ORIGINAL RESEARCH

Effects of adding a new PCMH block rotation and resident team to existing longitudinal training within a certified PCMH: primary care residents' attitudes, knowledge, and experience

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Background: Although the patient-centered medical home (PCMH) model is considered important for the future of primary care in the USA, it remains unclear how best to prepare trainees for PCMH practice and leadership. Following a baseline study, the authors added a new required PCMH block rotation and resident team to an existing longitudinal PCMH immersion and didactic curriculum within a Level 3-certified PCMH, aiming for "enhanced situated learning". All 39 residents enrolled in a USA family medicine residency program during the first year of curricular implementation completed this new 4-week rotation. This study examines the effects of this rotation after 1 year.

Methods: A total of 39 intervention and 13 comparison residents were eligible participants. This multimethod study included: 1) individual interviews of postgraduate year (PGY) 3 intervention vs PGY3 comparison residents, assessing residents' PCMH attitudes, knowledge, and clinical experience, and 2) routine rotation evaluations. Interviews were audiorecorded, transcribed, and analyzed using immersion/crystallization. Rotation evaluations were analyzed using descriptive statistics and qualitative analysis of free text responses.

Results: Authors analyzed 23 interviews (88%) and 26 rotation evaluations (67%). Intervention PGY3s' interviews revealed more nuanced understanding of PCMH concepts and more experience with system-level PCMH tasks than those of comparison PGY3s. More intervention PGY3s rated themselves "extremely prepared" to implement PCMH than comparison PGY3s; however, most self-rated "somewhat prepared". Their reflections demonstrated deeper understanding of PCMH implementation and challenges than comparison PGY3s but inadequate experience to directly see the results of successful solutions. Rotation evaluations from PGY1, PGY2, and PGY3s revealed strengths and several areas for improvement.

Conclusion: Adding one 4-week block rotation to existing longitudinal training appears to improve residents' PCMH knowledge, skills, and experience from "basic" to "intermediate". However, this training level appears inadequate for PCMH leadership or for teaching junior learners. Further study is needed to determine the optimum training for different settings.

Keywords: primary care, new models of healthcare, curriculum, family medicine, population health, residency education

Introduction

The health care landscape in the USA continues to change at a remarkable pace. New models of health care delivery, including the patient-centered medical home (PCMH) model, and population health management are increasingly considered critical for the

future of medicine, especially for primary care.[1–3] However, it remains unclear how to best prepare primary care residents for practice in this changing environment. While many residency programs describe PCMH practice transformation efforts[4–7] or focused aspects of PCMH implementation,[8–11] few describe formal curricula preparing residents for practice within these new health care delivery models[12] and even fewer report curriculum evaluations.[13,14] Most published residency curricula rely on immersion in a transforming PCMH practice as the primary educational method. Some supplement this with didactics, quality improvement projects, and chronic disease management training.[12–14]

While the larger health care system is undergoing fundamental transformation, residency programs struggle to meet existing accreditation requirements, while attempting to provide innovative training suited to the health care system of tomorrow. Radical changes in primary care residency education may be needed. However, currently only incremental changes may be possible. Additionally, it remains unclear what the appropriate "dose" of PCMH/population health training is needed for different clinical specialties.

The Brown University Family Medicine Residency Program's faculty-resident teaching practice is located in an urban, underserved setting in Rhode Island, USA, and provides care for patients with a heavy burden of complex medical and psychosocial needs. An early adopter of the PCMH model, this practice was recognized by the National Committee for Quality Assurance as a Level 3 PCMH in 2010. Level 3 is the highest level of PCMH accreditation available in the USA. Despite experiencing this high level of PCMH practice transformation and exposure to a PCMH didactic curriculum, our previous qualitative interview study of all graduating postgraduate year (PGY) 3 residents in June 2011 showed that residents' knowledge of PCMH-related concepts was vague and limited to a few specific elements, and their readiness to incorporate PCMH skills into their practices was limited.[15] Although these senior family medicine residents had considerable experience practicing within a Level 3 PCMH (eg, >1,650 patient visits each; Figure 1) and had received PCMH training comparable to that described by other programs,[12,14] residents appeared to remain peripheral to the system-level aspects of the PCMH, only passively participating in population health, chronic disease management, and quality improvement activities that are central to the PCMH model.[15]

