



# Preparing Future Leaders: An Integrated Quality Improvement Residency Curriculum

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**BACKGROUND AND OBJECTIVES:** The Accreditation Council for Graduate Medical Education (ACGME) has recognized the importance of quality improvement (QI) training and requires that accredited residencies in all specialties demonstrate that residents are “integrated and actively participate in interdisciplinary clinical quality improvement and patient safety activities.” However, competing demands in residency training may make this difficult to accomplish. The study’s objective is to develop and evaluate a longitudinal curriculum that meets the ACGME requirement for QI and patient safety training and links to patient-centered medical home (PCMH) practices.

**METHODS:** Residents in the Worcester Family Medicine Residency (WFMR) participated in a faculty-developed quality improvement curriculum that included web-based tutorials, quality improvement projects, and small-group sessions across all 3 years of residency. They completed self-evaluations of knowledge and use of curricular activities annually and at graduation, and comparisons were made between two graduating classes, as well as comparison of end of PGY2 to end of PGY3 for one class.

**RESULTS:** Graduating residents who completed the full 3 years of the curriculum rated themselves as significantly more skilled in nine of 15 areas assessed at end of residency compared to after PGY2 and reported confidence in providing future leadership in a focus group. Five areas were also rated significantly higher than prior-year residents.

**CONCLUSIONS:** Involving family medicine residents in a longitudinal curriculum with hands-on practice in implementing QI, patient safety, and chronic illness management activities that are inclusive of PCMH goals increased their self-perceived skills and leadership ability to implement these new and emerging evidence-based practices in primary care.

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The Accreditation Council for Graduate Medical Education (ACGME) recognizes the importance of quality improvement (QI) training and requires that accredited residencies in all specialties demonstrate that residents are “integrated and actively participate in interdisciplinary clinical quality improvement and patient safety

activities.”<sup>1</sup> Physician training in quality improvement methods and practice is critical to improving patient outcomes.<sup>2</sup> However, competing demands in residency education remain an ongoing challenge, including the demands of clinical sites working on patient-centered medical home (PCMH) transformation. Institutional burnout is an additional risk,<sup>3</sup>

particularly with multiple residents performing short-term QI projects that are often left incomplete upon graduation. For graduates to be prepared for our future health care system, they must be actively involved in QI initiatives during residency, not only as participants but as engaged leaders.

Multiple residency programs have reported on QI curricula.<sup>4-10</sup> Many report a distinct rotation experience that focuses on QI and patient safety skill development.<sup>11,12</sup> Tomolo et al have reported on the importance of an integrated longitudinal model of pediatric resident involvement in QI.<sup>13</sup> This brief report describes a unique comprehensive QI curriculum in a family medicine residency through the completion of longitudinal didactics and experiential team-based quality initiatives that meet the needs of the residency’s clinical sites.

## Methods

### *Curriculum*

The University of Massachusetts Worcester Family Medicine Residency (WFMR) trains 36 residents (12 a year, across three clinical sites). WFMR developed an integrated model of QI education across all years of residency in 2011. (See

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**Table 1: Quality Improvement Curriculum: Learning to Improve Systems in Which the Physician Provides Care (PBLI-3)**

<b>Training Year</b>	<b>Miller's Framework Stage</b>	<b>Curricular Activity</b>	<b>Curricular Structure</b>	<b>ACGME FM Milestones Addressed</b>
PGY1	Knowledge (Knows)	Community Assessment  IHI Module completion: PS 100: Introduction to Patient Safety PH 101: Introduction to Population Health	HC-based group with faculty support investigates community resources (2-week block rotation)  Independent time (2–4 hours per 2-week block) HC-based group time (4 hours per 2-week block)	Recognizes inefficiencies, inequities, variation, and quality gaps in health care delivery
PGY2	Knowledge (Knows)	IHI Module Completion: QI 101: Fundamentals of Improvement QI 102: The Model for Improvement: Your Engine for Change QI 103: Measuring for Improvement QI 104: The Life Cycle of a Quality Improvement Project QI 105: The Human Side of Quality Improvement QI 106: Mastering PDSA Cycles and Run Charts	Independent time (2–4 hours per 4-week block) HC-based group time (2 hours per 4-week block)	Recognizes inefficiencies, inequities, variation, and quality gaps in health care delivery
	Competence (Knows How)	IHI Module Simulations, Discussions	HC-based group time (2 hours per 4-week block)	Compares care provided by self and practice to external standards and identifies areas for improvement
PGY3	Performance (Shows How)	Interdisciplinary QI meetings QI team involvement	HC-based group time (1 hour per 4-week block)	Uses a systematic improvement method (eg, Plan-Do-Study- Act [PDSA] cycle) to address an identified area of improvement Uses an organized method, such as a registry, to assess and manage population health
	Action (Does)	Develops QI Project Proposal Leads Interdisciplinary QI Team Implements QI Project Analyzes QI Project Presents QI Project—At HC, department, and institutional settings	Independent time (4 hours per 4-week block) HC-based group time (2 hours per 4-week block) Team meetings (1–2 hours per 4-week block)	Establishes protocols for continuous review and comparison of practice procedures and outcomes and implementing changes to address areas needing improvement
		Optional regional and/or national presentations (MAFP, FMEC, STFM)		Role models continuous quality improvement of personal practice, as well as larger health systems or complex projects, using advanced methodologies and skill sets

