

Training Residents to Work in a Patient-Centered Medical Home: What Are the Outcomes?

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ABSTRACT

Background The patient-centered medical home (PCMH) provides a setting to enhance resident training in systems-based practice. Few studies have addressed the impact of PCMHs on resident knowledge and confidence.

Objective The goal of this study was to evaluate resident knowledge, confidence, behavior, and patient outcomes in a PCMH.

Methods Our curriculum emphasized patient panel report card interpretation, a telephone medicine curriculum, and interdisciplinary team-based care of chronic medical conditions. We measured resident satisfaction, knowledge, and confidence. Patient outcomes included hemoglobin A1c (HbA1c) and blood pressures. Prescores and postscores were compared using paired *t* tests for continuous measures and McNemar's test for binary measures.

Results A total of 154 residents were eligible for the curriculum. All residents participated in the curriculum, though not all residents completed the evaluation. Completion rates for paired pre-post knowledge and confidence surveys were 38% and 37%, respectively. Nearly 80% (69 of 87) of residents indicated that the curriculum was above average or outstanding. Our evaluation revealed very small immediate improvements in knowledge and confidence. No significant improvement in patients' HbA1cs or blood pressures occurred after the curriculum.

Conclusions Explicit training to work in a PCMH was feasible and resulted in high levels of resident satisfaction and immediate small improvements in knowledge and confidence.

Introduction

The advent of the patient-centered medical home (PCMH) has been associated with variable improvements in patient outcomes¹⁻⁴ and costs of care.³⁻⁷ To date, nearly 7000 practices are recognized as PCMHs by the National Council on Quality Assurance (NCQA).⁸

Recently developed milestones^{9,10} support assessment of resident competencies in systems-based practice that overlap with NCQA requirements for clinics to attain PCMH status. These requirements include (1) identifying and managing patient populations; (2) enhancing access to care; and (3) working in teams to coordinate care.¹¹

While concepts of the PCMH have been disseminated for several years, few studies have measured the impact of resident training in the PCMH.¹²⁻¹⁸ Previous PCMH curricular evaluations have shown improvements in knowledge, attitudes, and self-described behaviors. Most studies have not assessed the impact of PCMH training on observed resident

behaviors and patient outcomes. The purpose of this project was to study the acceptability, feasibility, and educational and clinical outcomes from a new curriculum focused on the PCMH.

Methods

Setting

The University of Pittsburgh Medical Center (UPMC) Internal Medicine Residency Program assigns 154 residents to 1 of 3 continuity clinic sites. The UPMC teaching and community hospital clinic sites both received Level 3 PCMH recognition in 2009 and 2014, respectively. The Veterans Administration Hospital clinic similarly has adopted a PCMH model utilizing patient-aligned care teams.

Ambulatory training at UPMC consists of a 3-year continuity clinic and 4 structured month-long blocks of ambulatory rotations. The PCMH curriculum takes place during ambulatory blocks 2, 3, and 4.

Participants

Residents in their second and third years attend weekly half-day PCMH training sessions for 4 weeks during each ambulatory block. All residents in the program participate in the curriculum.

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Editor's Note: The online version of this article contains the assessment instruments used in the study.

Curriculum Structure

Specific curricular objectives and structure are shown in TABLES 1 and 2. Didactic materials, reading lists, telephone medicine cases, and worksheets used to prepare for interdisciplinary team meetings are available from the authors.

Residents work in small groups to improve care for selected patients in their continuity clinics. During the first week, residents meet with an expert in population management. The residents review data from their panel of patients on a report card that displays performance indicators. Residents then select patients who are not receiving appropriate screening or immunizations. Residents contact these patients via telephone and provide counseling about immunizations and screening.

For the second week, residents meet in small groups to debrief telephone interactions that occurred in week 1 and engage in case-based discussions of telephone medicine. Cases include telephonic management of common complaints, requests for opiates, and the disclosure of protected health information.

To prepare for the third week of the curriculum, residents select patients who are not meeting their targets for diabetes or hypertension. Using survey instruments developed onsite, residents explore barriers to self-management with their patients. Residents then present their patients to the interdisciplinary team, and a care plan is developed with team support.

The final week is devoted to the care of special patient populations, including those with chronic nonmalignant pain, disabilities, and low health literacy. This week of the curriculum was evaluated in a separate initiative.

Curriculum Feasibility

Our curriculum is potentially adaptable to other PCMH clinic settings. A residency director of quality

What was known and gap

Training in the patient-centered medical home (PCMH) model familiarizes residents with a comprehensive approach to ambulatory care and enhances their understanding of systems-based practice.

What is new

A study assessed resident knowledge, confidence, and behavior in a PCMH, along with patient outcomes.

Limitations

Single institution study limits generalizability; small sample may limit the ability to detect relevant outcomes.