In reflecting on these findings, we reasoned that a simple situated learning model[16–18] (ie, longitudinal immersion in a PCMH practice with supporting didactics) was not adequate to ensure that residents gain the new skills necessary for practice and leadership in our rapidly changing health care
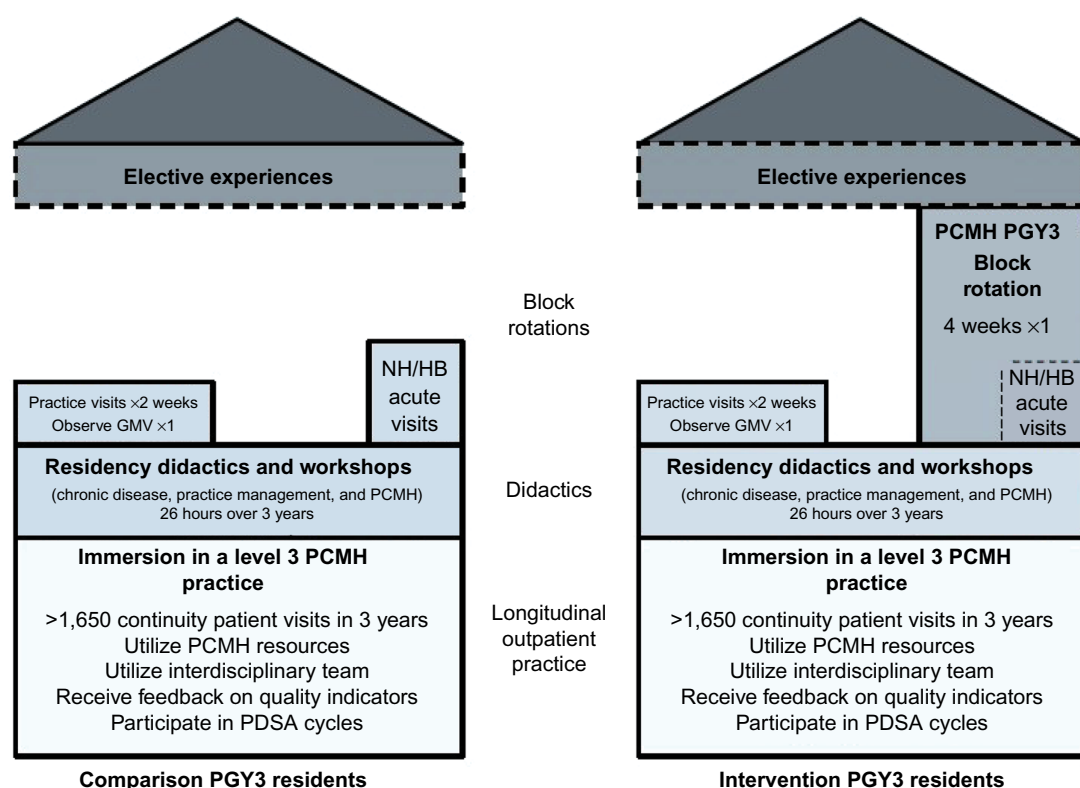

Figure 1 Comparison of PCMH training received by PGY3 comparison residents vs PGY3 intervention residents.
Abbreviations: GMV, group medical visit; PCMH, patient-centered medical home; PDSA, Plan Do Study Act; PGY, postgraduate year; NH, nursing home; HB, homebound.

environment. This may be because the "community of practice" (including most faculty and staff), which supports situated learning, was itself attempting to acquire new knowledge and skills. This left teaching about new models of practice to a handful of PCMH faculty "champions". We hypothesized that in order to effectively teach PCMH and population health skills, an "enhanced" situated learning model is needed. This would entail purposefully shifting residents from the periphery to the center of PCMH activities and having them take on increasing levels of responsibility as they progress from junior to senior residents. Thus, as they develop from novice to expert in PCMH-related skills, they become integral to the community of practice supporting future learners.

