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Quality Improvement Virtual Practicum: The QI Simulator

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Abstract

Introduction: In recent years, undergraduate and graduate medical education has been rightfully emphasizing education in quality improvement and patient safety (QIPS). However, the best methods for teaching the foundational principles of QIPS and associated skills are unknown. **Methods:** In collaboration with the Institute for Healthcare Improvement Open School, we developed an approachable simulation for teams of health care trainees at any level and any discipline. The simulation is based on the investigation of a case regarding a psychiatric patient admitted to a fictional hospital for medical treatment who has eloped. In teams, participants investigate the incident by collecting data and using basic QI principles to brainstorm and design interventions. Participants are guided through this paper-based simulation by QI facilitators who have working knowledge of basic QI principles and techniques. **Results:** The simulation has been successfully used with hundreds of medical students and other health professional trainees. While working in teams, participants gained exposure to patient-safety incident reporting and investigation, process mapping, plan-do-study-act cycles, run charts, intervention design, and interactions with hospital administrators. Surveyed participants reported that they had learned QI principles, gained confidence in their ability to do QI work, and increased their likelihood of leading a QI initiative in the future. **Discussion:** Simulation has become a standard way to teach many clinical topics in undergraduate and graduate medical education, and QIPS should be no exception. This simulation has been shown to be effective in increasing understanding of and interest in QIPS.

Keywords

Interprofessional Education, Simulation, Patient Safety, Quality Improvement, Team-Based Teaching

Appendices

- A. Small-Group Materials.docx
- B. Simulation Leader Guide and Agenda.docx
- C. Tips for QI Facilitators.docx
- D. Menu Items.docx
- E. Virtual Practicum Presentation.pptx
- F. Surveys.docx

All appendices are peer reviewed as integral parts of the Original Publication.

Educational Objectives

By the end of this session, learners will be able to:

1. Investigate a patient-safety incident and identify the systemic drivers that led to it.
2. Working in teams, utilize the basic principles of quality improvement (QI), including the plan-do-study-act cycle.
3. Progress through a QI project in a simulated but realistic health care environment.
4. Design and test a QI intervention.

Introduction

Quality improvement and patient safety (QIPS) have been set as a national priority in medical education by both the Association of American Medical Colleges and the Accreditation Council for Graduate Medical Education.^{1,2} The best methods for teaching the foundational principles of QIPS and associated skills remain unknown. Armstrong, Headrick, Madigosky, and Ogrinc recommended a framework for quality improvement (QI) education that begins with a combination of didactic and project-based work.³ Case-based learning and simulation have gained favor in other aspects of medical education⁴ but, to our knowledge, have never been applied to teaching QIPS.

Simulation is an engaging way to give participants the true feeling of having participated in a team-driven clinical quality initiative occurring in an accelerated time line. Whereas lectures and online educational modules have been the mainstay of QIPS education to date, they do not provide the experiential learning

that is so valuable in medical education. We developed a simulation to fill this void, and at the time of writing, there were no similar simulations available on *MedEdPORTAL*.

This simulation was designed for all learners who are new to QIPS and purposefully does not require specific expertise or medical knowledge other than basic familiarity with the function of a traditional hospital unit. It is designed to be used by QIPS learners at various training levels and across multiple health professions, including physicians, nurses, pharmacists, therapists, social workers, and hospital administrators. The simulation is particularly effective with interdisciplinary groups and with trainees at varying levels since interdisciplinary collaboration and recognition of expertise, even at the earliest training levels, play important roles in the simulation and in real-world QI.

Methods

This simulation focuses on a fictional hospital that has had a patient-safety incident involving a psychiatric patient who eloped from the hospital. The clinical scenario was presented to the large group via PowerPoint (PPT) presentation. Then, in teams, participants performed simulated data collection as they investigated the specific patient-safety incident and underlying systemic issues. At least four (and up to 200) learners with varying levels of QI background and experience may participate. Numbers may be limited by QI facilitators.

To most closely approximate participation in clinical QI, this simulation included all background data required to understand the health care system. Each team was provided with a folder that contained written materials required to gather the information necessary to develop hypotheses and consider potential interventions. Teams sequentially selected a limited number of items within the folder, including data, communication with stakeholders, summary of relevant literature, and information from technical companies. The volume of data required each team member to review his/her own newly acquired information and contribute his/her unique assessment to the group. With the guidance of a simulation facilitator, teams synthesized the data they collected and designed interventions to address the systemic drivers of the problems they uncovered.

After teams had implemented their ideas, their progress was tracked on a run chart, and as time passed, the teams saw the effect of their interventions and gathered new data before designing additional interventions as they went through plan-do-study-act (PDSA) cycles. After the approximately 1.5- to 2-hour simulation, participants working in groups had hands-on experience with a simulated, yearlong, unit-based QI project.

Equipment/Environment

- Room suitable for small-group (teams of four to six members) work, ideally with individual tables for each group and a projector for introduction slides.
- Printed materials (each small group to receive about 20 pages of printed material).
- Opaque envelopes or folders (one for each group).
- Scratch paper, pens, pencils.
- Simulation leader guide and agenda (Appendix B; one paper copy).
- Introductory materials.
 - Virtual practicum presentation (Appendix E): PPT slides to be presented by the simulation leader to all participants, providing an introduction to the case and the basic structure of the simulation.
 - Tips for the QI facilitator (Appendix C; one paper copy per QI facilitator): gives facilitators some additional information and possible responses to commonly proposed interventions.
- Small-group materials (Appendix A; one paper copy per team, given at beginning of simulation).
 - Virtual practicum rules: provides participants with a basic outline of how the simulation runs.
 - Meet the stakeholders: provides further information and definitions of the various stakeholders involved in the case.

