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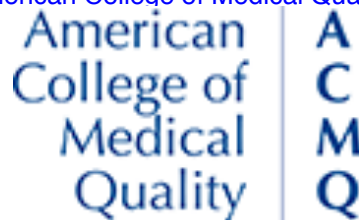
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The Impact of a Preventive Cardiology Quality Improvement Intervention on Residents and Clinics: A Qualitative Exploration

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Teaching and evaluating quality improvement (QI) is one corollary of new competency requirements in practice- and systems-based learning and improvement. This study explored the impact of the Preventive Cardiology Practice Improvement Module (PC-PIM) on residency clinics. Results from 22 clinic interviews indicated merit in using the PC-PIM to teach QI during residency. Many residents reported increased knowledge and confidence, particularly regarding the value of QI. The majority recognized that QI often leads to improved patient care and outcomes, even in resource poor environments. Conducting aspects of the QI process themselves (eg, chart audit, decision making) led to greater awareness of the patient and systems perspectives. Barriers included a lack of resident buy-in, discontinuity of care, and a lack of institutional support. These findings shed light on how residency clinics engage in QI activities and may

aid in the implementation of future QI initiatives in residency more generally. (*Am J Med Qual* 2009;24:99-107)

Keywords: quality improvement; residency; facilitators; barriers

Among a set of core competencies required of physicians is the capability to continuously evaluate outcomes of clinical work, including the ability to self-assess, generate knowledge, incorporate new developments into clinical practice processes, and improve outcomes of care. Recognizing advances in the sciences of practice measurement, assessment, and improvement, the Accreditation Council for Graduate Medical Education (ACGME) and the American Board of Medical Specialists jointly adopted requirements for training and evaluating physician competence in practice-based learning and improvement (PBLI) and systems-based practice (SBP) as 2 competencies for specialty certification. These competencies require physicians to actively engage in improving work processes and patient outcomes, with the goal of improving the quality of care in the United States.

The application of PBLI and SBP to residency programs is critical to ensure that future physicians continue to advance health care. Evaluation of residents' ability to implement quality improvement (QI) methods should be multifaceted and consider individual resident competence,¹ the microsystem in which the resident trains, as well as the linkage of these to meaningful improvement in patient care.²⁻⁵ However, to date, little systematic information has been gathered on the quality of the ambulatory experience for internal medicine residents and the quality of care provided.² A few studies examined

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some aspects of the quality of care delivered in residency clinics, but were limited to single institutions and small numbers of patients.²⁻⁵

Some express concern that residents too often train in dysfunctional ambulatory clinics and argue that residents should train in high-functioning outpatient settings to learn how to deliver care effectively and efficiently.^{3-4,6,7} Moreover, despite some success in areas of resident behavior and enhanced patient care,^{3-4,8} there are reports that many internal medicine residents feel unprepared to provide outpatient care at the completion of training.⁹ Though one potential explanation is the limited amount of time residents spend in a longitudinal outpatient clinic experience (currently the Residency Review Committee requires only 36 half-day sessions per year, which amounts to less than 3 full months over the course of an entire residency), less is known about the interaction of the practice systems in which residents provide patient care. To facilitate and evaluate QI in residency programs, a deeper understanding of residents' experience in ambulatory training is needed.

To address this gap in the literature, Mladenovic et al recently used the American Board of Internal Medicine's (ABIM) Web-based quality assessment and improvement tool, developed for its maintenance of certification programs, to describe the quality of the ambulatory care experience.¹⁰ Results illustrated that the variability in performance on clinical outcome, patient satisfaction, and measures of practice systems differed for certain program features (ie, size, type, presence of an electronic medical record [EMR]), as well as by the level of experience among the training sites and group size. Moreover, findings highlight the low frequency of functional basic technologies (eg, using templates, flow sheets, problem lists) at many sites and the authors posit that residents working in dysfunctional clinic microsystems are unlikely to be adequately prepared to engage in or implement more effective systems on graduation from residency.