With this enhanced situated learning model in mind, in July 2011, the Brown Family Medicine Residency underwent a significant curricular redesign in order to implement a new required 4-week PCMH block rotation for PGY1, PGY2, and PGY3 residents, forming a new three-member outpatient PCMH resident leadership team, modeled after the structure of inpatient resident teams.[19] We added this new block rotation to our existing longitudinal immersion and didactic PCMH curriculum, studied previously.[15] This redesign followed a critical review of our overall residency curriculum and specialty-specific Accreditation Council for Graduate Medical Education requirements. Redesign required making challenging choices regarding training priorities and negotiating with multiple stakeholders.[19] The goal of this new PCMH block rotation and resident leadership team is to improve residents' knowledge, attitudes, and skills regarding PCMH and population health competencies. We derived content from the National Committee for Quality Assurance PCMH standards[20] and recommendations of family medicine thought leaders.[21,22] Content is consistent with recent recommendations for family medicine residents[23] and a consensus report of PCMH entrustable professional activities (EPAs) for internal medicine residents.[24] A description of curriculum development within the Rhode Island context has been previously published.[19] Table 1 summarizes key curriculum content and teaching methods.

Table 1 Curriculum content and teaching methods

Content	Learning activities (experiential, didactics, weekly projects, and co-leadership roles)	ACGME competency
Principles of PCMH model and NCQA accreditation	D – overview E – participate in practice's interdisciplinary PCMH implementation meetings E – site visits to other PCMH practices (PGY1s only)	PBLI-3
Practice management, clinical operations and systems	E – participate in clinical operations committee meetings D and L – billing and coding learning activity followed by providing individual coding and billing reports to all practice providers (residents and faculty)	PBLI-3
Quality monitoring and improvement	D – chart audits, learning activity with feedback to fellow PCMH residents D, P, and L – PDSA cycle – design and implement; educate rest of the practice D, P, and L – patient safety; "trigger tools"; root cause analysis; and provide safety pearl for whole practice	PBLI-3 SBP-2
Direct patient care within a PCMH	E – provide direct patient care in the PCMH for continuity patients; utilize PCMH resources E and L – participate in triage of acute visits and do acute visits in PCMH E and L – participate in triaging nursing home and homebound patient acute and transitions of care issues; do acute visits offsite	SBP-4

Population health
  Care of complex and vulnerable patients
  Chronic disease management
	E and L – identify "high-risk" patients and arrange follow-up plan (using team)
	  Participate in review of overnight phone calls, assist in triage
	  Hospitalized patients/transitions of care
	  Nursing home and homebound patients
	E, P, and L – group medical visits (diabetes) – prepare and help run
	E, P, and L – diabetes registries – learn how to interpret and provide feedback on patient panel to all practice providers (residents and faculty)
		PC-2
		SBP-2
		C-4

Team-based interdisciplinary care	E and L – daily PCMH interdisciplinary morning rounds (RNs, NP, MD/DOs, and MSW) E and L – group medical visits (dietician, RN, MSW, PT, and MD/DO) E and L – coordinate care for nursing home and homebound patients with geriatrics team (NP and geriatrician) E – utilize interdisciplinary team available for patient care in the PCMH (eg, nurse care manager, colocated behavioral health team, dietician, and subspecialty providers)	C-3

Abbreviations: ACGME, Accreditation Council for Graduate Medical Education; D, didactic; E, experiential; P, project; L, leadership or co-leadership (taught and coached by faculty); NCQA, National Committee for Quality Assurance; PDSA, Plan Do Study Act; PCMH, patient-centered medical home; PGY, postgraduate year; RNs, registered nurses; NP, nurse practitioner; MD, medical doctor; DO, doctor of osteopathic medicine; MSW, master of social work; PT, physical therapist; PBLI-3, improves systems in which physician provides care; SBP-4, coordinates team-based care; SBP-2, emphasizes patient safety; PC-2, cares for patient with chronic conditions; C-4, utilizes technology to optimize communication; C-3, develops relationships and effectively communicates with physicians, other health professionals, and health care teams.

The purpose of this study is to critically explore the effects of this new curriculum 1 year after implementation, at which time all residents had participated in one, 4-week long, PCMH block rotation. Given the multiple completing training demands that residencies face and the varying needs of different clinical specialties, we felt it critical to determine whether a 4-week rotation, added to an existing longitudinal PCMH practice immersion and didactic curriculum, is adequate to impart PCMH leadership training or whether the planned full 3-year longitudinal block rotation series (4 wk/y ×3 years) is needed.

Methods
Study design
We used a multimethod approach to assess the effects of this new required rotation after the first year of implementation. To explore the meaning and context that residents brought to their experience, knowledge, and attitudes regarding their PCMH training, we chose as our primary method qualitative individual interviews comparing PGY3 intervention residents with PGY3 comparison residents. We supplemented this with analysis of routine rotation evaluations submitted through our electronic evaluation system (E*Value) from all intervention residents. We received Institutional Review Board approval for this study.

