different professionals and organizations when patients are most vulnerable to medical errors. The Institute of Medicine, the health arm of the National Academy of Sciences, has highlighted the importance of these capabilities and identified their absence as representing a key gap in primary care.<sup>13</sup>

However, studies examining the “readiness” of physician practices to implement structural capabilities show

## ABSTRACT

### Objectives

1) Evaluate structural capabilities associated with the patient-centered medical home (PCMH) model in PCMH pilots in Colorado, Ohio, and Rhode Island; 2) evaluate changes in capabilities over 2 years in the Rhode Island pilot; and 3) evaluate facilitators and barriers to the adoption of capabilities.

### Study Design

We assessed structural capabilities in the 30 pilot practices using a cross-sectional study design and examined changes over 2 years in 5 Rhode Island practices using a pre/post design.

### Methods

We used National Committee for Quality Assurance’s Physician Practice Connections—Patient-Centered Medical Home (PPC-PCMH) accreditation survey data to measure capabilities. We stratified by high and low performance based on total score and by practice size. We analyzed change from baseline to 24 months for the Rhode Island practices. We analyzed qualitative data from interviews with practice leaders to identify facilitators and barriers to building capabilities.

### Results

On average, practices scored 73 points (out of 100 points) for structural capabilities. High and low performers differed most on electronic prescribing, patient self-management, and care-management standards. Rhode Island practices averaged 42 points at baseline, and reached 90 points by the end of year 2. Some of the key facilitators that emerged were payment incentives, “transformation coaches,” learning collaboratives, and data availability supporting performance management and quality improvement. Barriers to improvement included the extent of transformation required, technology shortcomings, slow cultural change, change fatigue, and lack of broader payment reform.

### Conclusions

For these early adopters, prevalence of structural capabilities was high, and performance was substantially improved for practices with initially lower capabilities. We conclude that building capabilities requires payment reform, attention to implementation, and cultural change.

*Am J Manag Care.* 2014;20(7):e265-e277

### Take-Away Points

This article examines structural capabilities associated with the patient-centered medical home model in 30 small- and medium-sized primary care practices participating in medical home pilots in Colorado, Ohio, and Rhode Island. The authors found:

- On average, practices earned a total score of 73 points (out of 100) for their structural capabilities at baseline.
- High- and low-performing practices differed most in their achievement on electronic prescribing, patient self-management, and care management standards.
- Rhode Island practices had an average score of 42 points at baseline and 90 points after 24 months.
- Building structural capabilities requires attention to payment reform, implementation and cultural change.

low levels of preparedness. Factors that increase the likelihood of the presence of structural capabilities include: an affiliation with an integrated system, hospital, or other large entity;<sup>14-16</sup> the presence of external incentives, such as pay-for-performance;<sup>16</sup> serving racial/ethnic and economically disadvantaged populations;<sup>17</sup> and operation in a less-competitive environment.<sup>15</sup>

Practice size seems an especially important factor.<sup>14,18,19</sup> Larger practice size is associated with average adoption, with 22% of structural capabilities in place in small- to medium-sized practices ( $\leq 9$  physicians)<sup>16</sup> and 35% in larger practices ( $> 9$  physicians).<sup>19</sup> Rittenhouse et al<sup>19</sup> found that the capabilities of nurse care managers, disease registries, clinical-information technology, and quality-improvement processes were least developed in smaller practices.

Because 88% of all patient visits occur in small- and medium-sized practices, it is important to understand the experience of these practices with regard to implementing structural capabilities, including which capabilities are easier or more difficult to adopt, whether practice size makes a difference, the time frame for implementation, and the resources and supports they require. This information can help policy makers understand how to best facilitate the transformation of physician practices into PCMHs.

## METHODS

### Research Design and Sample

As part of a larger study of the impact of the PCMH model on quality, costs, coordination, and consumer and provider satisfaction (using data from 30 primary care practices in 3 pilot initiatives in Rhode Island, Colorado, and Ohio),<sup>12</sup> we conducted a quantitative investigation of the practices' PCMH structural capabilities, using the Physician Practice Connections–Patient-Cen-

tered Medical Home Model (PPC-PCMH) accreditation survey data from the National Committee for Quality Assurance (NCQA). We used a cross-sectional study design to assess the extent of adoption of structural capabilities in the pilots across the 3 states.

For the Rhode Island pilot, we obtained data on the structural capabilities of participating practices at 2 years post baseline because their baseline data were lower than in the

other pilots. This allowed us to explore the change in prevalence of structural capabilities. To understand the facilitators and barriers to the adoption of structural capabilities, we interviewed practice care leaders in the primary care practices involved in the pilot. The study was approved by the Institutional Review Board at the Harvard School of Public Health.

### Intervention

Although there was variation across the pilots in the timing and priority attached to implementing specific components of the medical home, the 3 pilots shared 3 common elements: a self-assessment using the PPC-PCMH survey to obtain PCMH recognition; technical assistance from “transformation coaches” and participation in a learning collaborative; and a per-member, per-month care management fee.

The Rhode Island pilot involved 5 primary care practices with 28 physicians collectively serving 24,000 patients. Historically, there was an underinvestment in primary care, compared to high-performing healthcare systems.<sup>20</sup> In 2008, the State Office of the Health Insurance Commissioner Department worked with commercial insurers to increase the portion of spending on primary care and also to support the Rhode Island Chronic Care Sustainability Initiative (with participation from primary care physicians, specialists, professional associations, payers, purchasers, and technical experts) with a graduated, per-member, per-month fee of \$3 to \$4.50, and funding support for a nurse care manager for each of the 5 pilot practices. The 5 practices were invited to participate in the pilot based on their diverse practice characteristics, history of working with each other, readiness for change, and use of an electronic medical record (EMR) (D. Hurwitz, MBA, letter, August 2013). The expectation was that the practices would strive to achieve certain levels of medical home recognition, participate in shared learning

to facilitate practice transformation, and measure their performance.<sup>20</sup>

The Colorado pilot included 14 primary care practices with 50 physicians collectively serving 98,000 patients. This pilot was initiated in May 2009 by HealthTeamWorks and major payers that included Aetna, Anthem-Wellpoint, Cigna, CoverColorado, Colorado Medicaid, Humana, and UnitedHealthcare. The practices were selected from a pool of 23 applications in a competitive process based on their demographics, the culture of the practice (eg, teamwork, collegiality, attitude), quality improvement practices, and electronic capabilities (eg, EMR, disease registry).<sup>21</sup> The practices received a monthly fee of \$4 to \$8 per patient based on their NCQA recognition level, a pay-for-performance payment, assistance from transformation coaches, and participation in a learning collaborative involving all practices in the pilot. Additionally, for all participating practices, HealthTeamWorks brought in a vendor to implement “Reach My Doctor,” an extant Web-based registry featuring a patient portal.

The Ohio pilot had 11 primary care practices with 37 physicians collectively serving 30,000 patients. The pilot was initiated in September 2009 by the Health Improvement Collaborative of Greater Cincinnati and payers that included Anthem, Humana, and UnitedHealthcare. The practices were selected from a pool of 27 applications in a competitive process based on their diverse practice characteristics, demographics, readiness for change, and EMR capabilities (S. Bolton, MPH, letter, August 2013). The practices received a monthly fee of \$6 to \$7 per patient based on their PCMH recognition level, practice transformation assistance offered mainly by telephone and webinars, and benchmarking data to support improvement.