The extent of variability in residency programs is of concern and, though expected, may be underappreciated. To this end, this qualitative study, built on the work conducted by Mladenovic et al, explored residency clinics' experiences with using the Preventive Cardiology Practice Improvement Module (PC-PIM) as a tool for learning and applying QI practices, in greater detail. The aim of this study was to inductively determine the impact of the intervention on residents and residency clinics, as well as to uncover barriers and facilitators to achieving a successful outcome.

METHODS

Design

This was an exploratory qualitative study. Qualitative methods are well suited to explore the "black box" of interventions—the process dimension—and complement quantitative findings by providing a more in-depth understanding of how interventions succeed.¹¹ Due to the large degree of variability in microsystems in residency clinics, the qualitative approach was a reasonable choice to highlight the complexities of clinics' cultures, views, and actions. The goal was to describe the process of implementing QI in residency longitudinal clinics from the perspective of both faculty and residents, using the PC-PIM as the intervention.

Sample and Data Collection

Data for this project were collected as part of a collaboration between the ABIM and the Alliance for Academic Internal Medicine to use the PC-PIM to determine the feasibility of utilizing a structured curriculum in QI (resident and faculty practicum in PBLI) to teach residents about PBLI and SBP. From 24 applicants, 15 residency programs, comprising 23 unique ambulatory training sites, were funded for an 18-month feasibility project to implement the PC-PIM in training programs. The study involved 720 participating internal medicine residents at the 23 ambulatory sites; 43% were female and participants were almost equally divided by postgraduate year (PGY) level (30.7% PGY1, 32.9% PGY2, 34.2% PGY3). Results of clinical, patient survey, and practice system data collected during the initial phase are published elsewhere.¹⁰

After the pilot study was completed, an invitation was extended to residency clinics to participate in a structured telephone interview conducted by an independent research firm with expertise in methods of interviewing research. All programs agreed to participate in the interview portion of the study. The purpose was to: (1) understand the process of using a PIM in residency programs, (2) discover what facilitated or hindered successful use, (3) evaluate the importance of specific components of the module, and (4) determine how to improve the module for the future.

A total of 22 interviews at 15 training sites were subsequently held with faculty and resident project champions. One program had 2 faculty champions who were interviewed separately. The 2 residents

Table 1
Interview Protocol

Thinking back over the last several months, please describe what your residency program and/or clinic has done to implement the preventive cardiology module.

What were your goals in participating in this project, or _____ (insert appropriate response given by interviewee)?

Who has been involved with this project? What has your role been?

What do you believe has worked well? What do you think your residency program or clinic can do better in using the PC-PIM?

Do you believe your residents are doing a better job of providing preventive cardiology care? (If yes, ask) What do you believe would be the most important factor for this improvement? (If no, ask) What do you believe is the most important factor for the lack of improvement?

What were some of the tensions that occurred during the process of change?

What were some of the challenges (barriers) to implementing the PC-PIM, and how were they overcome?

Were there any other educational activities (or methods) that you used to train the residents in preventive cardiology? Practiced-based learning and improvement? Systems-based practice?

Can you tell me about any unanticipated results from participating in this project?

How did your clinic use the data generated from this project?

PC-PIM = Preventive Cardiology Practice Improvement Module.

representing each site were also interviewed separately. Seven interviews included the faculty champion and a resident from the same program, and one of these included the faculty champion and 2 residents. Nine interviews were held with the faculty champion only and 6 interviews were held with a resident only. Of the 15 programs, all but 3 had a resident voice. Interviews were conducted by telephone during a 3-week period and ranged in length from 20 to 45 minutes. Each followed a standard interview protocol featuring several open-ended questions (Table 1).