Participants and setting
We invited all 39 residents present at Brown University's 13–13–13 family medicine residency program during academic year 2011–2012 (intervention residents) and 13 comparison residents (Brown Family Medicine residency class of 2011) to participate in the study.

Intervention participants
All Brown Family Medicine residents participated in this new required block rotation during academic year 2011–2012. These 39 intervention residents included 13 PGY1s, 13 PGY2s, and 13 PGY3s.

Interview study participants
The 13 PGY3 intervention residents (class of 2012; who received baseline PCMH training[15] plus one PCMH block rotation) and 13 comparison PGY3 residents (class of 2011; who received baseline PCMH training only[15]) were eligible to participate in the qualitative interview study. Figure 1 illustrates the differences in curriculum received by these two groups.

Rotation evaluation participants
All 39 intervention residents were asked to complete routine rotation evaluations through the E*Value system.

Data collection
A nonteaching, nonsupervisory staff person conducted semistructured individual in-person interviews, using a largely open-ended interview guide, with the 13 PGY3 intervention and the 13 PGY3 comparison residents just prior to graduation. Questions topics included PCMH attitudes and knowledge as well as residents' self-assessment of preparedness for PCMH practice and self-report of the number of selected PCMH-related activities they had performed during residency. Interviews were audiorecorded and transcribed verbatim with identifiers removed. Participants signed written informed consent forms.

We extracted all PCMH rotation evaluations from all 39 residents present during academic year 2011–2012 from the E*Value system. These deidentified evaluations included both numerical ratings and free text responses.

Data analysis
We conducted a thematic analysis of the content of the individual interviews using the immersion/crystallization method.[25] This entailed two researchers (GA and RG) first individually reading transcripts and making notes regarding emerging themes. This was followed by analysis meetings to discuss data and interpretation of content until we reached consensus regarding major themes and subthemes. Three researchers (CF, RC, and GA) extracted numerical data from the interviews and analyzed the findings using descriptive methods. Three researchers (GA, RC, and FE) analyzed E*Value rotation evaluations, using descriptive statistics of numerical ratings and qualitative analysis of free text responses.

Ethical approval
This study was reviewed and approved by the Memorial Hospital of Rhode Island's Institutional Review Board. Memorial Hospital of Rhode Island is the home institution for the Brown University Family Medicine Residency Program.

Results
Participants
Eleven PGY3 intervention (85%) and 12 PGY3 comparison residents (92%) participated in the individual interview study. Twenty-six residents (66.7%) completed rotation evaluations.

Qualitative interviews: intervention vs comparison PGY3s

Our analysis of interview data from intervention and comparison residents yielded four major differences between the groups (Tables 2 and 3).

Attitudes toward the PCMH model

Both sets of residents expressed generally positive attitudes toward the PCMH model. However, comparison residents displayed an undercurrent of significant, often vague, concerns such as the model is "too challenging to fully implement" or "only for large practices". For intervention residents, after addition of only one 4-week rotation, expressed concerns were less pointed and focused on spe-cific issues, reflecting a more in-depth understanding of the PCMH model. For example, one intervention resident reflecting on poor diabetes measures in patients with complex psychosocial issues wondered "would you be penalized for that or should you be commended for taking on more complicated patients?"

In comparison group interviews, there was a sharp contrast in attitudes between the few PCMH resident champions in the class and the majority of the class. This contrast was much less apparent in the intervention group. In both groups, several residents believed that PCMH-related competencies would be unnecessary in their future practice, although this attitude was much less prominent in intervention residents.

Table 2 Comparison vs intervention residents' PCMH knowledge, attitudes, and preparedness (qualitative interviews)

Understanding of PCMH concepts

	Themes	Representative quotations
Comparison PGY3 residents (class of 2011)	Vague definitions/lack specifics; PCMH identified with nurse care managers; Source of education – one faculty	"having the addition of the care coordinators is the biggest, I think like obvious, thing that it means to me. Just having an extra person to help coordinate care for people. And then I know I hear a lot about the certain health outcomes or measures that we are now paying a lot of attention to."
Intervention PGY3 residents (class of 2012)	More in-depth definitions with specifics; Multiple elements of PCMH identified; Source of education – multiple sources	"Model of care that is patient-centered provides comprehensive care for patients and a team-based model that is not just 'I am the doctor, you are the patient.' It is working with everyone involved from the front staff to the nurses to the pharmacist to behavioral staff and incorporates group visits, thinking of different models of care and how to reach patients. I think it is innovation."