Table 1). The curriculum was developed following university-based quality scholars faculty development, literature review, and a faculty leadership retreat. The curriculum included monthly meetings on foundational concepts in QI and PCMH as well as projects in the three residency health centers. The Institute of Healthcare Improvement (IHI) Open School course modules<sup>14</sup> were used, with faculty-facilitated group discussions. The IHI Open School provides comprehensive training in quality improvement and patient safety through an institutional subscription. The use subscription allows tracking of the residents' progress during and between sessions, and residents were encouraged to complete basic IHI certification by graduation. Residents also participated in their clinical site's Quality Improvement Committee, which demonstrated the use of formal QI tools such as process maps, fishbone diagrams, and run charts as applied to the health centers' various QI/PCMH projects (eg, how to improve childhood vaccination rates, diabetes care measures, or hepatitis C screening rates). Residents also engaged with multidisciplinary teams within their health center to work on identified improvement initiatives and were asked to lead a project in their third year. Monthly meetings reviewed the residents' own project development, including: developing a literature review, writing an Aim statement, defining measures, and developing and evaluating rapid-cycle PDSA interventions. The integration of residents in teams over an extended period of time allowed for ongoing projects to be managed and adapted for future residents and maximized benefits for the health centers. Resident projects included: "Improving colorectal cancer screening," "Increasing rates of breast-feeding," and "Development of an electronic medical record procedure scheduling tool."

### Evaluation

Residents completed an annual evaluation of their activities related to

implementing evidence-based practices for chronic illness management and improving safety and quality in their practices. We compared self-evaluation data for residents at the end of their PGY2 year and again at the end of the PGY3. At the same time as the PGY2 year was completing the evaluations, the PGY3s graduating that year also completed the evaluation in order to assess the impact for the prior year's graduating residents who had some but not the fully developed curriculum. The prior class received some of the IHI modules in PGY2 and 3 but did not participate in health center QI committees or have their own QI project to lead. In addition to annual surveys, a focus group was conducted with the PGY3 residents who completed the full curriculum just before graduation. Two faculty not involved directly with resident training led the group and independently produced process notes and coded for themes. A tape recording of the session was transcribed, and a third staff member used the transcript to also code major themes. The three coders then met to develop consensus. The evaluation plan was reviewed by the University of Massachusetts Medical School IRB and found to not meet the DHHS definition of human subject research.

### Results

Table 2 shows results of representative self-report questions. The overall response rate for the 2 years of graduates was  $n=23$  (95.8%) as one PGY3 graduate who completed a PGY2 survey was not available to respond in PGY3. On all items, the residents who participated in the full curriculum reported higher use or knowledge comparing their responses between PGY2 and PGY3 years, and nine out of 15 items were significantly improved using a  $P<.05$  criterion. In the categories of chronic care management and patient safety skills, the majority of items were significantly improved between PGY2 and PGY3, but only one item (designing prospective chart reviews)

was significantly improved for the QI skills category. Compared to prior year graduates who received a less fully developed curriculum, those receiving the full curriculum gave higher ratings on all 15 items, but only five were significantly different. Notably, more of the significant differences were found between the two groups in the chronic care management area than for QI skills and patient safety. In contrast, the focus group with graduates completing the full curriculum found that residents emphasized learning many of the technical QI skills was a key strength of the curriculum. For example, they noted, "PDSA cycles have become second nature" and that doing root cause analysis as a team was a "powerful" and "useful" learning experience. Overall, however, several commented feeling more knowledgeable about all three topic areas (chronic disease management, PCMH, and QI) than the practices they were interviewing with (for post-residency placements) and felt confident they would hit the ground running and could be leaders in their new positions.