Data Analysis

Grounded theory methods were utilized to analyze the data. Because these methods are drawn from data, they are likely to offer insight into otherwise difficult concepts to capture, to enhance understanding, and to provide a meaningful guide to action.¹²

Data gathered from the interviews were transcribed verbatim. Initial coding of the data involved line-by-line analysis of transcripts to select words or phrases that reflected a "single unit of meaning."¹² Each thought unit was color coded, with each color

representing the broad question to which the participant was responding. Every thought unit coded in the same color was then recopied onto another document so that the coders could identify differences and similarities in the responses within and between participants.

From these datasets, 2 researchers independently developed a list of thematic categories and subcategories. These themes were then further developed and ordered during several meetings to discuss the categories, resolve questions, and define the thematic categories. Several iterations of the datasets were undertaken and coding was terminated when new information confirmed the existing classification scheme and when there were no further discrepant cases.¹¹ Finally, the themes were reviewed by both coders and a third senior-level researcher who validated the interpretations from a medical and clinical perspective.

After additional discussion to review and refine categories, resolve questions, and compare linkages to the existing literature on QI in residency programs, the final thematic categories were completed. Several overarching categories were then identified and utilized to frame the data collected.

RESULTS

In this study, grounded theory techniques were used to develop a well-integrated set of concepts to provide a theoretical explanation of how resident clinics implemented QI using the PC-PIM. Importantly, most clinics reported a successful experience and results demonstrated multiple aspects of positive impact from implementing the PC-PIM. The few programs that were less successful in their processes or outcomes continued to express a commitment to improvement and shared factors that facilitated or hindered their experience.

A detailed, comprehensive, iterative coding and analytic process bifurcated at least 2 core categories around which the data were organized as follows: (1) impact of the intervention on the resident and on the clinic, including unanticipated consequences and facilitators, and (2) challenges and barriers encountered during the process. Each of these will be discussed.

Impact and Facilitators

There is significant merit in using the PC-PIM as an instrument to teach and provide an experience of QI in residency clinics at the individual and

systems level. Relevant excerpts follow that reveal the impact of the PIM process, specifically the patient and systems surveys, on residents and clinics. The importance of multidisciplinary team effort and effective leadership within practice are further highlighted.

INDIVIDUAL LEVEL

At the individual level, this was many residents' first experience with QI, thus "not knowing what to expect," or feeling "surprised" or "shocked" by feedback from their patients or an intervention led to an increased overall awareness of QI. Though a few residents seemed to be surprised that their clinics had good clinical outcomes and high patient satisfaction scores ($n = 3$; 14%), the majority had poorer clinical outcomes and lower patient satisfaction scores, and were surprised by these negative findings.

In several instances, learning which clinical processes were omitted from the office visit exposed potential reasons why resident efforts to improve patient compliance and behavior were poor. For example, one resident learned that not addressing exercise during the office visit may have been correlated with the low level of exercise reported in his patient population, while another learned that he "hadn't asked [the same questions] on every single patient," which "brought to light a lot of very basic things that should be asked, that weren't necessarily recorded."

In this context, the value to residents of conducting the chart audit themselves was considerable. Several residents described the audit as helping to "bring them down to earth," "see how the clinic as a whole was doing," and gave them "a better sense of differences in the care . . . at different sites." Though some faculty reported that not having a local research assistant was a barrier to efficient data collection, almost half of the residents interviewed ($n = 9$; 41%) reported that doing the chart audits themselves was a facilitator to a successful experience and increased their awareness of the importance of having high-quality clinical data. One resident nicely described how the audit revealed the value of the individual and aggregate patient perspective:

Doing the chart reviews not only reinforces, for the residents, where they should be and what the guidelines are, but makes them realize how many outliers they have. It gives them an idea that they should be looking at their population as more of a whole as opposed to each individual visit (or episodic acute

cares versus more chronic care models), so I think that the project helped that.

These perspectives were further illustrated in comments about the utility of the patient survey, which a majority of residents interviewed ($n = 14$; 64%) agreed was indispensable. Understanding patient experiences became a central factor in conceptualizing the quality of care delivered: "I thought the patient surveys were invaluable in telling us okay, this [is] what we are experiencing, but what are the patients actually experiencing?" This placed the patient perspective "higher on the food chain" in terms of importance in overall medical care, and as one resident described, put "an emphasis on preventative [sic] care even though it is not exciting or glamorous, but it's still important."

