A Learner's Perspective on Educating Trainees in Quality, Safety, and Implementation Science

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Experiential learning forms the foundation of residency and fellowship training. We learn to provide high-quality patient care through studying, deliberate practice (simulation), performing clinical duties with faculty feedback and learning from mistakes (1). Growth as a physician is important, but trainees must also understand the larger healthcare context and drivers of patient outcomes. This requires effort to break down silos separating healthcare roles and promote interprofessional collaboration early in training. Quality improvement (QI), patient safety, and implementation science are important aspects of achieving these goals.

Currently, QI education in many residency and fellowship training programs is provided by means of online, asynchronous didactic modules to meet the Accreditation Council for Graduate Medical Education and Clinical Learning Environment Review Pathways to Excellence requirements (2, 3). Although the content in these online modules may be appropriate, many trainees do not understand how to apply QI methodology or integrate it into a clinical context (4). Additionally, without a visible quality gap connected to patient care, trainees often are not motivated to invest time in QI education or projects, given competing clinical, education, and research demands (3). This results in missed opportunities for trainees to engage and contribute to interprofessional projects to optimize quality and patient safety.

To engage more trainees in QI and patient safety initiatives, we must make experiential learning a central component (5, 6). A proposed educational framework for QI methodology and clinical learning environments is provided in Table 1. Trainees can build familiarity with QI methodology through online modules and

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Table 1. Proposed framework for quality improvement education using the "define, measure, analyze, improve, and control" process

Process Components	Online Modules and Resources	Morbidity and Mortality Conference	Simulation	Project
Define	- DMAIC process - Quality gap identification o Benchmarking o Observed to expected ratios o Peer performance o Baseline performance - Aim statement generation - SIPOC+R - SWOT - SBAR	- Quality gap identification o Observed to expected ratios o Peer performance o Baseline performance	- Aim statement generation - Balancing measure identification	- Stakeholder input - Balancing measure identification - Communication strategies
Measure	- Survey generation - Value stream mapping	—	- Waste walks - Process observation	
Analyze	- Fishbone cause-and-effect analysis - Pareto diagram - Run chart - Root cause analysis	- Fishbone cause-and-effect analysis - Root cause analysis	- Fishbone cause-and-effect analysis - Five Why's - RCA(2) - Psychological safety with case scenarios	- Focus groups - Stakeholder engagement
Improve	- Impact-effort grid - "Just-do-it" interventions - PDSA cycles - Postintervention measures to assess effectiveness	—	- PDSA cycles	- Change management - PDSA cycles - Stakeholder engagement - Postintervention measures to assess effectiveness
Control	- Performance monitoring plans	—	- Setting trigger threshold for maintenance	- Communication strategies - Stakeholder engagement - Transition plan - Performance monitoring plan

Definition of abbreviations: DMAIC = define, measure, analyze, improve, and control; PDSA = plan, do, study, act; RCA(2) = root cause analysis and action(squared); SBAR = situation, background, assessment, recommendation; SIPOC+R = supplier, input, process, output, customer, requirement; SWOT = strength, weakness, opportunity, threats.

integration into existing morbidity and mortality (MandM) conferences. They can then translate methodology to practice by building their skills in simulation and applying learned concepts in real project scenarios, and they can loop back to online modules and resources to refresh their understanding. As trainees look to apply their skills in other settings/clinical contexts, online learning and simulation can provide additional opportunities for further skill development.

Most of our exposure to clinical quality gaps (i.e., complications, medical errors, and harm) happens during MandM conferences. Cases are discussed alongside a review of relevant literature to further our understanding of the incidence of certain complications and associated risk factors. However, these conferences rarely frame patient care issues as quality gaps, do not routinely incorporate QI methodology or techniques, and do not review whether the clinical practice more broadly has observed rates for certain complications that fall within the expected ranges. These are missed opportunities to incorporate regular QI education and practice into existing conferences (7). Although quality review may happen regularly on a departmental level, education on and consistent exposure to methods used to evaluate the clinical practice for quality gaps are important for both trainees and faculty. As systems and process issues are identified, an interest in addressing these problems develops, which can open the door for additional QI education and training. Although there are time limitations with any conference, the integration of QI methods into MandM conferences brings QI into focus and can distinguish an unfortunate outcome from a concerning trend. Integration with clinical conferences such as MandM conferences increases trainee engagement, interest, and motivation to learn QI methodology and patient safety principles as they identify project ideas that are interesting, address gaps, improve patient care, and foster innovation. In addition, such exposure could also foster faculty interest and motivation and address the currently limited number of faculty QI mentors (8).