## Measurement

We used the PPC-PCMH accreditation survey data to measure structural capabilities in the pilot practices. The PPC-PCMH survey asks 170 questions (elements) regarding the capabilities of physician practices on 9 standards: 1) access and communication, 2) patient tracking and registry, 3) care management, 4) patient self-management support, 5) electronic prescribing, 6) test tracking, 7) referral tracking, 8) performance reporting and improvement, and 9) interactive website. The questions identify the presence or absence of the elements, which are coded as present, absent, or not applicable. The score for each standard represents the proportion of weighted points, up to a possible cumulative score of 100 points (see [eAppendix A](#)).

To gain recognition by the NCQA, a practice self-assessed its capabilities using the PPC-PCMH web-based survey and submitted the required data to the NCQA. The NCQA then evaluated and scored the application based on the information received, and it conducted an audit of a sample of the applications as well. Pilot practices received 1 of 3 levels of recognition based on their total score and achievement on 10 “must pass” areas considered foundational for undergoing medical home transformation:<sup>20</sup> Level 1 (a total score of 25 to 49 points and at least 50% achievement on 5 out of the 10 “must pass” elements); Level 2: (a total score of 50 to 74 points and at least 50% achievement on the 10 “must pass” elements); or Level 3 (a total score of 75 to 100 points and at least 50% achievement on the 10 “must pass” elements).

## Data Collection

We obtained the PPC-PCMH baseline data from the NCQA for all 30 primary care practices in the Rhode Island, Colorado, and Ohio pilots. Additionally, since the 5 practices in the Rhode Island pilot began the study at below Level 3 status, they had the opportunity to improve their recognition level. Accordingly, we also obtained their PPC-PCMH data at 24 months post baseline. We used practice addresses to identify the state involved and calculated each practice’s size based on its number of physicians.

To understand the implementation experiences as they sought to transform into medical homes, we conducted interviews at baseline, 18 months, and 30 months with a practice leader in each medical home who had responsibility for facilitating the transformation from primary care physician practices to patient-centered medical homes. Most often, they were physicians with a formal leadership role within the practice (eg, medical director), although sometimes they were informal champions of medical home transformation. The interviews lasted approximately 1 hour and were conducted by 2 or more authors. The interview protocol included open-ended questions with guided probes that explored facilitators and barriers to implementing the PCMH model (please see [eAppendix B](#) for a copy of the interview protocol).

## Data Analysis

To understand the prevalence of structural capabilities, we calculated the mean and range of the total score, as well as the average percentage score by standard for the 30 pilot practices. To understand which capabilities are easiest to develop and which ones are more difficult,

**Table 1.** Characteristics of PCMH Pilots in Colorado, Ohio, and Rhode Island at Baseline

Characteristics	All Practices N = 30, (%)
<b>NCQA Recognition level</b>	
Level 1	4 (13.3)
Level 2	4 (13.3)
Level 3	22 (73.3)
<b>Number of physicians (individuals)</b>	
Solo	3 (10.0)
2-3	15 (50.0)
≥4	12 (40.0)
<b>Region</b>	
Colorado	14 (46.7)
Ohio	11 (36.7)
Rhode Island	5 (16.7)
<b>Practice Affiliation</b>	
Private, stand-alone practice	18 (60)
Federally Qualified Health Center	1 (3)
System-owned	11 (37)
<b>Single vs Multispecialty</b>	
Single	28 (93)
Multispecialty	2 (7)
<b>Family Medicine vs Internal Medicine</b>	
Family Medicine	20 (67)
Internal Medicine	8 (27)
Both FM and IM	2 (6)

NCQA indicates National Committee for Quality Assurance; PCMH, patient-centered medical home.

we stratified practices by their total score and compared the capabilities of the 10 lowest- and highest-performing practices by standard. To understand how the prevalence of capabilities differs by practice size, we also analyzed performance by 3 practice size categories: solo, 2 to 3 physicians, and 4 or more physicians. Finally, to understand how structural capabilities change over time, we analyzed the mean score and the average percentage by standard at baseline and 24 months for the 5 Rhode Island practices. Due to the small sample size, we did not examine statistical differences among groups.

We used thematic analysis to analyze the qualitative data.<sup>22</sup> First, we analyzed responses to each interview question. The investigators discussed and developed a preliminary list of codes to represent salient and recurring themes describing facilitators and barriers to the adoption of structural capabilities. The primary author then applied the codes deduced through the

initial analysis to data from the 60 interviews using qualitative software (ATLAS.ti, version 6.2). We established coding reliability by having the project's research assistant code approximately 20% of the quotes extracted from the transcripts (kappa = 0.95, percent agreement = 0.96). We selected quotes to illustrate the key themes emerging from the interviews. All authors confirmed agreement with codes once applied.

## RESULTS

The characteristics of the practices are summarized in **Table 1**. The majority of practices were in Colorado (47%), followed by Ohio (37%), and Rhode Island (17%). All were small- to medium-sized practices,<sup>16</sup> with the typical practice being a private family medicine, single-specialty practice, with 3 or fewer physicians.

### Achievement of Structural Capabilities

The summary of structural capabilities at baseline appears in **Table 2**. The mean practice score across the 30 pilot practices was 72.7 points (range from 30 to 97 points) (eAppendix B). The majority of the practices had achieved Level 3 recognition (22 practices), while a small percentage had achieved Level 1 (4 practices) and Level 2 recognition (4 practices). The practices with lower PPC-PCMH status were predominantly those in Rhode Island.

The difference in structural capabilities between the 10 lowest- and highest-performing practices is shown in **Figure 1**. There was least difference between the low- and high-performing practices in their achievement on the access and communication, patient tracking and registry, and referral tracking standards. The greatest difference in their achievement was on the electronic prescribing, patient self-management support, and care-management standards.

Solo practices averaged the highest PPC-PCMH score (87.9 points) compared with practices in other categories

■ **Table 2.** Average Achievement of PPC-PCMH Elements for Colorado, Ohio, and Rhode Island PCMH Pilot Practices at Baseline by Recognition Level, Practice Size, and State