### Discussion

The curriculum appears to be successful in training family medicine residents in quality improvement that broadly encompasses constructs from PCMH such as chronic disease management and the use of systematic techniques to improve quality and patient safety. Lessons learned include the need for building a longitudinal curriculum where opportunities for learning and demonstrating skills extends across the majority of residency training, not just a short-term module.<sup>15</sup> In addition, having residents conduct QI projects with faculty and staff at their sites provided robust "real world" experience that directly impacted patient quality and safety and added value to the ongoing QI work of busy clinical settings. Finally, use of existing QI resources, such as the IHI curriculum, facilitated high-quality training without the need for extensive

**Table 2: Resident Ratings of Their Performance on Chronic Care, Quality Improvement, and Patient Safety Skills**

Variable	End of PGY2 n=11 (%) Usually/Always	End of PGY3 n=11 (%) Usually/Always	P Value <sup>a</sup>	Prior Residents PGY3 n=12 (%) Usually/Always	P Value <sup>b</sup>
<b>Chronic care management skills</b>					
I regularly give patients specific materials for their role in achieving guideline adherence.	3 (27.3)	4 (40) <sup>c</sup>	.66	1 (8.3)	.14
I assist patients in setting and attaining self-management goals.	4 (36.4)	11 (100)	<.01	5 (41.7)	<.01
I follow up with patients between visits by telephone (me or my staff).	4 (36.4)	11 (100)	<.01	2 (16.7)	<.01
I use published guidelines as the basis for the management of patients.	4 (36.4)	11 (100)	<.01	7 (58.3)	.04
I feel ready to be a family physician leading a team in a PCHM.	6 (54.5)	11 (100)	.04	8 (66.7)	.09
<b>Quality improvement skills</b>					
I can systematically analyze my practice using QI methods and implement changes with the goal of practice improvement.	4 (36.5)	10 (90.9)	.02	8 (66.7)	.32
I can describe the difference between structure, process, and outcome measures in clinical performance.	5 (45.5)	9 (81.8)	.18	6 (50.0)	.19
I can describe methods for measuring clinical performance of QI and assessing quality of care (PDSA, LEAN).	8 (72.7)	11(100)	.21	8 (66.7)	.09
I can design a prospective chart audit for quality measures.	3 (27.3)	10 (90.9)	<.01	5 (41.7)	.03
I can develop and implement a chronic disease registry for a practice.	3 (27.3)	8 (72.7)	.09	6 (50.0)	.40
<b>Patient safety skills</b>					
I can identify mechanisms to improve patient safety/reduce medical errors.	7 (63.6)	9 (81.8)	.64	7 (58.3)	.37
I know how to report medical errors in our institution.	5 (45.5)	10 (90.9)	.06	8 (66.7)	.32
I can define and discuss sentinel events and root cause analysis.	0	9 (81.8)	<.01	4 (33.3)	.04
I can define and discuss barriers that prevent health care professionals from collaborating to optimize patient care and safety and ways to remove these barriers.	2 (18.2)	10 (90.9)	<.01	6 (50.0)	.07
I can define and discuss the impact of language and cultural differences and health beliefs on the implementation of medical safety programs.	3 (27.3)	9 (81.8)	.03	7 (58.3)	.37

a Paired Fisher's exact test between same group of residents end of second year and after completing the full curriculum at graduation PGY3 (n=11 both years)

b PGY3 residents in first group receiving full curriculum compared (n=11) to a prior year of PGY3 (n=12) residents not receiving full curriculum; independent samples Fisher's exact test.

c For this one item there was one missing response for a total of n=10.

local development of new topics. The study has a few limitations such as the small size of the residency cohorts and the use of self-evaluation and perceptions of skills change as the main indicator of how well the curriculum is working. Collecting data from subsequent cohorts, implementing other forms of outcome data such as changes in patient indicators, as well as following and assessing graduates into their first years of clinical practice will be helpful in further verifying the value of these curricular changes.

### Conclusions

Involving family medicine residents in a longitudinal curriculum with hands-on practice in implementing QI, patient safety, and chronic illness management activities that are inclusive of PCMH goals increases their knowledge and self-reported use of these new and emerging evidence-based practices in primary care and contributes to their sense of confidence in leading such practice changes.

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