Teaching Quality Improvement in Graduate Medical Education: An Experiential and Team-Based Approach to the Acquisition of Quality Improvement Competencies

Karen Hall Barber, MD, Karen Schultz, MD, Abigail Scott, Emily Pollock, MSc, Jyoti Kotecha, MSc, and Danyal Martin, MA, MScHQ

Abstract

Problem

An emerging priority in medical education is the need to facilitate learners' acquisition of quality improvement (QI) competencies. Accreditation bodies in both Canada and the United States have included QI and patient safety in their core competencies.

Approach

In 2010, the Department of Family Medicine at Queen's University designed a graduate medical education curriculum to engage residents in a clinical QI program that would meet accreditation requirements. Monthly didactic sessions were combined with an experiential, team-based QI project that aligned with existing clinic priorities. The curriculum spans the first year of residency and is divided into three stages: (1) Engaging, (2) Understanding, and (3) Improving and translating. In Stage 1, teams of residents select a clinical QI topic, engage stakeholders, and collect baseline data related to their topic. In Stage 2, they focus on understanding their problem, interpreting their results, and applying QI tools. In Stage 3, they develop change ideas, translate their knowledge, and prepare to hand over their project.

Outcomes

This QI curriculum aided residents in effectively acquiring QI competencies and allowed them to experience real-world challenges, such as securing project buy-in, negotiating with peers, and developing solutions to problems. Unlike in many QI programs, residents learned how to improve quality rather than about QI; thus, they formed the necessary foundation to carry out QI work in the future.

Next Steps

The curriculum will be evaluated using a knowledge assessment and satisfaction tool and postproject resident interviews. Facilitators will focus more on improving faculty development in QI.

Problem

An emerging priority in medical education is the need to provide learners with training in quality improvement (QI) and patient safety (PS).[1] Accreditation bodies in both Canada (Royal College of Physicians and Surgeons of Canada [RCPSC][2] and College of Family Physicians of Canada)[3] and the United States (Accreditation Council for Graduate Medical Education)[4] have integrated

Please see the end of this article for information about the authors.

Correspondence should be addressed to Karen Hall Barber, Department of Family Medicine, Queen's University, 220 Bagot St., PO Bag 8888, Kingston, ON, Canada, K7L 5E9; telephone: (613) 533-9303; e-mail: karen.hallbarber@dfm.queensu.ca.

QI/PS into their core competencies. In their recent update of the CanMEDS framework, the RCPSC gave increased emphasis to QI/PS by integrating these concepts throughout the framework and by adding a QI/PS key competency to the core role of Medical Expert.[5] Therefore, graduate medical education (GME) programs now must develop authentic curricula in this area.

Approach

In 2010, the Department of Family Medicine (DFM) at Queen's University began updating its traditional clinical audit curriculum to create a comprehensive QI curriculum. This new hybrid approach combines a one-year, experiential team project and a series of structured didactic sessions (see Table 1). It flips the traditional clinical audit model[6] (see Figure 1). Instead of focusing on lengthy data extractions, which often reveal weaknesses in either the institution or the physician, residents spend proportionally more time understanding the problem, engaging stakeholders, and identifying improvement ideas to better reach standards. By design, the curriculum

engages residents in QI projects, allowing them to demonstrate the CanMEDS roles and to attain the core competencies and necessary QI skills (see Table 2).

The QI curriculum is currently implemented at the largest of the DFM sites, with approximately 52 first-year residents. Residents are divided into teams of three to six, based on clinic location. Teams are supervised by four QI facilitators (a faculty physician, a clinic coordinator, a research associate, and a data analyst), who oversee the program. Each team selects a unique QI topic to investigate. During this investigation, residents learn how to identify an appropriate topic, formulate a question, review the literature, engage stakeholders, apply QI methodology, reflect on results using QI tools, and propose feasible improvement ideas. To facilitate coaching and feedback, teams submit two project charters (i.e., questionnaires that describe a structured approach to a QI problem), which the QI facilitators use to provide feedback. Additionally, the teams produce two deliverables: (1) an interim presentation to the DFM's interdisciplinary QI committee, which includes clerical

Table 1
Overview of the Quality Improvement (QI) Curriculum for First-Year Residents in the Department of Family Medicine at Queen's University[a]