Standard/element and description	Must pass	Percentage of Capabilities Met for Each PPC-Standard/Element									
		Recognition Level				Number of Physicians			State		
		All Practices (N = 30)	Level 1 (n = 4)	Level 2 (n = 4)	Level 3 (n = 22)	1 (n = 3)	2 or 3 (n = 15)	4 or More (n = 12)	CO (n = 14)	OH (n = 11)	RI (n = 5)
<b>Standard 1:</b>		79.53	63.19	75.69	83.20	86.11	78.33	79.40	80.56	82.32	70.56
<b>Access and communication</b>											
PPC 1A Has written standards for patient access and patient communication	Must pass	96.67	87.50	100.00	97.73	100.00	95.00	97.91	96.43	100.00	90.00
PPC 1B Uses data to show it meets standards for patient access and communication	Must pass	65.83	43.75	56.25	71.59	75.00	65.00	64.58	67.86	68.18	55.00
<b>Standard 2:</b>		84.76	64.88	63.39	92.26	97.22	84.52	81.94	89.37	90.15	60.00
<b>Patient tracking and registry functions</b>											
PPC 2A Uses data system for basic patient information (mostly non-clinical data)		77.50	25.00	62.50	89.77	83.33	75.00	79.17	83.93	95.45	20.00
PPC 2B Has clinical data system with clinical data in searchable fields		93.33	93.75	75.00	96.59	100.00	86.67	100.00	89.29	97.73	95.00
PPC 2C Uses the clinical data system		73.33	68.75	12.50	85.23	100.00	75.00	64.58	80.36	77.27	45.00
PPC 2D Uses paper- or electronic-based charting tools to organize clinical information	Must pass	93.33	75.00	75.00	100.00	100.00	100.00	83.33	100.00	100.00	60.00
PPC 2E Uses data to identify important diagnoses and conditions in practice	Must pass	95.00	75.00	100.00	97.73	100.00	95.00	93.75	96.43	100.00	80.00
PPC 2F Generates lists of patients and reminds patients and clinicians of services needed (population management)		61.67	25.00	31.25	73.86	91.67	53.33	64.58	71.43	59.09	40.00
<b>Standard 3:</b>		66.08	18.44	42.50	79.03	75.00	64.75	65.52	80.63	63.98	30.00
<b>Care management</b>											
PPC 3A Adopts and implements evidence-based guidelines for 3 conditions	Must pass	91.67	50.00	100.00	97.73	100.00	86.67	95.83	96.43	100.00	60.00
PPC 3B Generates reminders about preventive services for clinicians		75.00	25.00	43.75	89.77	83.33	65.00	85.42	89.29	65.91	55.00
PPC 3C Uses non physician staff to manage patient care		55.83	18.75	31.25	67.05	66.67	50.00	60.42	66.07	56.82	25.00
PPC 3D Conducts care management, including care plans, assessing progress, addressing barriers		75.00	0.00	37.50	95.45	100.00	83.33	58.33	100.00	77.27	0.00
PPC 3E Coordinates care/follow-up for patients who receive care in inpatient and outpatient facilities		40.83	12.50	18.75	50.00	33.33	41.67	41.67	53.57	31.82	25.00

(Continues)

■ **Table 2.** Average Achievement of PPC-PCMH Elements for Colorado, Ohio, and Rhode Island PCMH Pilot Practices at Baseline by Recognition Level, Practice Size, and State (Continued)

Standard/element and description	Must pass	Percentage of Capabilities Met for Each PPC-Standard/Element									
		Recognition Level				Number of Physicians			State		
		All Practices (N = 30)	Level 1 (n = 4)	Level 2 (n = 4)	Level 3 (n = 22)	1 (n = 3)	2 or 3 (n = 15)	4 or More (n = 12)	CO (n = 14)	OH (n = 11)	RI (n = 5)
<b>Standard 4:</b>		62.78	4.16	37.50	78.03	100.00	64.44	51.38	82.14	63.64	6.67
<b>Management support</b>											
PPC 4A		55.00	12.50	62.50	61.36	100.00	50.00	50.00	64.29	59.09	20.00
Assesses language preference and other communication barriers											
PPC 4B	Must pass	66.67	0.00	25.00	86.36	100.00	71.67	52.08	91.07	65.91	0.00
Actively supports patient self-management											
<b>Standard 5:</b>		57.71	18.75	4.69	74.43	81.25	54.79	55.47	68.53	61.65	18.75
<b>Electronic prescribing</b>											
PPC 5A		60.83	6.25	0.00	81.82	91.67	61.67	52.08	73.21	70.45	5.00
Uses electronic system to write prescriptions											
PPC 5B		67.50	31.25	12.50	84.09	91.67	63.33	66.67	82.14	63.64	35.00
Has electronic prescription writer with safety checks											
PPC 5C		38.33	18.75	0.00	48.86	50.00	31.67	43.75	41.07	45.45	15.00
Has electronic prescription writer with cost checks											
<b>Standard 6:</b>		80.64	56.73	45.19	91.43	100.00	76.15	81.41	88.19	89.16	40.77
<b>Test tracking</b>											
PPC 6A	Must pass	78.33	25.00	62.50	90.91	100.00	70.00	83.33	85.71	95.45	20.00
Tracks tests and identifies abnormal results systematically											
PPC 6B		83.33	93.75	25.00	92.05	100.00	83.33	79.17	91.07	81.82	65.00
Uses electronic system to order and retrieve tests and flag duplicate tests											
<b>Standard 7:</b>		81.67	68.75	68.75	86.36	91.67	91.67	66.67	91.07	79.55	60.00
<b>Referral tracking</b>											
PPC 7A	Must pass	81.67	68.75	68.75	86.36	91.67	91.67	66.67	91.07	79.55	60.00
Tracks referrals using paper-based or electronic system											
<b>Standard 8:</b>		75.67	18.75	83.75	84.54	86.67	77.00	71.25	80.71	81.82	48.00
<b>Performance reporting and improvement</b>											
PPC 8A	Must pass	91.67	37.50	100.00	100.00	100.00	86.67	95.83	100.00	95.45	60.00
Measures clinical and/or service performance by physician or across the practice											
PPC 8B		78.33	12.50	87.50	88.64	100.00	76.67	75.00	89.29	81.82	40.00
Survey of patients' care experience											
PPC 8C	Must pass	81.67	25.00	87.50	90.91	100.00	80.00	79.17	82.14	90.91	60.00
Reports performance across the practice or by physician											
PPC 8D		56.67	0.00	75.00	63.64	66.67	63.33	45.83	50.00	77.27	30.00
Sets goals and takes action to improve performance											
PPC 8E		70.00	18.75	68.75	79.55	66.67	78.33	60.42	82.14	63.64	50.00
Produces reports using standardized measures											
PPC 8F		70.00	18.75	68.75	79.55	66.67	78.33	60.42	82.14	63.64	50.00
Transmits reports with standardized measures electronically to external entities											

(Continues)

■ **Table 2.** Average Achievement of PPC-PCMH Elements for Colorado, Ohio, and Rhode Island PCMH Pilot Practices at Baseline by Recognition Level, Practice Size, and State (*Continued*)

Standard/element and description	Percentage of Capabilities Met for Each PPC-Standard/Element										
	Must pass	Recognition Level				Number of Physicians			State		
		All Practices (N = 30)	Level 1 (n = 4)	Level 2 (n = 4)	Level 3 (n = 22)	1 (n = 3)	2 or 3 (n = 15)	4 or More (n = 12)	CO (n = 14)	OH (n = 11)	RI (n = 5)
<b>Standard 9: Advanced Electronic Communication</b>		22.29	0.00	7.81	28.98	64.58	20.83	13.54	41.52	5.11	6.25
PPC 9A Availability of interactive website		32.50	0.00	12.50	42.05	66.67	28.33	29.16	55.36	13.64	10.00
PPC 9B Electronic patient identification		19.16	0.00	0.00	26.14	66.67	25.00	0.00	41.07	0.00	0.00
PPC 9C Electronic care management support		18.33	0.00	18.75	21.59	58.33	5.00	25.00	28.57	6.82	15.00

PPC-PCMH indicates Physician Practice Connections–Patient-Centered Medical Home. Reference: Table adapted from Scholle 2011.<sup>23</sup>

(average score for 2 to 3 physicians: 72 points; for 4 or more physicians: 69.5 points). Solo practices also scored the highest on each of the 9 standards (see eAppendix).