Importantly, a number of residents interviewed ($n = 7$; 32%) reported that completing the PC-PIM empowered them to make small changes in their knowledge, habits, and/or their practice, which in turn either grew into or had the potential to grow into larger more systemic changes. The concept of starting small, with clear, attainable goals, helped empower residents. As described by one resident, "as soon as you have one patient for whom it has worked well, you tend to do it on everyone over time, because you feel much more comfortable with it and you've seen it work." One faculty member further linked this sense of empowerment to a broader sense of increased perceived ownership about patients:

[The QI experience] taught residents to own their practices and look critically at how they were taking care of patients—to really examine and analyze how they're taking care of patients . . . they realize that they should be doing this regularly and that this is a lifelong process. Once you have that data, what are you going to do about that so that you can continually take better care of your patients? That is something they've never done before, so I think they had more ownership of their patients and of the resident practice, more control of that, and realizing this is how you practice medicine.

These increases in confidence, ownership, and motivation were linked to a greater likelihood of sustained change, particularly if or when the new skills that emerged were relevant to future practice and disseminated among colleagues and staff. As noted by one resident, "[QI] gets done a lot for us in residency, but when [we]re independent, [we] have to do it on our own."

Overall, the themes that emerged to describe the value of doing the PC-PIM at the resident level were the following: (1) learning the value of a QI team, as well as how to form one; (2) recognizing that QI often leads to improved patient care and outcomes, even in resource poor environments; and (3) increased knowledge and confidence regarding performing QI activities.

CLINIC LEVEL

At the clinic level, the PC-PIM often was regarded as a catalyst for change. Unanticipated benefits of performing the PC-PIM (eg, enhanced resident counseling skills, increased comfort in talking with patients, overall ease of performing process improvement), even if the intervention was not as successful as had been anticipated, often generated interest in attempting future improvement changes. According to one faculty member,

[The interventions] facilitated some other changes which I think are going to be much more successful. It was sort of the catalyst to push us in a direction where we needed to go, but we didn't really know how to get there.

A total of 6 clinics (27%) reported that the PC-PIM facilitated an "embeddedness" of a QI culture: "It is nice to have [QI] as part of the culture and I think it was of great benefit just for that." This embeddedness in culture was frequently cited as a facilitator to behavioral change, "it made us do stuff we've talked about for years that we haven't done," as well as systems change. A resident stated,

We want stuff that is day in and day out—it's one of the reasons why I like the [reminder] form. The form is going to be in their face forever. There's a constant reminder to it. I'm hopeful that . . . it will be obvious, and it will become more and more obvious as time goes on.

The survey of office systems was further described by almost half of the clinics as a source of new information leading to increased awareness and/or modest changes in clinic processes. One resident described enhanced communication between the staff and residents: "There were some really big differences where the residents thought things worked great and the staff disagreed . . . and vice-versa."

Several other residents (n = 4; 18%) became aware of a need for multidisciplinary input and effort, described in such terms as "no man is an island," and

"you can't do everything by yourself in the clinic." Here, delegating responsibilities to nonphysician staff increased team cohesion, "Having all the residents participate in the module created a closer quality improvement [team]"; and maximized team effort, "The less you rely on physicians remembering things, the more successful an intervention is likely to be."

Residents also spoke of the importance of team leaders, both internal and external (n = 6; 27%). Internal leaders were particularly important in cultures in which institutional rules and norms resisted change and generally were reported in larger, more academic institutions, while external leaders empowered the team and offered a source of support and guidance: "[Champions] were real leaders. I learned a lot. They were really good mentors to me personally."