Stage and time frame	Session no.	Session topic	Lecture details
Engaging: First third of the year (July–October)	1	Introduction to QI in the real world	1. Physicians' roles with respect to QI 2. CanMEDS roles and where QI fits in
	2	Introduction to the resident QI project	1. Overview of the project and requirements 2. Ethics considerations 3. Review of residents' first project charter drafts
	3	Stakeholder engagement and teamwork	1. How to engage stakeholders (informal huddles, focus groups, interviews, surveys, etc.) 2. Blame culture and just culture 3. How to work as a team
	4	Interim presentation to the interdisciplinary QI committee	1. Residents present initial project discoveries to a group of interdisciplinary staff and receive early thoughts and feedback
Understanding: Second third of the year (November–February)	5	Interim presentation debrief	1. Facilitators have a one-on-one debrief session with each resident team to discuss feedback and next steps
	6	Understanding the problem	1. QI tools (Ishikawa/Fishbone diagrams, Pareto charts, 5 Whys, process maps) 2. Survey development and mini validation of surveys
Improving and translating: Final third of the year (March–June)	7	Process improvement	1. Improvement tools (PICK charts, PDSA cycles) 2. Improvement plans (aim statements)
	8	Leadership	1. Leadership and first follower 2. Building buy-in
	9	Grand rounds presentation	1. Residents present final project discoveries and implementation plans to the Department of Family Medicine and receive suggestions and feedback
	10	Project handover	1. The broader picture of QI 2. Residents hand over project for continued follow-up

Abbreviations: PICK indicates possible, implement, challenge, kill; PDSA, plan, do, study, act.
[a]The quality improvement curriculum is broken down into three stages, each aligning with approximately one-third of residents' postgraduate year 1. Each session theme teaches residents foundational knowledge, which corresponds to the approximate timeline of their experiential, team-based project.

staff, allied health professionals, nurses, physicians, and management; and (2) a summative evaluation at a year-end grand rounds seminar.

Given the educational requirements common to all GME programs, we believe that this yearlong curriculum has relevance to, and can be adapted by, other programs. In the sections that follow, we outline the three stages of the longitudinal QI curriculum that is integrated into our family medicine program (see Supplemental Digital Appendix 1 at http://links.lww.com/ACADMED/A296 for additional information about the curriculum).
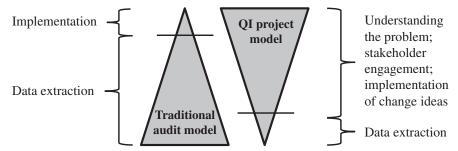
Stage 1: Engaging

First, resident teams choose an appropriate topic and develop a focused question. A "good" topic aligns with local clinical QI priorities, is interesting and relevant to professionals in primary care, will have a positive impact on patient care, has measurable outcomes, and is appropriately narrow in scope (see Supplemental Digital Appendix 2 at http://links.lww.com/ACADMED/A296 for previous topics chosen). Given residents' limited experience and the time constraints of the GME program, they are guided to choose their topic from a list of approved project ideas. The majority of these ideas are taken from our organization's Quality Improvement Plan and are therefore institutional priorities (i.e., vaccinations, medication reconciliation, and discharge follow-up). Furthermore, parallel work in these areas typically is being done by faculty and staff; thus, resources are in place already to continue the project when residents leave.

Resident teams are encouraged to assign themselves roles based on personal strengths to facilitate workload distribution and to mirror real-life project management processes. These roles often include a team leader and team members responsible for the literature review, data collection, and stakeholder engagement. Once a topic and question have been determined, the QI facilitators assist the teams with their submission for research ethics board approval. After the second didactic session, teams must submit a completed first project charter (see Table 2), which the QI facilitators use to provide feedback.

Resident teams also conduct a literature review to identify a criterion standard or guideline(s) that is the appropriate gold standard for their project. Prior to attempting to implement solutions to reach this gold standard, teams must perform a baseline audit to determine how the institution is currently performing in this area. Instead of completing a historical clinical audit, the

Figure 1 Comparison of a traditional clinical audit curriculum and the quality improvement (QI) curriculum for first-year residents in the Department of Family Medicine at Queen's University. The QI curriculum flips the traditional clinical audit model. Instead of residents spending the majority of their time extracting data, they spend proportionally more time understanding the problem and implementing change ideas.

data collection performed by the teams varies between projects depending on the topic. Teams can extract electronic medical record (EMR) data, perform manual chart audits, use cycle time protocols, or conduct stakeholder focus groups or surveys. The best approach is often determined by the availability of the data and the needs of the project.

For the projects to be successful, residents cannot operate in "silos"; they must continuously engage key stakeholders. Resident teams use surveys, focus groups, and informal "hallway discussions" to assess what factors stakeholders think drive a given result and what barriers, "local culture," or opportunities exist for improvement. For some, this is a difficult and intimidating step. Teams often require assistance both in identifying those at the institution who have done work in their topic area and in running a meeting that fosters a productive and blame-free discussion. Although they are encouraged to think of their projects in terms of the patients, the QI facilitators discourage actual patient engagement for logistical reasons. For example, our institution is an academic health center, so our patients are often inundated with surveys.