Opinions of PCMH

	Themes	Representative quotations
Comparison PGY3 residents (class of 2011)	Positive attitude with undercurrent of significant concern; Several stated just new label for old model	"I definitely think there are advantages […] since we implemented I feel like […] a certain subset of our patients have gotten care who would otherwise not have gotten care." "Not for me"; "Too idealistic"; "Only for the money"; "Reduces physician autonomy" "[What] family doctors have been doing all along."
Intervention PGY3 residents (class of 2012)	Positive attitude with some ambivalence; Less stated that it is just a new label; Concerns focused on specific issues and more in-depth understanding of PCMH	"It is the best of family medicine", "take better care of patients" "get money for doing things well" "patient tracking is annoying", "things to meet requirements of measures", "it worries me if […] it doesn't take into consideration like patients' compliance and things like that […] we can't obviously – we're not responsible for other people's decisions"

Self-assessment of preparation to implement PCMH activities after graduation

	Level of preparation	Why "somewhat prepared"?
Comparison PGY3 residents (class of 2011)	0% extremely prepared; 67% somewhat prepared; 33% somewhat unprepared; 0% extremely unprepared	Because they had heard of the concept and so could research information as needed: "I mean I figure if I wanted to implement later on I could call [the medical director]" "just because I know it exists as a model and I would think that the resources available that I would just have to access"
Intervention PGY3 residents (class of 2012)	18% extremely prepared; 72% somewhat prepared; 9% somewhat unprepared; 0% extremely unprepared	Because they understand what it takes to implement a PCMH, including challenges: "I think that I have a basis for thinking about it, and I'm actually looking forward to my job next year kind of thinking about how to move some of these things to the practice" "I think that one month […] probably wasn't enough to fully get a grasp on it […] I saw bits and pieces of it which I could use, but I don't know that I understand the whole picture of it" "I do not feel like I am extremely prepared for anything"

Abbreviations: PCMH, patient-centered medical home; PGY, postgraduate year.

Table 3 Intervention vs comparison residents' experience with PCMH clinical activities (from qualitative interviews)

PCMH clinical activity	Comparison PGY3s (class of 2011), N=12 (of 13)	Intervention PGY3s (class of 2012), N=11 (of 13)
Quality improvement: PDSA cycles		
Total number of PDSA cycles conducted during residency (by the whole class)	16 (median =1)	33 (median =2)
Number of residents who had conducted a PDSA cycle during residency	7 (58%)	10 (91%)
Number of residents stating they were "prepared" to conduct a PDSA cycle after graduation (scale: extremely unprepared, somewhat unprepared, somewhat prepared, and extremely prepared)	4 (33%) (all "extremely prepared")	9 (82%) (64% "somewhat prepared" and 18% "extremely prepared")
Quality monitoring: chart audits (of other resident/faculty charts)		
Total number of chart audits conducted during residency (by the whole class)	10[a] (median =0)	59 (median =5)
Number of residents who had done a chart audit during residency	1 (8%)	10 (91%)
Chronic disease management: GMVs		
Total number of GMVs participated in during residency (by the whole class)	7 (median =1)	20[b] (median =2)
Number of residents who have participated in a GMV	6 (50%)	9 (82%)
Total number of GMVs lead by the class during residency (by the whole class)	0 (median =0)	13[b] (median =1)
Number of residents who have lead a GMV during residency	0 (0%)	8 (73%)
Number of residents stating they were "prepared" to run GMVs after graduation (choices: prepared vs not prepared)	6 (50%)	11 (100%)
Population health: diabetes registries		
Total number of practice-wide diabetes registry analyses completed (by the whole class)	0 (median =0)	12 (median =1)
Number of residents who had completed a practice-wide registry analysis	0 (0%)	7 (64%)

Notes: Data extracted from closed ended questions in qualitative interviews; therefore, only raw numbers, percentages, and medians are provided. [a]All done by one resident – prenatal chart reviews (elective project). [b]One resident did additional group medical visits (elective project).
Abbreviations: GMVs, Group Medical Visits; PCMH, patient-centered medical home; PDSA, Plan Do Study Act; PGY, postgraduate year.