Bottom line

Explicit training in the PCMH model resulted in high resident satisfaction and small improvements in their knowledge and confidence.

improvement oversaw the development of resident report cards and provided a 90-minute lecture and discussion session on interpretation of report cards for each block. An administrative assistant with 0.33 full-time equivalents (FTEs) prepared the report cards for the entire division including faculty and residents. A programmer worked 0.10 FTEs to extract data from the electronic health record (EHR). Telephone medicine was taught by our chief residents in 2-hour small group sessions for each block. Interdisciplinary members at each clinic met with the residents for a monthly 90-minute team meeting during the ambulatory blocks.

PCMH Curricular Evaluation

A multipronged approach was used to evaluate the PCMH curriculum. We focused our evaluation on ambulatory blocks 2 and 3 from 2010 to 2012. Knowledge was evaluated using test questions obtained from assigned reading materials. Confidence to work in a PCMH was also assessed. Both assessment instruments are available as online supplemental material. No PCMH knowledge or confidence survey instruments with evidence of validity were available at the time of this study. Thus, instruments were

TABLE 1
Objectives for Patient-Centered Medical Home (PCMH) Training

Competency	Objectives
Population management	- Introduce residents to the concepts of the PCMH, report cards, and patient registries - Work with current report cards and registries to address patients who are not meeting primary and secondary prevention targets
Intervisit telephone communication	- Develop techniques to give bad news over the telephone - Develop an approach to providing protected health information over the telephone - Perform complete and efficient documentation of telephone encounters
Team-based care of chronic medical conditions	- Brainstorm a strategy to overcome barriers to achieving targets for chronic medical conditions with an interdisciplinary team - Implement this strategy and document in the medical record

TABLE 2

Patient-Centered Medical Home Curriculum Structure

Timeline	Ambulatory Block 2 (PGY-2)	Ambulatory Block 3 (PGY-3)	Ambulatory Block 4 (PGY-3)
Week 1: Population Management	- Readings - Didactics - Registry informed telephone medicine	- Readings - Registry informed telephone medicine	Registry informed telephone medicine
Week 2: Intervisit Telephone Communication	- Readings - Small group case discussions	- Readings - Small group case discussions	- Readings - Videos in telephone medicine
Week 3: Team-Based Care	Discuss panel patient with diabetes	Discuss panel patient with hypertension or hyperlipidemia	Discuss panel patient with CHF or COPD at risk for readmission
Week 4: Special Populations	Chronic nonmalignant pain	Disabilities	Low health literacy

Abbreviations: PGY, postgraduate year; CHF, congestive heart failure; COPD, chronic obstructive pulmonary disease.

developed onsite to measure satisfaction, knowledge, and confidence after vetting with a subset of residents for comprehension. No additional validity evidence was obtained. Resident knowledge and confidence levels were measured before and immediately after their rotation. Prescores and postscores were compared using paired *t* tests for continuous measures and McNemar's test for binary measures.

We measured the frequency with which residents logged into their EHR inbox. Our program required that residents initiate ambulatory EHR logins a minimum of 3 times per week to check on test results and communicate with patients. We measured the mean number of logins per month and the percentage of resident months with 12 or more logins before starting the PCMH curriculum. We compared this to the number of logins between blocks 2 and 3, between blocks 3 and 4, and after block 4. We calculated means and percentages as well as tests for trend. We also monitored the number of resident logins for 2 years while residents were working in the PCMH, but before implementation of the curriculum. We used this group as a historical control.

Resident patient HbA1c levels and blood pressure readings were assessed before and after the introduction of the curriculum. Generalized McNemar's tests were performed to assess the predifferences and postdifferences for both HbA1c and blood pressure.

The University of Pittsburgh Institutional Review Board deemed the study to be exempt from review.

Results

A total of 154 residents were eligible to participate in the curriculum from 2010 to 2012. Not all residents participated in all aspects of the study, with 87 residents (56%) completing the satisfaction assess-

ments, and 59 (38%) and 57 residents (37%), respectively, completing the paired pre-post knowledge and confidence surveys. Only the 125 residents at the UPMC teaching and community hospitals were included in the EHR login and the patient outcomes analyses.

Resident Satisfaction

Residents expressed high levels of satisfaction with the curriculum. Of the respondents, 95% (83 of 87) indicated that they were satisfied with the course, and nearly 80% (69 of 87) indicated that they considered it to be above average or outstanding in quality.

Knowledge

To evaluate resident knowledge on concepts related to the PCMH, precurriculum and postcurriculum quizzes were administered. The percentage of correct responses increased for each question after completion of the curriculum. Overall, the total number of correct responses increased from a mean of 3.9 (SD = 1.4) to 4.5 (SD = 1.3) out of 7 questions for block 2 ($P = .02$), and from 2.4 (SD = 0.9) to 3.3 (SD = 1.1) out of 6 questions for block 3 ($P = .03$).

Confidence Levels

Resident confidence was measured on a 5-point Likert scale, with 1 indicating strong disagreement and 5 indicating strong agreement with each statement. Sample statements and mean resident scores before and after the curriculum are shown in TABLE 3. Resident confidence to work in a PCMH was high before the curriculum, but increased further after the curriculum was completed.