The importance of team formation and structure cannot be overstated in this context, specifically, shared decision making, the wisdom of the group, and involving residents from the bottom up was repeatedly revealed as a facilitator to successful experiences. A faculty member said,

I think what worked very well is that we involved the residents. It was something that we didn't impose on them. It's not like we came with an idea and said, 'This is what we are going to do and you have to do it.' We discussed with the whole group of residents and they agreed that it was a good approach.

In sum, the impact of the PC-PIM on these residents and clinics is extensive and generally favorable. Residents were most affected when they conducted aspects of the QI process themselves (eg, chart audit, planning process changes), which led to greater awareness of the patient perspective and system functions. As evidenced by recent literature on the topic, this increased awareness may lead to modest improvements in practice and in overall regard of QI, from both an individual and a cultural perspective.^{8,13} The intent to change, the realization that "no man is an island," the generation of new and shared ideas among diverse team members, emerging leaders, and role models, and the confidence to use the PC-PIM as a starting point, further exemplify the utility of the intervention process.

Barriers

Residents cited a number of challenges throughout the process of using the PC-PIM. As one resident eloquently stated, the difficulty was not so

much to surmount a single challenge, but rather that residents, faculty, patients, support staff, and external collaborators all needed to work together to ensure successful implementation, and that there were many opportunities for mishaps and systems failure:

Lots of things need to come together for [QI] to work. The main challenge was that you had to get people to get together because it is not just you, it's everybody working toward one goal. You need team effort and you need the patient population to follow-up. Also in a hospital setting, you need committee approvals. Like, if you had a certain form that needed to be put into your chart, it had to be approved by a committee. So you had all these burdens along your way that you had to pass through.

A multitude of reasons were given to explain these instances, and included attributions to the self (resident [in]ability or buy-in), the patient (poor compliance due to cultural misalignment with intervention or to other demographics), the microsystem (other medical and nonmedical staff and the interactions therein, policies and cultural norms, collective buy-in), and the macrosystem (cultural and institutional norms and regulations). Of the myriad of responses given, the core categories revealed in the data as major barriers were attaining resident buy-in ($n = 16$; 73%) and lack of continuity in the care delivered ($n = 6$; 27%).

Resident buy-in is a complex construct. From an attitudinal perspective, an overall lack of knowledge about QI, a lack of adequate role modeling of QI, (as stated by one attending, "the EMR is going to fix this all"), as well as a lack of understanding of how or why the PC-PIM was constructed were frequently cited as reasons for minimal resident buy-in. Many residents linked buy-in to academic currency, whereby preventive care was not regarded as "glitzy" or "glamorous" and may be "hard to sell" to those who are looking for something "better on their resume." Several others questioned the measures used, wondering if they were "pulled out of the sky," and desired a more effective mechanism to look up guidelines.

Resident buy-in was frequently interrelated to additional barriers. The following account of a resident's frustration in attempting to change clinic processes highlights the obstacles created by overburdened residents (who are already exhausted and stretched thin, with QI perceived as an add-on), staff turnover, complex patient medical histories, and lack of resident and nonmedical staff buy-in:

It was just another requirement that we had to fulfill. If we weren't reminded, it seemed to be forgotten. It's tough when you're dealing with all of these other problems that the patients come in with, and then have to worry about one more vital sign to put down on the chart. It was an inconvenience, the whole thing, to be honest with you, and nobody really knew what the goal of this was, aside from getting a number. In the midst of this whole project, to top it off, the clinic staff was in some turmoil and that really cut into our efficiency. We were counting on nurses to get the heights done, and we lost probably 50% or more of our staff. Then, once you didn't get a height, the residents definitely weren't going to be measuring everybody up against the wall before they took them into the room.

Along these lines, many residents complained that the operational structure of the residency clinic did not lend itself to making process changes and to improving quality. One resident talked about a lack of patient ownership stemming from frequent clinic rotations and not seeing the same patients regularly, asking the question, "Why should I spend the 15 minutes to fill it (the form) out when it's not my patient? I won't see them again." This perspective is especially relevant given the discussion of patient ownership as a facilitator in the previous section, and raises important questions about how to effectively motivate residents and maximize buy-in. Other residents talked about group size as a constraint, whereby larger groups were seen as a hindrance to total resident involvement. As one resident stated, "I think if you had one big project, you lose some people. You can't get everybody involved and that would be a shame." A lack of protected time in resident schedules to work on QI-related tasks, the cost of implementation on an already overextended budget, and shorter resident work hours also were revealed as structural barriers to resident buy-in and participation.