Knowledge of PCMH concepts

Comparison residents' definitions of the PCMH model were vague and imprecise, with most residents equating PCMH with a recently hired nurse care manager who had been of tremendous help to them. Almost all reported that their PCMH education came solely from a single faculty member, the medical director. In contrast, intervention residents provided more nuanced definitions of PCMH, were able to articulate multiple elements of the PCMH model, and referenced multiple sources of education regarding PCMH-related competencies.

Preparedness to implement PCMH

There was a difference in self-reported preparedness to implement PCMH principles after graduation between comparison and intervention residents, with none of the comparison residents vs 18% of intervention residents feeling "extremely prepared" (Table 2). In both groups, the majority felt "somewhat prepared". However, the reasons they felt somewhat prepared differed significantly. Many comparison residents believed that because they had heard of PCMH, they would be able to find more information if needed. In contrast, intervention residents provided more in-depth explanations reflecting a detailed understanding of the challenges involved with implementing a PCMH.

Specific learning activities

As a proxy measure for PCMH and population health skills gained through the rotation, we asked residents about their experience with specific learning activities (Table 3). The intervention class reported having participated in higher numbers of diabetes group medical visits (GMVs) (median 2 vs 1), Plan Do Study Act quality improvement cycles (median 2 vs 1), chart audits (median 5 vs 0), and practice-wide chronic disease registry analysis (median 1 vs 0). The quality of the involvement in these activities also differed considerably, with comparison residents reporting observer or participant status, whereas intervention residents reported having had some mentored leadership roles. For example, more intervention residents had co-led a GMV. Residents in both groups who expressed low interest in future practice leadership roles appeared less interested in learning about quality improvement.

Educational strengths and challenges with the PCMH rotation

Intervention residents were asked to reflect on what they learned and what needed improvement (Table 4). Residents felt that they learned many things including "big picture" aspects of PCMH and their practice, that change was possible and how change happens, how to work with interdisciplinary teams on a system level, and some specific skills.

Table 4 Interventions residents' opinions of rotation's educational strengths and weaknesses (qualitative interviews)

Theme	Subthemes	Representative quotations
Educational strengths		
Learned about system-wide factors (previously unaware of)	"Big picture" regarding PCMH Practice committees (operations, PCMH, etc) Practice policies	"I think all of us will leave with a general understanding of, you know, how to move a practice along, how to work with our chronic care patients, and I see it as a huge benefit to our training" "it is easy to complain like this is not working. You know, but then to actually see what goes into making changes is - that was kind of enlightening."
Learned that change is possible	Opportunities to make an impact Concrete mechanisms for change Change can take time	"Opportunity to recognize areas that needed change and then to actually do something active to make those changes" "[I] learned change can take a long time [...] but also see that change can happen fairly quickly"
Learned how to work with interdisciplinary team on systems	Interdisciplinary PCMH rounds Committees (operations and PCMH) Improved communications	"I did not even know they [operations committee] met once a month [...] really valuable [...] because it does give you insight into how things work and how things change and what the barriers are"
Learned specific skills not learned elsewhere in residency	PDSA cycles, registries, GMVs, chart audits, etc Tracking high-risk patients Impacting practice policies	"I learned some specific tips about patient policies. We looked at the violent patient policy, the geriatric policy for nursing homes [...]. so, that was the only time I did that" "[...] so while I find some of that kind of annoying, I also think that it is important to actually have objective measures [...] track different things [...] like how many people have you talked about smoking cessation with"
Educational weaknesses		
Inadequate time to see impact of many changes	Mixture of understanding and frustration	"I know that whatever we did [...] I wouldn't see any fruits from it. So I did the work, but kind of left it more for the second and first years, as they were the ones more likely to see change" "I think it is nice to analyze things and find out that there are ways that could be better. I think it didn't necessarily give me hope though".
Lack of adequate resources – residents felt they were doing "secretarial" work (specifically re: hospital transitions of care)	Few saw no benefit and were frustrated Many saw benefit but remained concerned Few saw benefit and were not frustrated	"It [the rotation] is all about tracking" "the transitions of care piece is a frustrating piece for the residents, but it is also a very important piece and something that needs improvement" "[...] satisfaction out of being like okay I found one [hospitalized PCMH patient], and now I am going to tell the PCP and just feeling like I was contributing to continuity of care, and not any people get lost"
Nursing home patient acute visits did not seem to "fit" in PCMH rotation	Several did not see relationship Few understood population management of elderly	"So you have a lot of like those nursing home responsibilities that are keeping you from doing like your PCMH responsibilities or PCMH responsibilities that are keeping you doing your nursing home responsibilities"
Unclear roles and responsibilities	More prominent earlier in year A work in progress	"I did not know what my - [what] the expectations were for the rotation in the beginning." "I am glad it is in place, and I think there is a lot of improvements that have already happened, and I think continuing to improve it will be good."