### Two-Year Change in Structural Capabilities of the Rhode Island Practices

Figure 2 shows the capabilities in the Rhode Island pilot practices at baseline and 24 months. Even though Rhode Island practices began low, with an average score of 42 points at baseline, by the end of year 2 their average score was 90 points, surpassing the baseline figures for Colorado and Ohio on all standards except for the availability of an interactive website. The biggest gains were seen in the patient self-management (from 7% to 83%) and care management (from 30% to 97%) standards, followed by test tracking (from 41% to 100%), electronic prescribing (from 19% to 70%), and performance reporting and improvement (from 48% to 97%) standards (eAppendix C).

### Facilitators and Barriers to the Adoption of Structural Capabilities

Table 3 shows quotations, taken from interviews with practice leaders, which illustrate what they deemed as the facilitators and barriers to the adoption of structural capabilities. Four factors emerged as facilitators: payment incentives, technical assistance from “transformation coaches,” participation in learning collaboratives, and the availability of data to support performance management and quality improvement. Five factors surfaced as barriers: the extent of transformation required, shortcomings of electronic technology, slowness in achieving cultural change, change fatigue, and the lack of broader payment

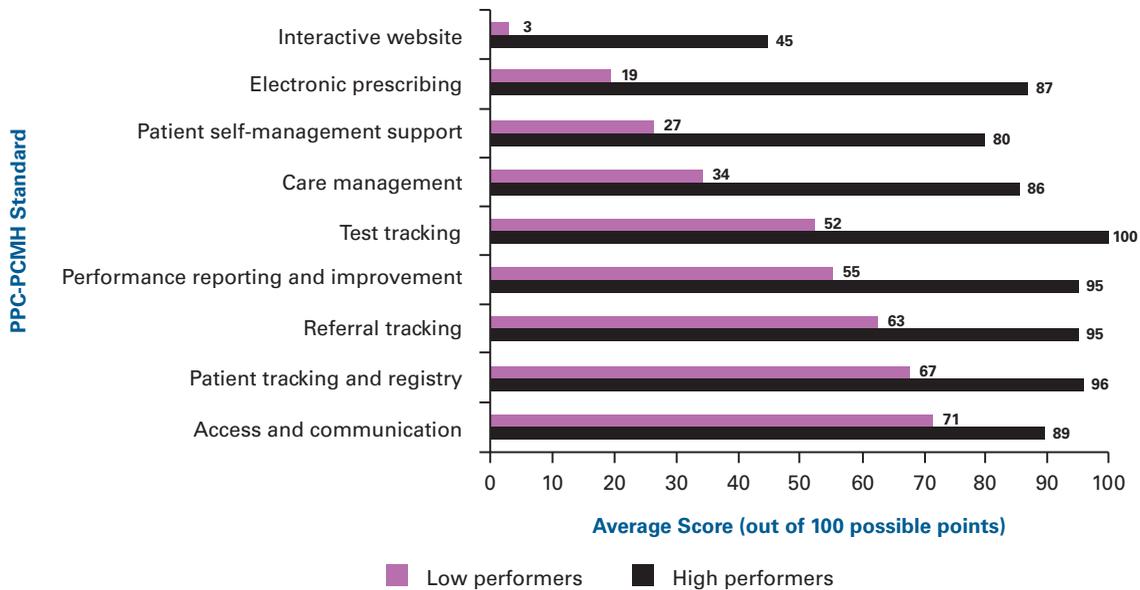
reform. These themes were consistent across states, although each state’s context is quite different.

## DISCUSSION

This is the first study to examine structural capabilities and change over time in small- to medium-sized primary care practices participating in PCMH pilots, using a nationally recognized dataset. Contrary to the concerns expressed in the literature about the ability of physician practices to achieve structural capabilities,<sup>14,16,18,19</sup> we found that a set of small practices were able to attain high levels of medical home capability. However, in comparison to Rittenhouse’s national randomly selected sample which included a broader definition of primary care and where about one-quarter of practices had an EMR (26.2%), ours was a select group, with predominantly primary care physicians, and where the vast majority of practices (approximately 90%) had an EMR.<sup>16</sup> We also found that improvement was rapid in the Rhode Island pilot practices, for which initial performance was low. This suggests that basic capabilities do not have to take a long time to build.

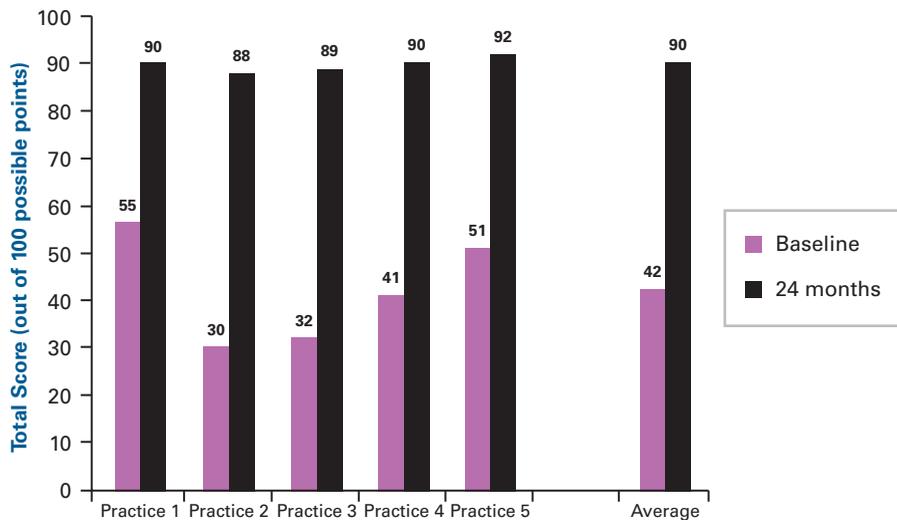
A review of the capabilities of the third-highest and third-lowest performing practices suggests that some capabilities are more easily developed than others. The standards that everyone achieved—access and communication, patient tracking and registry, and referral tracking—were also the areas with the majority of the “must pass” elements, supporting the adage that what got measured had received more attention. The standards achieved disproportionately by high performers—electronic prescribing, patient self-management support, and care management standards—may require greater practice and

**Figure 1.** Performance by Standard for Practices With 10 Top and 10 Bottom Practice Scores



PPC-PCMH indicates Physician Practice Connections–Patient-CMH.

**Figure 2.** Total Scores of Rhode Island Practices at Baseline and 24 Months



cultural transformation. Both high- and low-performing practices had the least-developed capabilities for the interactive website standard, a capability that may require better-developed technology, as well as cultural change by providers and consumers.

To date, studies on structural capabilities have found a difference by practice size, with smaller practices having lower capabilities.<sup>14,18,19,24</sup> However, in our sample, solo practices had the highest capabilities on all 9 standards.