Several other residents struggled with changing "how things are done" and the challenge of facing institutional rules and regulations. Cultural resistance to change and a lack of awareness of how to access resources within one's microsystem further magnified the perception of QI as a burden and/or inconvenience. One resident described how his process change could have been more readily implemented had he been able to locate the materials:

The patient education office has patient education material available and plenty of brochures, but they are tucked away in an office on the 11th floor apart

from where the ambulatory clinics are. To get somebody to come down there to keep everything in the exam room . . . supplied with the proper education materials, we haven't figured out how to do it.

Competing projects or areas of study further weakened resident buy-in, summarized by this faculty physician who described the difficulty in getting residents to attend a session on a topic outside of the traditional clinical perspective. This theme also highlighted issues of accountability and whether/how to mandate resident participation in QI projects. According to a faculty member,

[The residents] are overloaded with all of this talk about QI. [Residents] don't want to go to noon conferences on QI. They want to go to noon conferences on how to best treat osteomyelitis or some rheumatologic condition . . . it's hard to get buy-in from the residents. There is not a lot of accountability in this residency program. You don't have to sign in or anything like that to show that you've participated in anything, so it was hard to get people to show up to that subject area.

The relationship between resident buy-in and setting clear, simple, attainable goals was often described: "If you're going to have residents do something, it generally has to be simple for them to be able to do it, such as take a piece of paper, click on their needs, exercise, and diet counseling, and who makes it happen." Not using "bottom up" feedback from residents in approach and process was further related to lower resident buy-in and ownership of the project, and projects that come "top-down" may miss the mark in relevance and empowerment for residents.

As noted earlier, leadership at both the resident and faculty level was a facilitator to creating and sustaining QI. Without it, clinics may be subject to Nelson et al's concept of clinical inertia,¹⁴ as illustrated in the following passage from a faculty member:

We've been talking about a preventative [sic] flow sheet for ten years in our faculty practice. We've never been able to come up with one, because there is no buy-in to what should be on the form and I've been on quality counsels here forever. We have never been able to come to consensus on a medication list that we all will use at all of our sites. We've never been able to come to a consensus on a preventative [sic] flow sheet, on whether or not we should be using cardiovascular flow sheets.

Finally, varying ways of doing things and a lack of systems, practice, and culture congruity emerged

as barriers for residency clinics. Staff turnover was also a major disruption and information was lost in translation as support staff, residents, and faculty tried to deal with frequent changes in the personnel in the clinic. As a result, there is a "gap in continuity" and "too many people get involved," making the process more "complicated" and "disjointed."

Generally, obtaining resident buy-in was a major barrier to QI and was related to poor attitudes and knowledge or a lack of adequate role modeling about QI, operational constraints (eg, an inefficient microsystem or institutional rules and regulations leading to cultural resistance to change), and structural constraints (eg, the idea of QI as an add-on, or a lack of protected time in resident schedules). Lack of continuity in the way care is delivered (due to the complexity of a residency clinic) was further implicated.

DISCUSSION

Generally, our findings illuminated a number of important considerations to applying QI training and process change in residency programs. Simply stated, the PC-PIM is a functional tool that worked from the perspective of residents and faculty. The distilled framework of the PC-PIM's impact on residents and clinics illustrated that, despite many barriers, the PC-PIM provided a tool for a structured QI curriculum that was successfully integrated into training and resident education. Several themes uncovered in the data, many of which are consistent with prior literature, are described.