Abbreviations: GMV, group medical visit; PCMH, patient-centered medical home; PDSA, Plan Do Study Act; PCP, primary care physician.

However, they struggled with resolving the gap between the ideal of a PCMH and the realities of practicing within their faculty-resident practice, which had limited resources and a high burden of underserved and vulnerable patients. Several residents voiced frustration with certain rotation components, including tracking hospital transitions of care for PCMH patients, which was arduous due to the outdated community hospital's information technology system (and not, they felt, a physician role), and doing acute nursing home visits (which they felt did not "fit" with PCMH). Many, however, expressed understanding of the link between population health and both of these activities. Finally, many commented that 4 weeks was inadequate time to see the positive results of their efforts: "it's just really not long enough to have anything really change. And I think that's part of the things that are disheartening".

E*Value surveys: implementation and process evaluation

Monthly E*Value rotation evaluations and verbal feedback from residents and faculty informed rotation improvements throughout the year. Table 5 provides details of E*Value numerical ratings (1–4 scale) from residents. While residents rated the quality of teaching between "very good" and "excellent" (mean 3.35), they rated overall educational value only "adequate" to "very good" (mean 2.58). We did not calculate *P*-values due to small sample size. However, there appeared

Table 5 First year implementation feedback: rotation evaluation numerical ratings from residents (E*Value)

Residents	N	Response rate (%)	Achieved learning objective		Adequacy of resources		Quality of teaching		Overall educational value	
			Mean	Median	Mean	Median	Mean	Median	Mean	Median
PGY1	11 (of 13)	84.6	2.91	3	2.91	3	3.37	3	2.55	3
PGY2	8 (of 13)	61.5	3.13	3	2.88	3	3.13	3	2.50	2.5
PGY3	7 (of 13)	53.4	2.86	3	3.00	3	3.57	4	2.71	2
All	26 (of 39)	66.7	2.96	3	2.92	3	3.35	3	2.58	2.5

Note: Rating scale of 1–4 (1, inadequate; 2, adequate; 3, very good; 4, excellent).
Abbreviation: PGY, postgraduate year.

to be a trend in median ratings of overall educational value from highest in PGY1s (3= very good) and lowest in PGY3s (2= adequate). PGY3s rated the quality of teaching higher than other groups.

Free text responses revealed that residents considered the "most valuable" components to be review of overnight phone calls during PCMH morning rounds, GMVs, acute visits, and didactic sessions. Additionally, many PGY1 residents reported seeing acute nursing home patients with their senior resident (PGY3) as among the most valuable learning experiences. The most commonly reported "least valuable" activity was tracking the practice's hospitalized patients to ensure appropriate transition of care. The most common resident requests for improvement encompassed logistics of rotation orientation, clarification of roles and expectations, and improvement of the hospital's information technology (IT) system.

Discussion

We instituted a major curriculum redesign that added a new annual PCMH block rotation and resident leadership team[19] to our existing longitudinal PCMH immersion and didactic curriculum.[15] Residents' rotation evaluations revealed strengths (eg, quality of teaching) and several areas requiring improvement (eg, clarification of residents' roles). Residents especially expressed frustration at their hospital's lack of adequate IT capabilities to enable efficient tracking of the practice's hospitalized patients.