Although larger practices may have more resources at their disposal, solo practices may have the advantage of being more nimble and adaptable, suggesting a possible “U-shaped” relationship between practice size and capabilities. This would be consistent with research finding a curvilinear relationship for healthcare facilities between size and various quality metrics such as safety climate<sup>25</sup> and quality improvement.<sup>26</sup> However, the small sample size and voluntary nature of the pilots (ie, perhaps only

■ **Table 3.** Interview Quotes Illustrative of Facilitators and Challenges to Adopting Structural Capabilities

**Facilitators**

Payment incentives including a per-member per-month fee and funding for a staff position

I probably should feel more embarrassed...I am pretty sure I wouldn't have done this if there wasn't some money in it for me. There's just too much reality of cost and effort to implement and maintain these processes. *[Practice Leader, Colorado]*

Our motto has long been, "Sick today, seen today, healthcare for all"...But to really live up to that mission and vision takes resources that before CSI [Chronic Care Sustainability Initiative], we did not have...When I make a diagnosis that a patient has diabetes, I can review it all and then say, "Hold on a minute"...Several times a day, [my colleagues and] I go and find the clinical nurse manager when [we] are bumping into more complicated sorts of issues having to do with diet, exercise, arranging things, medicines not being paid for. All those kinds of things that heretofore just languished in a room. *[Practice Leader, Rhode Island]*

Technical assistance from transformation coaches

Engagement with Health TeamWorks and [the focused] attention given by the coach [was important]. I am skeptical of other models that do not use a coach. Even with my commitment and energy, I still think that with the coach (as a problem solver, advisor and supporter), that kind of support dynamic I have found to be really important. I really would urge any practices considering engaging with this movement to join with a program that has a coach. *[Practice Leader, Colorado]*

Having [the coach's] knowledge about what's going on in the rest of the country, what people are trying...early results...this seems to work well here, this seems to work well there...[Learning about the] best ideas, best practices from around the country has been really helpful. *[Practice Leader, Rhode Island]*

Participation in learning collaboratives

I think what has been most helpful overall is that the project is a defined thing and that the five practices are all grouped together...[and] with the plans, who are also grouped together. [It's] a nice balance between letting the practices develop their own local solutions, but also jointly. [Hearing,] "This is what is working for us, this is what we've tried, and here's our questionnaire, here's our policy, here's our approach to that data collection problem"—has been [a] huge [help]. *[Practice Leader, Rhode Island]*

By far the strongest part of the program was the interaction with the other physician offices that were participants, simply the sharing of ideas. Saying, "We tried this and this is what happened...We tried open scheduling, it was a disaster...Here is what we've hired a staff member to do...Here's how we've taken this concept of working to your highest level of certification and put it into practice...What are our MAs doing now that they weren't doing before? Where did we change staffing?"...The best way to learn this is to jump in, talk to other practices who are doing the same venture and learn from each other's experiences. *[Practice Leader, Ohio]*

Access to electronic information for performance management

My initial sense of measuring [was]...this isn't worth it. I'm a good doctor, I work very hard, I keep up with the literature. I didn't think measurement would make a difference. It was a striking and difficult experience when I realized I wasn't doing as good a job as I thought, as measured...If you assume you are doing a good job, you are leaving the door wide open for not doing a good job. If you measure and improve at whatever level you start, if you can show improvement, that's the part that's far more inspiring. *[Practice Leader, Colorado]*

I think the thing that makes the most difference is just the extra attention you are paying to the reporting and data across your whole practice. You are always watching it on an individual patient; that was never a problem, and there, nothing really has changed. But reporting data across the whole population and quantifying it so that you can relate yourself to your peers and how well you are doing, I think that was the most important thing, the thing that hit me with the most significance. You always think you are doing things a certain way [until] you really get to looking and crunching the numbers and you find out, well, there is certainly room for improvement here or there. *[Practice Leader, Ohio]*

*(Continues)*

■ **Table 3.** Interview Quotes Illustrative of Facilitators and Challenges to Adopting Structural Capabilities  
(Continued)

Challenges	
Underestimating magnitude of system transformation challenge	<p>To provide this type of care, it really involves a transformation of your practice... You've got to be ready for that. Honestly, I'm not sure that we were ready for it, the whole of our practice. That is probably the biggest thing that I've learned. It requires a lot of work and requires people to be on the same page and have the same desires for care. <i>[Practice Leader, Colorado]</i></p> <p>Well, I guess one surprise would be that it's been much harder than I anticipated. I thought we could just lay this out and start doing something new. And it really takes a lot of work and a lot of time. Even if someone has a really good idea of how to do it, you still have to make your changes on the local level, figure out how it's going to work for you. <i>[Practice Leader, Rhode Island]</i></p>
Inadequacies of electronic health records	<p>We've had to jerry-rig our own ways of getting this stuff out and reported. On my really bad days when I am frustrated, I worry that our data might not be that accurate because of all that jerry-rigging. We at least have gone out of our way to really double and triple check stuff manually to make sure that we have the right data reported and data entered. <i>[Practice Leader, Colorado]</i></p> <p>It's been over a year and we still have difficulties interfacing the registry with our EHR. We haven't been able to do population management effectively. <i>[Practice Leader, Colorado]</i></p>
Changing culture	<p>I think the biggest challenge has been the culture...[T]he idea was met with varying reception. The idea of, "Hey, we are going to go from being I am the doctor and I tell everyone what to do and you listen to me and this is how we are going to do it," to now "we are a healthcare provider team and we are going to work together and you are going to have defined roles as far as what to do. And we are going to have a process of improvement [that's] not going to stop." <i>[Practice Leader, Colorado]</i></p> <p>What I do know is that this is a real practice transformation process. We can talk about registries and active communication policies and on and on, but it's...approaching [our work] from a different perspective: the patient-centeredness idea. But that isn't something you can just speak to, you have to live it and you have to practice it. You have to...keep [moving] in the direction of improving the culture. <i>[Practice Leader, Colorado]</i></p>
Change fatigue	<p>We haven't had that problem [change fatigue] in the past, but we are beginning to have it now as we are adding more disease registries. When we only had one disease registry, it was easy to keep it up-to-date. Now that we are trying to do three or more, it's that much more additional work on all of the staff and they get a little frustrated. <i>[Practice Leader, Colorado]</i></p> <p>I do get change fatigue. But, when you are the only physician champion, you can't really afford to show it...It will be a lot easier for practices years from now who are starting up their PCMH. They are going to have a guidebook they can follow...But for us, making the change is definitely very trying. <i>[Practice Leader, Colorado]</i></p>
Lack of broader payment reform	<p>I'm not fearful of success, but I am fearful of success...I have a team of extraordinary folks with great hearts and they are working really, really, really hard. But it's not sustainable. We don't have the funding here to have what it takes to be a PCMH. We certainly don't have the funding to be medical neighbors, in terms of being able to get off of that treadmill and carve out time to actually take care of the patients without putting them through a mini-mill...I'm concerned about the sustainability of doing this. <i>[Practice Leader, Colorado]</i></p> <p>One of the big things going forward that we need to figure out is how to do is create an integrated system with aligned incentives...That is one of the reasons why the hospitals are now a little more interested in giving us that data on discharges because they now have an additional incentive to do that. A lot of the things we bump our head up against [are] because people are not motivated to work together in the way that you need them to, to really streamline the care. <i>[Practice Leader, Rhode Island]</i></p>

the most advanced solo practices choose to participate in a PCMH pilot) make it difficult to draw conclusions, and the question requires further exploration.