Once trainees are familiar with QI methodology, the next step in the framework is to build skills with simulation. Interprofessional simulation sessions teach and enhance psychological safety by promoting opportunities to hear the perspectives of other healthcare team members. These skills are necessary for successful project execution and can be practiced in a variety of simulated scenarios and clinical contexts. Simulation helps to practice QI methodology that is difficult to master from online modules, such as process observation, waste walks, and the iterative development process of various intervention techniques such as Plan-Do-Study-Act cycles. A barrier to interprofessional simulation is the difficulty in scheduling multiple individuals across healthcare team roles to participate at the same time. However, short, *in situ* simulation scenarios relevant to the clinical context provide dedicated practice with QI methods while minimizing impact on the clinical workday by not removing team members from the bedside.

Participation in interprofessional simulation helps trainees to see that diverse teams are key to successful cause-and-effect analyses to address quality gaps and patient safety issues. In our experience with QI projects related to patient care, it is incredibly helpful to have a team member from the institution's patient safety

and quality teams. These relationships build a more complete understanding of processes, provide access to the data needed to define the gap/aim statement and monitor the effectiveness of project interventions, and help teams consider the long-term sustainability of interventions early during the development phase.

As trainees consider quality gaps to address with QI, it is helpful to identify ongoing QI projects being done in their department and/or work area. This can be accomplished by sharing QI projects in departmental research news and by inviting trainees to attend department staff meetings when reviewing quality and outcomes data. QI initiatives that align with departmental and/or institutional strategic priorities provide strong momentum and engagement from departmental faculty leaders, fostering a good mentorship environment for trainees to engage. Additionally, trainees can learn how a department measures and tracks the effectiveness of various interventions.

When transitioning to QI project participation, it is helpful to gain experience as a team member before leading a project. It is valuable to watch the QI framework for a project progress in the clinical setting and understand that constant reevaluation of project goals and aims are part of the process. Trainees also have an opportunity to observe communication strategies, stakeholder engagement techniques, and change management methods across various groups and healthcare team roles. This insight proves valuable in the role of a team leader when generating buy-in from multiple stakeholders. Assessing the effectiveness of a QI project is an important step in determining its success and identifying areas for improvement. This can be measured by whether the QI project meets its goals and objectives; whether it meets key performance indicators such as patient outcomes or other relevant metrics, using statistical analysis to look for significant improvements when comparing QI results with the baseline data; and whether the QI project is publishable. At our institution, effectiveness is also measured by whether the QI project is certified at certain levels on the basis of rigorous criteria set by our internal quality academy.

When trainees become project leaders, it is essential to have a faculty member experienced in QI methodology serve as a project champion and QI advisor (4, 8). Arguably, the most important step of a project is defining the scope and a well-informed aim statement; this is where learners can often benefit the most from mentorship. Nonetheless, guidance throughout the remainder of the QI process helps trainees select the right techniques and tools at various stages. Additionally, trainees benefit from mentor involvement when engaging with various stakeholders, as their advice on communication strategies and change management is instrumental to a project's success and long-term sustainability.

Participation in QI projects as a trainee provides significant leadership development and an opportunity to have broader impact beyond the patients for whom we provide direct care. Although the idea of leading a project can be intimidating at first, experiential education makes QI more approachable and provides trainees with additional opportunities for skill development in communication and leadership. The investment of faculty QI advisors helps make projects both doable and

meaningful, creating positive momentum for continued engagement with implementation science. Patient safety, QI, and implementation science are necessary components of health care and will be part of our careers; as such, opportunities to develop these skills as trainees help us to not only be better physicians but also elevate the care provided at the hospitals we join as attending physicians.

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