At the end of Stage 1, teams present preliminary interim results to the DFM's interdisciplinary QI committee for feedback regarding the scope of the project and its impact on clinical processes, and to gauge staff buy-in.

Stage 2: Understanding

During Stage 2, resident teams critically consider whether their preliminary results make sense and delve into the whys of their findings. They explore outliers, errors, trends, comparators, and data limitations. Teams compare

their results in multiple ways, looking at the whole clinic, discrete teams, and individual practitioners, being mindful of processes and systems and not assigning blame or critiquing individual performances. Additionally, teams can look at patient characteristics (i.e., area-based socioeconomic measures) to determine whether these characteristics play a role in the care the patients receive.

Observation, reflection, and understanding are important components of our QI curriculum, as the main objective is for residents to come to understand the complexity of their topic and the system in which they work. During this stage, residents draw on available QI tools to brainstorm and map possible causes of their identified problem. They use surveys, Ishikawa/Fishbone diagrams, Pareto charts, 5 Whys, process maps, and spaghetti diagrams (outlined in the locally relevant Health Quality Ontario Quality Improvement Guide[7]) to gain a better understanding of their results. Near the end of Stage 2, teams submit a completed second project charter (see Table 2).

Stage 3: Improving and translating

Once resident teams better understand their data and the forces influencing their results, they develop implementation goals. These goals, which could include the creation of change ideas or aim statements, are to be small in scope and feasible given the limited timeline for implementation. Examples of such goals include the creation of patient/staff education materials, patient communication tools (such as waiting room slides), recommendations for EMR programming changes, or changes to clinical policies and medical directives. Teams often use PICK (possible,

implement, challenge, kill) charts and prioritization matrices to organize their recommendations. They then work with the QI facilitators and clinic managers to develop sustainable implementation strategies. However, the successful implementation of the improvement is not the primary aim of the project. Instead, we hope that residents gain insight into the unanticipated complexities of their topics, the true number of stakeholders in a real-world project, and the fact that solutions go beyond the simple provision of a physician's order. Authentic QI endeavors rely on effective communication with peers, which is typically a new skill for residents who are more comfortable in the hierarchical structures within health care, which is where they have been working thus far in their training.

At year-end, residents share their findings and recommendations during an interdisciplinary grand rounds presentation, which offers faculty and staff an opportunity to learn from the residents, ask questions, and provide feedback. This exercise is not only beneficial for residents to gain support and buy-in for their projects but also for the faculty and staff as a form of faculty development. Faculty, staff, and residents complete evaluation forms to assess the projects in several categories. The most recent data showed that 99% of staff and residents believed that the QI projects were relevant to the institution and region, and 92% said that the projects either met or exceeded their expectations.

Finally, residents hand over their project data and recommendations to the QI facilitators. A database of residents' projects is maintained to facilitate institutional memory and to allow future cohorts of residents to build on or reaudit previous projects.

Outcomes

Although accreditation bodies now require QI education across all specialties, no standard QI/PS curriculum exists.[8] In this report, we presented a longitudinal curriculum that teaches residents QI skills and trains them in the CanMEDS roles and core competencies (see Table 2) as they complete a project in an outpatient clinic environment. Aligning these projects with our institution's

Table 2

The Quality Improvement (QI) Curriculum for First-Year Residents in the Department of Family Medicine at Queen's University Mapped to the CanMEDs Roles and Core Competencies[a]

CanMEDS role	Competency	First project charter questions	Second project charter questions	Skills gained
Communicator, Collaborator	Communication, negotiation, and collaboration	What skills do you have within your team that might influence team roles?	What roles are assigned to whom on your team?	• Elicit relevant information from colleagues • Understand views and roles of interprofessional colleagues • Proactively deal with conflict
Leader[b]	System analysis	What is your broad topic area and problem?	What is the problem you are trying to solve? What do you hope to improve?	• Seek out root causes of the problem • Understand how the project interacts with competing initiatives
Scholar	Data and research	What is the plan for your data set extraction?	What are the barriers to meeting your recommendations? What might you do to address these barriers?	• Collect data from the electronic medical record • Design a survey • Apply for research ethics board approval
Leader	Knowledge and planning	What does the literature say about your topic? What criterion standard or guidelines support your topic?	What are your recommendations for meeting those targets? What are you going to recommend that your clinic do differently?	• Define key steps in the QI process • Understand the physician's role in QI • Develop projects which identify concerns of the clinic • Perform literature search
Medical expert[c]	Stakeholder engagement	Who are the important stakeholders? Who is already doing complementary work?	Who are the stakeholders affected by your recommendation? Who can affect your recommendation?	• Identify key stakeholders • Understand how others influence a project • Demonstrate consideration of patient's views