Given the low prevalence of structural capabilities seen nationally, it is important to identify the facilitators and barriers to achieving structural capabilities. From the interviews we conducted with practice leaders, 3 critical factors emerged. First, financial incentives were instrumental in facilitating the creation of systems. For example, the Rhode Island practices were provided with additional resources, including a care coordinator and a graduated per-member, per-month fee based on their recognition level. Rittenhouse et al<sup>16</sup> also found that external incentives, such as pay-for-performance and public reporting, were positively associated with the presence of structural capabilities in small- to medium-sized practices. At the same time, broader payment care reform is important to ensure sustainability.

Second, while payment can facilitate the adoption of capabilities, other factors, such as inadequacies of technology, may affect their successful implementation. Implementation isn't just about putting individual processes and systems in place; it involves transforming how primary care is delivered, a process that requires time, effort, and a focus on learning. Key intervention components that practices in Rhode Island, Colorado, and Ohio reported as being valuable included assistance from transformation coaches and participation in learning collaboratives. This finding supports the literature about the importance of quality-improvement coaches and learning collaboratives to facilitate the implementation of evidence-based practices, the transfer of tacit knowledge, benchmarking with peers, and the adoption of system-level changes.<sup>27-30</sup>

Finally, practices noted that using structural capabilities on a regular basis involved cultural change and required more time. Culture is powerful because it is rooted in the values, attitudes, norms, routines, and shared traditions of people who work together in an organization.<sup>31</sup> In their review of the relationship between implementation of structural capabilities and culture, Duggan et al found that physician practices that emphasized collegiality and teamwork were more likely to implement structural capabilities compared to those that emphasized hierarchy and autonomy.<sup>32</sup> However, a recent study found a preponderance of rational and patient-centered cultures in multispecialty physician groups, and less emphasis on the group and developmental cultures that are necessary for transforming primary care practices into PCMHs.<sup>33</sup>

Structural capabilities, such as referral tracking, test tracking, and continuity of care, are important not only

for the delivery of safe, high-quality primary care, but also to facilitate the implementation of key reform initiatives, including accountable care organizations, medical neighborhoods, bundled payments, and initiatives to reduce inappropriate hospital readmissions by improving care coordination across the continuum. Our other research found a reduction in emergency department visits in the Rhode Island pilot.<sup>12</sup> The findings of other studies examining the association between structural capabilities, utilization, costs, and quality have been mixed.<sup>34-36</sup> As a result, more research is needed to isolate the capabilities that lead to improvements in care and costs.

Our study has limitations. First, we focused on pilot practices in 3 states, and these practices may differ from those in other states or in other medical home pilot interventions. Since the pilot practices volunteered to be early adopters of the model, there may be a selection bias in the sample regarding openness to innovation and baseline performance, which limits the generalizability of our findings. Indeed, our data suggest that pilot practices in Ohio and Colorado had already adopted many PCMH features at baseline. In addition, pilots received financial incentives and resources, and therefore the results may not be generalizable to practices without similar incentives and support.<sup>20</sup>

Second, state was substantially confounded with structural capabilities, suggesting that additional research is necessary to determine whether different or additional structural capability gaps are present between low and high performers from different states. Third, the PPC-PCMH measurement tool and data may not capture all the important primary care capabilities or the extent to which, and consistency with which, they are used.<sup>36</sup> Fourth, our sample size was small, resulting in limited power for statistical analyses, including associations between the presence of capabilities and quality and patient experience. Notwithstanding these limitations, our study is the first to examine the prevalence and development of structural capabilities in small- to medium-sized PCMHs using a combined cross-sectional and longitudinal study design.

## CONCLUSIONS

Despite some early promising evidence from PCMH initiatives, there are concerns about the ability of primary care practices, particularly small- to medium-sized ones, to achieve structural capabilities. At a minimum, the results of our study suggest that small- to medium-sized PCMHs can achieve these capabilities. Furthermore, our findings for the Rhode Island pilot suggest that building

these capabilities need not take a many years. However, our sample included early adopters, and so the findings from these practices may not compare with later adopters of same-size or larger practices. Building capabilities may require at least transitional financial support if not payment reform, attention to implementation, and cultural change. These investments in primary care may be critical for achieving affordable, safe, high-quality care. A wide range of public and private stakeholders are seeking delivery system reforms rooted in the capabilities that PCMHs are intended to embody.

### Acknowledgments

Ms Alidina's effort on this project was supported by dissertation grants from the Canada Program, Weatherhead Center for International Affairs, and the Canadian Federation of University Women. Funding for the study as a whole and for the efforts of Dr Schneider, Dr Singer, and Dr Rosenthal was provided by the Commonwealth Fund, a national private foundation based in New York City that supports independent research on healthcare issues and makes grants to improve healthcare practice and policy and Colorado Trust.

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**Source of Funding:** The research was approved by the institutional review board at the Harvard School of Public Health and financially supported by the Commonwealth Fund and Colorado Trust (Principle Investigator: Dr Rosenthal). Ms. Alidina's effort on this project was supported by a dissertation grant from the Canada Program, Weatherhead Center for International Affairs and the Canadian Federation of University Women.

**Author Disclosures:** None of the authors report a relationship or financial interest with any entity that would pose a conflict of interest with the subject matter of this article.

**Authorship Information:** Concept and design (ES, AS, SS, MR); acquisition of data (SS, MR); analysis and interpretation of data (ES, AS, SS, MR); drafting of the manuscript (ES, AS, MR); critical revision of the manuscript for important intellectual content (ES, AS, SS, MR); statistical analysis (AS, MR); obtaining funding (ES, MR); administrative, technical, or logistic support (AS); supervision (ES, SS, MR).

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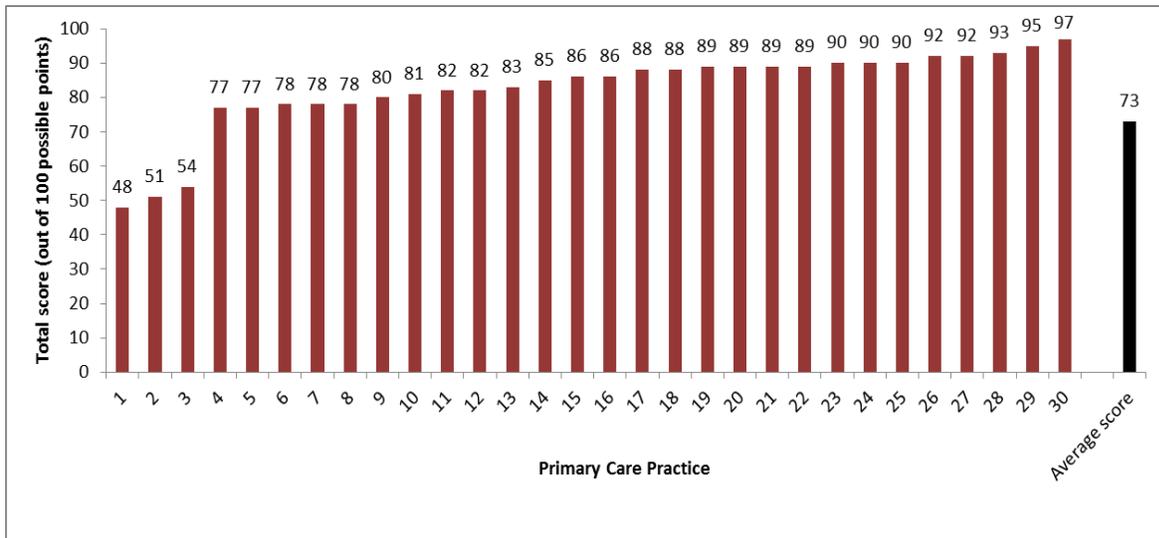
## eAppendix A