Despite these implementation challenges and after only 1 year of implementation, our qualitative interview data showed interesting differences between intervention and comparison PGY3s. Intervention residents expressed fewer concerns about the PCMH model, with remaining concerns focused on specific issues rather than general impressions, reflecting a more nuanced conceptual understanding of the model. Although the majority in both groups rated themselves as only somewhat prepared to implement PCMH principles after graduation, intervention residents' reasons for this self-rating reflected a more sophisticated understanding of

the challenges involved with PCMH implementation. Proxy measures for PCMH-related skills (eg, Plan Do Study Act cycles) demonstrated a greater number done and more active resident leadership roles in the intervention group. Finally, despite addition of this 4-week block rotation, several intervention PGY3s were still not convinced that PCMH would touch their work lives and PGY3s tended to rate the overall educational value of the rotation lower than PGY1s and PGY2s.

Although literature review reveals many articles discussing PCMH training in residency education, most focus on the challenges of PCMH practice transformation in residency settings.[3,4,26,27] Some describe implementation of specific PCMH training based on a simple situated learning model,[12–14] similar to that of our baseline PCMH curriculum prior to 2011,[15] with few reporting curricular evaluation.[13,14] Studies of effects on residents have been limited to quantitative evaluations of resident self-reported knowledge, attitudes, and skills, with either small sample sizes[14] or pooled results of multiple programs with multiple different curricular interventions.[13] In contrast, our intervention was created in response to our qualitative interview study that revealed that longitudinal immersion in a PCMH practice with supporting curricula, similar to those implemented by others in early stages of PCMH transformation,[12–14] was not adequate to impart PCMH leadership skills to family medicine residents. We reasoned that while residents were experiencing active situated learning related to direct patient care within a PCMH, they were experiencing only passive situated learning related to population health and PCMH systems. Therefore, our educational intervention is an attempt to move beyond "PCMH basic training" toward "PCMH leadership training", which many experts have described as essential for the future of primary care.[22,23,28,29] By actively creating a meaningful role for resident leadership within the PCMH, we attempted to transform passive situated learning to active situated learning.

Our qualitative interviews reveal what might not be easily measured by quantitative questionnaires, namely a

subtle, yet significant difference between intervention and comparison of PGY3 residents' PCMH knowledge and attitudes, and their experience conducting PCMH-related tasks. However, after experiencing just 4 weeks of this new PCMH block rotation, the PGY3 residents in this study appear not to have had adequate experience to become leaders in the PCMH community of practice necessary to support junior learners in the situated learning model. A PCMH curriculum dose of our baseline longitudinal immersion and didactic curriculum[15] plus one 4-week block rotation likely provides adequate opportunity to appreciate the system-level challenges involved with such things as population health and quality improvement, but inadequate experience to tackle complexities and see results of interventions, leading to some frustration. Thus, this higher level of training might be considered "PCMH intermediate training" but does not reach our goal of PCMH leadership training.

There are several limitations to this study. This is an intervention at a single family medicine residency, which has been a Level 3 PCMH since 2010, so this intervention many not be well suited to programs in earlier stages of PCMH transformation or to residencies for which primary care is not a central concern. In addition, our study was conducted after only 1 year of program implementation; therefore, the long-term effects of the rotation have not been assessed. Finally, although a family medicine residency size of 39 residents (13 in each class) is considered a large residency program in the USA, a qualitative study of only 13 participants in each group (total 26) may limit the generalizability of these findings.

Next steps

Given the promising results of this study and the need for family medicine residencies to prepare future leaders in primary care innovation,[21–23,28] we are continuing with our plan for a robust 3-year longitudinal curriculum toward PCMH leadership training. We have developed and are implementing new educational elements and progressive leadership roles for residents returning for Year 2 and Year 3 of this block rotation. Clarification of resident roles and expectations improved through this first year but need ongoing attention. While residents' frustration with institutional barriers to improve patient care systems (eg, transitions of care) reflects a new understanding of real-world system challenges, explicit education regarding institutional change process may be needed. Faculty development regarding PCMH transformation is being implemented as residents progress from novice to proficient or even expert in PCMH-related competencies. Finally, we plan to rigorously assess the PCMH learning

trajectory as residents progress through this longitudinal curriculum.

Conclusion

The primary care practice landscape in the USA is changing rapidly making it necessary for primary care residencies to prepare graduates to be knowledgeable and versatile leaders in this changing environment. While PCMH practice transformation with PCMH basic training is a necessary first step in this process, PCMH intermediate training, utilizing an enhanced situated learning model, such as studied in this article, may be a necessary next step in the journey toward PCMH leadership training for primary care residents. Further study is needed to assess the effectiveness and sustainability of this educational intervention.

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Disclosure

The authors report no conflicts of interest in this work.

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