TABLE 3

Confidence Assessment: Perceived Ability to Work in a Patient-Centered Medical Home

I feel fully confident that:	Mean Prescore	Mean Postscore
I can utilize resources to optimize patient care	3.7	4.1 ^a
I can develop a successful plan to lower the HbA1c in my patients with diabetes	3.8	4.2 ^a
I can successfully utilize my interdisciplinary team to develop plans for patients not meeting targets	3.5	3.9 ^a
I can handle telephone requests for opiates	3.2	3.8 ^a
I can evaluate and treat most patients who call with complaints suggesting sinusitis	3.8	4.1 ^a
I can identify specific patients who are not meeting targets for primary or secondary prevention	4.1	4.3
I can comprehend data from my panel of patients	3.9	4.3 ^a

^a $P < .05$. Confidence was measured on a 5-point Likert scale (1, strong disagreement to 5, strong agreement).

Stratified analyses of satisfaction, knowledge, and confidence showed no significant differences when analyzed by clinic site.

Logging Into the EHR Inbox

We measured the frequency with which residents logged into their EHR inboxes. The mean number of logins per month increased from 14.5 before block 2 to 16.0 after block 3 ($\beta = 1.54$; $P = .009$; TABLE 4). The percentage of residents who had 12 or more logins also increased in this time period from 71% to 81% (OR = 1.77, $P = .04$). There was no increase in resident panel size concurrent with increasing EHR login activity. The historical control group of residents who were working in a PCMH environment prior to implementation of the curriculum logged into their EHR inboxes an average of 11.2 times per month at the end of their second year of residency and 11.7 times at the end of their third year.

Outcomes on Patient HbA1c Levels and Blood Pressure Readings

We assessed the HbA1c levels for patients with diabetes ($N = 35$) and the blood pressure for patients with hypertension ($N = 102$) before and after the PCMH curriculum. Mean HbA1c and blood pressure values were collected 2 months prior to block 2 and 2 months after block 4. No significant difference was found in patients' HbA1cs ($P = .66$) or blood pressures ($P = .30$) after this curriculum.

Discussion

This study showed that a new curriculum designed to improve skills needed to work in a PCMH was well accepted and showed a small immediate change in knowledge and confidence levels. The curriculum also was associated with a gradual increase in EHR logins over the course of 2 years, compared with a historical control. These interventions were not associated with any immediate improvement in HbA1c levels or blood pressure control among residents' patients.

Our results are similar to prior studies evaluating the impact of PCMH training. Other studies have also shown improvement in knowledge, attitudes, and self-described skills as a result of PCMH training,¹³ as well as increased resident response rates to a reminder tool for population management. Initiation of a PCMH curriculum also increased resident satisfaction with care for patients with chronic pain,¹⁵ identified the need for faculty development,¹⁶ and resulted in the development of tools to assess teamwork,¹⁷ efficiency, and quality of care.¹⁸

Our study differs from previous work in that we focused on observed rather than self-reported resident behaviors and patient outcomes in addition to measuring resident knowledge and confidence.

The study has several limitations. There are many potential reasons why we were unable to show an improvement in patient HbA1c levels or blood pressures. Our intervention, while liked by most residents, may be insufficient to substantially im-

TABLE 4

Resident Logins to Electronic Health Record (EHR) per Month

Ambulatory Block	Percentage of Logins $\geq 12\%$ (95% CI)	No. of Logins to EHR Mean (95% CI)
Before Block 2	71.1 (65.0–77.2)	14.5 (13.5–15.4)
Between Blocks 2 and 3	76.6 (71.1–82.1)	15.6 (14.7–16.5)
Between Blocks 3 and 4	81.3 (73.1–89.6)	16.0 (14.7–17.3)
After Block 4	78.8 (63.0–94.7)	15.1 (13.1–17.2)
Test of Trend	OR = 1.27, $P = .019$	Beta = 0.66, $P = .003$

prove patient outcomes. Moreover, resident panels are relatively small, containing an average of 55 patients. Thus, our sample size may not have had the power to detect a difference in patient outcomes. Patient factors, rather than resident or clinic factors, may have had an impact on hemoglobin A1c and blood pressure. The high-risk nature of the patients on the resident patient panels could have been a barrier to successful health outcomes. In addition, residents in the study came from a single institution, the findings may not be generalizable, and our response rates were low for the paired assessment of knowledge and confidence. The survey instruments used had only preliminary validity evidence, and questions may not have been interpreted as intended. Finally, the absence of a concurrent comparison group creates the possibility that changes in knowledge, confidence, and EHR logins may be due to external factors.

Future studies should address the impact of increasing resident EHR utilization on patient perceptions and satisfaction. Additional patient evaluation should be performed to determine whether training residents to work in a PCMH can improve health processes and outcomes.

Conclusion

In conclusion, we have shown that explicit training in a PCMH with minimal resources is acceptable to a majority of residents and was associated with small immediate increases in knowledge, confidence, and EHR logins for clinic patients.

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