**Supplemental Table 1.** PPC-PCMH—How PCMH Structural Capabilities are Defined and Measured

<b>Standards</b>	<b>Number of elements</b>	<b>Sample Element</b>	<b>Points</b>
1. Access and communication	17	Written standards for patient access and communication	9
2. Patient tracking and registry	47	Generates lists of patients and reminds patients and clinicians of services needed (population management)	21
3. Care management	32	Coordinates care/follow up for patients who receive care in inpatient and outpatient facilities	20
4. Patient self-management support	9	Actively supports patient self-management	6
5. Electronic prescribing	19	Uses electronic system to write prescriptions	8
6. Test tracking	14	Uses electronic system to order and retrieve tests and flag duplicate tests	13
7. Referral tracking	4	Tracks referrals using paper-based or electronic systems	4
8. Performance reporting and improvement	14	Measures clinical and/or service performance by physician or across the practice	15
9. Advanced electronic communication	14	Availability of an interactive website	4
<b>Totals:</b>	<b>170</b>		<b>100</b>

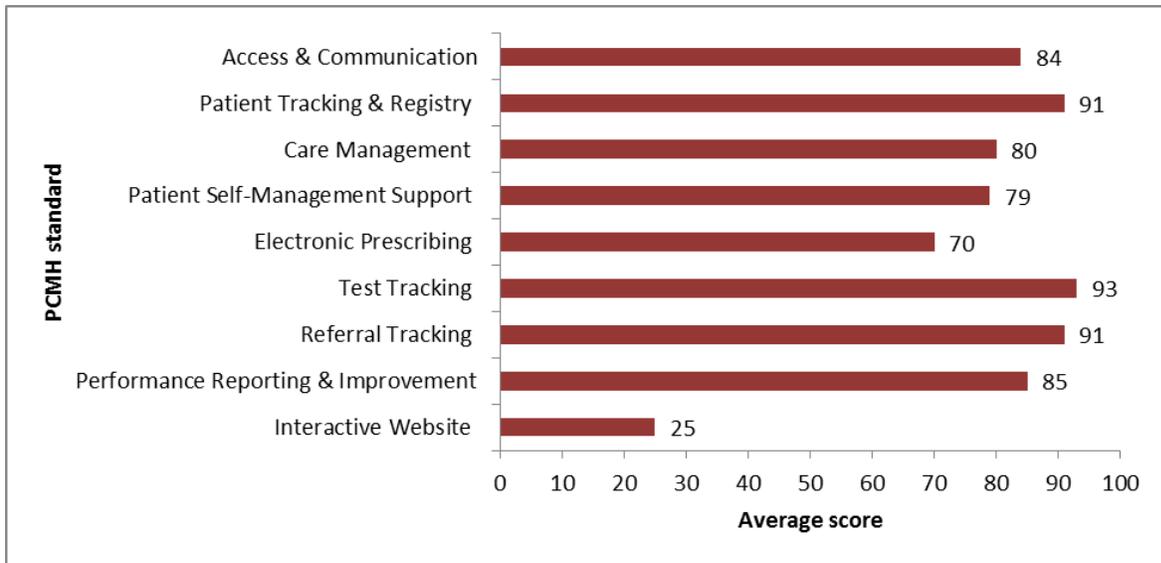
## eAppendix B

### Supplemental Figure 1. PPC-PCMH Baseline Score by Practice



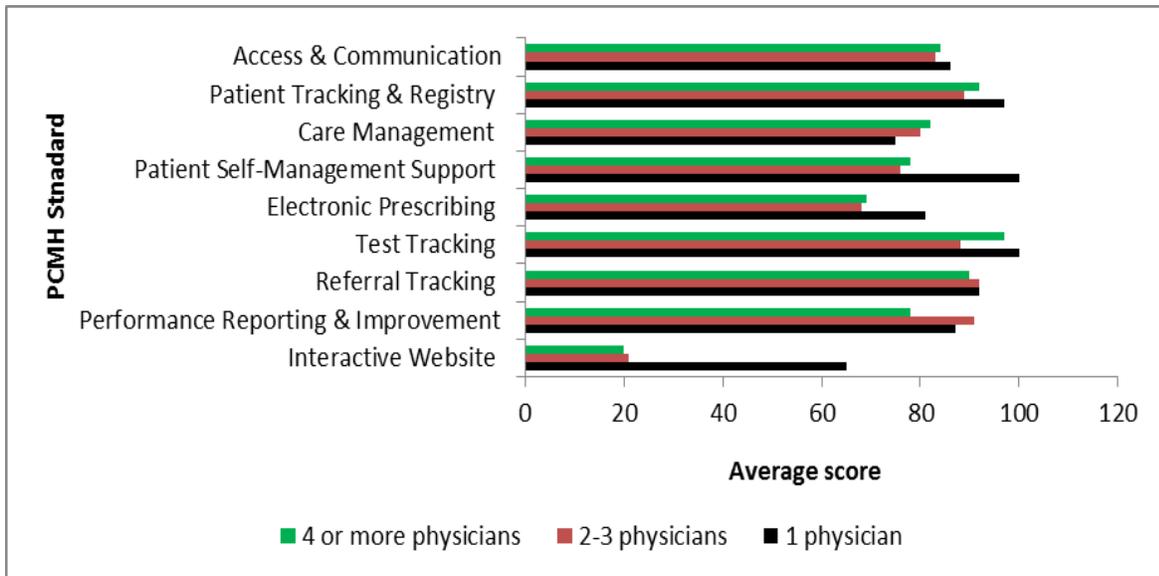
## eAppendix C

**Supplemental Figure 2. Average Score by PCMH Standard**



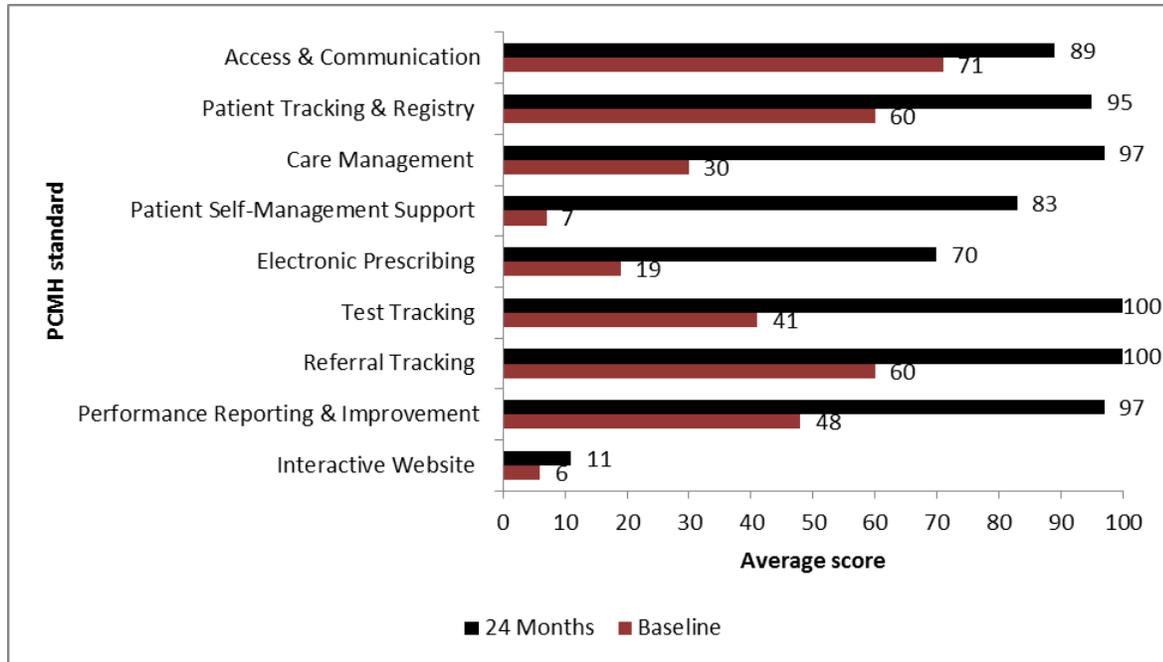
## eAppendix D

Supplemental Figure 3. Performance by Practice Size



## eAppendix E

**Supplemental Figure 4.** Average PPC-PCMH Scores of Rhode Island Medical Home Pilot Practices by Standard at Baseline and 24 Months



## **eAppendix F. Interviews With PCMH Practice Leaders at Baseline, 18 Months and 30 Months**

### **Baseline**

- 1) What does the PCMH mean to you? Probe: What are essential elements? What outcomes will it produce? How radical is the change embodied by the PCMH?
- 2) To what extent are you already operating as a PCMH as you've defined it?
- 3) Why did the practice get involved in trying to become a PCMH? Probe: To what extent was participation motivated by the need for a new payment model or financial sustainability concerns?
- 4) How committed are practice leaders to the principles embodied by the PCMH concept, as defined by the program?
- 5) How committed are practitioners in your practice to the principles embodied by the PCMH concept? How motivated are they to making the changes required to become a PCMH?
- 6) What about the PCMH principles is compatible with your group's culture, preferences, and current work practices? What is not compatible? Are there differences among practitioners, e.g., by discipline, age, gender?
- 7) Tell us about what you have done so far to transform the practice. How have you organized this work? How involved are physicians and staff (all of them)?  
Probe for things we expect will need to change, e.g., staff mix, staff compensation.
- 8) How much change do you believe is still required for your practice to become a PCMH?
- 9) What do you anticipate the challenges will be in becoming a PCMH? Probe for things we expect will be challenging, e.g., staff resistance.
- 10) What are you doing to address these obstacles?

**At approximately 18 months**

- 1) When we spoke with you at the beginning of the pilot, we asked you what the “medical home” meant to you. Now that it’s a year later, how has your personal definition or your practice’s definition of the medical home changed, if at all? *Probe: Are there aspects of the medical home that seem more or less important or applicable to your practice?*
- 2) What have you done over the course of Year 1 toward becoming a PCMH? Please describe specific changes in the practice that are ongoing or have been completed as a result of the pilot.
- 3) For the practice as a whole, what have been the most challenging aspects of your efforts to change practice? The most surprising? *Probe: For different types of staff members, were there any particular challenges? For example, were there challenges that seemed to be unique to doctors, nurses, or medical assistants?*
- 4) What has been most helpful to your efforts to change practice? *Probe: Has the pilot provided resources (financial or non-financial) that enabled changes you could not have otherwise made?*