[a]The quality improvement curriculum trains residents in the CanMEDS roles and core competencies. These core competencies map to specific project charter questions and skills gained. Resident teams submit a completed first project charter early in Stage 1 of the curriculum for feedback on their project topic and scope. Teams submit a completed second project charter during Stage 2 for feedback on navigating barriers and initiating implementation ideas.
[b]The Leader role is referred to as "Manager" in CanMEDS–Family Medicine.
[c]The Medical expert role is referred to as "Family medicine expert" in CanMEDS–Family Medicine.

Quality Improvement Plan allows residents to actively participate in existing clinical initiatives. By the end of the project, residents can recognize and know how to seek opportunities for clinical QI work and can describe the steps to understanding a problem and how system factors influence clinical performance. Thus, they are prepared to use QI principles and to participate in and lead QI initiatives in the future. Additionally, our QI curriculum integrates emerging themes in medical education, such as teamwork, interdisciplinary relationships, and professionalism.[9]

Many implementation and feasibility barriers to sustaining a successful QI curriculum in a GME program have been described.[10] Such barriers include the developmental stage of the residents, insufficient QI knowledge among faculty, a lack of value placed on QI by the institution, competing curricular/clinical demands, unsupportive leadership, and the absence of a promotion pathway.[11] Our greatest barriers were time constraints; residents had to execute their QI projects in their first year for logistical reasons. First-year residents are just beginning to understand the broader health care system and its problems; therefore, expecting them to fix these problems while they are still learning about them is challenging. Other resident-related barriers include time limitations due to educational/service demands and often-poor engagement in understanding and working toward clinic goals due to the transient nature and lack of "ownership" in residency. Faculty and environmental barriers include an insufficient number of QI facilitators, competing priorities and scheduling issues, the functionality of the EMR, and the geographic location of satellite training sites.

Fortunately, a number of factors influenced the success of our curriculum, contributing to its growth and sustainment. These factors include leadership support, a QI/PS clinical culture, interprofessional collaboration, and access to data. The support of our GME leadership, including our department head, program director, and research center, was one of the largest contributing factors to the curriculum's success. These leaders have made QI a cultural priority within our department. As a result, faculty and staff have endorsed and prioritized QI/PS as an integral part of clinical care and residency education. Collaboration with our interprofessional colleagues has led to greater success for the curriculum. Specifically, through the interim presentations, residents have been able to reach out to members of the DFM's interdisciplinary QI committee, which increased buy-in for their projects.

Also contributing to the success of the curriculum was that residents had timely access to operational and clinical data because of the EMR infrastructure and the participation of a clinical data analyst. Finally, organizational assets, such as protected time for learning, dedicated research support, and an organizational Quality Improvement Plan and committee, encouraged residents' professional development in QI.

Because resident education requires support from clinic faculty and staff, efforts were made to ensure that projects were not an "energy drain." For example, resident teams chose topics of local interest, kept their projects narrow in focus, and engaged stakeholders already working on similar projects so as to not duplicate efforts. However, to sustain QI training in GME, faculty and staff must legitimize QI work in their practice in the clinic.

Next Steps

Future goals for our program include coordinating postproject reflections, reauditing projects to assess implementation effectiveness, and increasing the capacity for faculty development. We are also piloting an assessment of the program using a modified Quality Improvement Knowledge Application Tool to evaluate residents' knowledge and satisfaction after completing the curriculum.

Residents must acquire QI expertise to evaluate, analyze, and improve the health care system. Our QI curriculum effectively taught key concepts of this work to residents, providing authentic engagement with the challenges of problem identification, staff engagement, and solution development.

K. Hall Barber is assistant professor, Department of Family Medicine, Queen's University, and family physician, Queen's Family Health Team, Kingston, Ontario, Canada.

K. Schultz is associate professor and program director, Department of Family Medicine, Queen's University, and family physician, Queen's Family Health Team, Kingston, Ontario, Canada.

A. Scott is data and quality improvement analyst, Queen's Family Health Team, Kingston, Ontario, Canada.

E. Pollock is research associate, Centre for Studies in Primary Care, Department of Family Medicine, Queen's University, Kingston, Ontario, Canada.

J. Kotecha is assistant director, Centre for Studies in Primary Care, and adjunct assistant professor, Department of Family Medicine, Queen's University, Kingston, Ontario, Canada.

D. Martin is manager, Quality Improvement Plans & Quality Improvement Strategies, Health Quality Ontario, Toronto, Ontario, Canada.

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