To begin, the findings confirmed the following number of important curricular principles enumerated by Boonyasai and colleagues for teaching physicians about QI: enable learners to be active participants, provide content that relates to learners' current experiences, assess learner needs, allow learners to identify and pursue their own needs, allow learners to practice their own learning, provide feedback to learners, facilitate self-reflection, and faculty role modeling.⁸ All of these principles emerged as themes in the interviews, and the PC-PIM seemed to be particularly well suited to facilitate relevant and meaningful feedback and reflection.

Our results also resonate with the findings of prior literature that participating in a QI initiative can produce innovative and creative process improvements that demonstrate individual residents' competency in PBLI.^{15,16} Importantly, residents can learn the value of reliable data, the use of performance measures, and the skill of developing

and testing QI ideas. Through this process, we can enhance patient care and maximize resident buy-in while addressing the competency of PBLI required by ACGME for resident education.

Of additional significance is the necessity for a unified, empowered QI team as well as effective leadership and ongoing relationships between residents, faculty, and administrative and clinical personnel. This finding is consistent with Nelson et al's article on practice microsystems, whereby leadership, culture, a patient and staff focus, organizational support, and others are described as vital elements in the anatomy of the microsystem.¹⁷ Our study suggests that these elements are as important in residency clinics as they are in a practicing physician's office. While the anatomy of a residency microsystem is quite dynamic and not always predictable, identifying consistent relationships between these elements in residency clinics may enhance our understanding of how residency clinics move toward more effective QI.

Along these lines, several findings among residency clinics that reported positive experiences with the PC-PIM are worth highlighting. At the resident level, participating in and learning about QI principles and practices augments perceived ownership of their patient care, which may lead to a greater internal locus of control and more effective leadership skills.¹⁸ As individuals with an internal locus of control are more likely to self-initiate change,¹⁹ conceptualizing the PC-PIM as an instrument to empower physicians and promote the feeling that they have influence over their individual microsystem and, ultimately, over care for their patients, is useful to achieve and effect change. Strong leadership and decision-making skills are also critically important, particularly as the medical profession continues to evolve.²⁰

Finally, improving the image of QI by making it more practical, tangible, and relevant to residents will aid in creating a culture that is more understanding of and amenable to QI. Incorporating resident perspectives and insights, integrating their input early in the process, and thereby maximizing team cohesion and buy-in may generate best practices¹⁴ that ultimately can be disseminated among QI training programs.

One's path to improvement often begins with awareness of the need for change.²¹ As illustrated in this article, the value of the PC-PIM in providing salient measures of performance and patient experience, and raising awareness regarding the nature

of one's practice is immeasurable. Despite busy schedules and myriad barriers to implementation, the majority of residents reported inherent value in seeing their practice as a system of people performing multiple processes. Whether positive or negative, chart audits reveal resident practice patterns that may lead to meaningful attempts at QI.¹³

There are several limitations to this study. First, theoretical saturation may not have been reached given that we interviewed sites previously chosen for a parent project. Along these lines, simultaneously collecting and analyzing data, central to grounded theory methods, was not an option. To maximize the study's credibility and confirmability,²² however, we enhanced rigor by utilizing interdisciplinary and analytic¹¹ triangulation through the use of multiple independent coders. We also were meticulous in our audit trail so that our findings may be confirmed and reproduced by others.²²

Second, this qualitative study cannot confirm whether improvements in quality processes of care or outcomes actually occurred. While it is encouraging that the PC-PIM process created motivation and self-reported behavior change, the programs did not directly remeasure all quality indicators in the PC-PIM. However, the goal of this study was to specifically describe the key themes regarding the process of teaching and implementing QI in residency clinics. The richness provided by qualitative methods allows for deeper explorations of the how, what, and why of the QI process in a training environment.

Despite these limitations, the PC-PIM may facilitate the development of QI interventions tailored to residency programs. Outcomes of this study may be integrated into future interventions. These outcomes have raised several concepts for others to build on. An important challenge for dissemination will then be to explore how these data can be readily and practically transported more ubiquitously into the residency setting, given the practical and financial barriers.

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