- 5) Have you solicited patient feedback about the process? Do patients seem to be aware of the changes your practice has made? (If not already clear) How can you tell? Are there things you’ve accomplished that you believe are not apparent to your patients, but may still be important.
- 6) How have the structural and technological changes required in becoming a PCMH promoted or interfered with the provision of effective, patient-centered clinical care? *Probe: In your opinion, has the “patient-centered” part of the clinical home been more difficult to achieve because of additional requirements delineated by NCQA or others?*
- 7) How has the pilot affected the culture of the practice? (e.g., from physician-centered care to team approach; from physician-directed care to shared physician-patient decision making). *Probe: Are there new staff meetings devoted to patient experience or quality of care? Have the relationships between staff members changed (e.g., the way medical assistants interact with doctors and nurses)?*

- 8) *(If not answered in 7)* How have the staff's roles changed or evolved during Year 1? Have the staff members experienced "change fatigue"?
- 9) What kinds of changes do you believe would still be required for your practice to become an "ideal" PCMH, as you define it? Which of these do you plan to undertake in the near term? What major hurdles must your practice overcome to succeed and how do you plan to surmount these obstacles?
- 10) What early lessons can you take away from Year 1 of the pilot? What has been successful? What has been especially challenging? Why?
- 11) If a leader of another practice were considering participation in a medical home demonstration project, what advice would you have for that leader?

**At approximately 30 months**

- 1) What aspects of your practice's transition to a patient-centered medical home have been the most successful to date? Where do you see the most room for improvement? How do you define success/failure, and what measures or changes would you point to in particular (e.g., cost savings, quality improvements, replication by others, physician and staff satisfaction, patient satisfaction, cultural transformation, collaboration with medical neighbors)?
- 2) Reflecting on your practice's path towards becoming a PCMH, what factors have been most critical to your accomplishments? (e.g., resources provided by the pilot, leadership, cultural changes, learning orientation, operational changes)
- 3) Are there ways in which the medical home model has changed people's job satisfaction? What has been most important for changes in job satisfaction? As you look to the future, what are two or three things that would most contribute to improving job satisfaction in medical homes?
- 4) What is your experience in establishing a medical neighborhood? What obstacles have you encountered? How important is the strength of the medical neighborhood to the success of the medical home? *Probe: Who are the neighbors and how extensive are your*

*collaborations? To what extent do your medical neighbors have an infrastructure that supports collaboration (systems, processes, staff, shared EHR, etc.)?*

- 5) How have you engaged patients in the practice's improvement? (e.g. obtained feedback through patient surveys or advisory councils) Do you think patients will (or do) see Patient Centered Medical Homes as an attractive alternative to standard practices? For what aspects of the PCMH have your patients acknowledged/expressed support?
- 6) If you were designing a PCMH pilot, what major elements would you incorporate? (e.g., enhanced payment, collaboration with pilot practices, in-office coaching, technical assistance, other in-kind investments) What advice would you have for practice leaders participating in your demonstration? *Probe: Which components would you import from the CSI-RI PCMH pilot and what (if any) major changes would you make?*
- 7) How would you assess your progress to date relative to where you thought you might be now when you began the pilot? *If not already answered:* Are there any components of the medical home that are not in place? If so, what factors have prevented your practice from actualizing these elements?