- Map of hospital unit: provides layout of the building of interest in this case.
- Item menu: listing of the various data that teams can request, given to groups at the beginning of the simulation. Teams choose multiple items and receive them all at once from the prix fixe menu. After completion of PDSA cycles, teams may pick additional new items from the à la carte menu.
- Run chart: given to the groups at the beginning of the simulation and used to track a group's data over the course of the simulation. The QI facilitator adds 3 months of data onto a group's run chart after each PDSA cycle. Teams use that data to develop their next steps.
- Basic process map: a basic outline of some of the relevant hospital processes, given at the beginning of the simulation. Groups that choose to map out a process can use this as a starting point and add new information as it is discovered.
- Blank fishbone diagram: given to the groups at the beginning of the simulation.
- Institute for Healthcare Improvement (IHI) PDSA worksheet: an adapted version of the IHI's PDSA worksheet that teams may use when assessing their data and planning interventions.
- Menu items (Appendix D; one paper copy per group, kept in a folder until requested).
 - Items 1A, 1B, and 1C: three different *gemba* walks (in which the QI team visits the hospital unit; each walk is different).
 - Item 2: Riverville Hospital (fictional hospital) policies and guidelines (policies relevant to the problem at hand).
 - Item 3: literature search (latest research on the problem at hand).
 - Item 4: available technological solutions (descriptions and price quotes for new technology).
 - Item 5: staffing and unit info for 6N (hospital unit information).
 - Item 6: 6N patient census data.
 - Item 7: email from Nurse Manager.
 - Item 8: email from Chief Nursing Officer.
 - Item 9: email from Chief Medical Officer.
 - Item 10: email from General Counsel.
 - Item 11: email from Chief of Psychiatry.
 - Item 12: email from Head of Security.
- Surveys (Appendix F; optional)
 - Pretest.
 - Posttest.
 - Answer key.

Personnel

- One simulation leader: gives introduction presentation, briefs QI facilitators on their roles, keeps time, and assists the facilitators.
- One QI facilitator for every eight to 12 participants: QI facilitators should be well versed in basic QI principles, methods, and tools so they can provide mentorship to the teams as they progress through the simulation as outlined in Appendix C. Physician, pharmacy, and nursing faculty, resident physicians, medical students, public health students, hospital project managers, and executives have all been used successfully as facilitators.
- One CEO (optional): QI facilitator who authorizes or denies expensive interventions proposed by the teams over the course of the simulation.

Assessment

Teams received feedback and guidance from QI facilitators multiple times during the simulation based on the facilitators' expert opinion, experience, and expertise. Facilitators also provided new data based on their intervention ideas. The facilitator guide (Appendix C) can aid in assessment of the teams as the

simulation progresses. Participants were asked to complete a survey before and after the simulation (Appendix F).

Debriefing

As the simulation concluded, teams discussed their experiences among themselves while they put together brief (3-minute) oral reports to be presented by a designated team member. Teams shared their experiences, successes, failures, and learning points as they progressed through the simulation. Identifying common themes, interventions, and challenges helped teams learn from each other.

Results

Hundreds of trainees in various professional disciplines and varying training levels have successfully completed this simulation since it was first run with about 150 people at the IHI National Forum in 2015. Since then, it has been incorporated into the Boston University School of Medicine (BUSM) QI curriculum for all MD students and used in the psychiatry, pediatrics, and obstetrics and gynecology residencies at Boston Medical Center. It was also adapted for teaching obstetrics and gynecology educators by the Association of Professors of Gynecology and Obstetrics.

Survey data of 130 participants at BUSM showed that this virtual practicum simulation increased both their understanding of clinical QI and their interest in QI. When asked, “Did this simulation improve your understanding of QI?” the mean score was 4.37 on a 5-point Likert scale (1 = *Not at all*, 5 = *Significantly*). When asked, “How did this simulation affect your interest in pursuing QI in your career?” learners indicated a mean score of 4.00 on a Likert scale (1 = *Greatly Decreased*, 5 = *Greatly Increased*). While the emphasis of this simulation was to build experience and comfort with QI rather than to learn specific facts, participants on aggregate answered slightly more knowledge-based questions correctly on the posttest than the pretest (Appendix F), which had questions about what constitutes a QI project (95% of participants answered correctly on the pretest and 93% on the posttest), how QI projects are performed (83% pre vs. 96% post), and how to foster a culture of safety (85% pre vs. 88% post). Subjective feedback described the simulation as “a fun exercise,” “a great activity,” and “motivating.” One participant stated, “I finally understand what QI is,” after completing the simulation.

Discussion

The theory and practice of QI are increasingly becoming a standard of undergraduate and graduate medical education. While there is no standard approach for teaching the essentials of QI, we have found that experiential group learning through this collaborative and immersive simulation is an effective and fun way to teach these important topics.

Success of the simulation is dependent on QI facilitators who understand clinical QI in both theory and practice. Successful facilitators can teach QI principles while also providing guidance to teams rather than generating their own ideas on learning and forcing groups down certain pathways. Participants found the simulation less valuable if individual team members dominated the discussion, interpretation of data, and design of interventions, so facilitators should monitor their teams to ensure that there is a collaborative atmosphere.

The various components of the simulation have been modified after each iteration to incorporate feedback. While this version has worked in a number of settings, minor modifications have been made to various components after each group. For example, constructive feedback on postsimulation surveys recommended allotting more time at the beginning to fully understand the case and simulation structure (which has been incorporated into the agenda in Appendix B). Educators who use the simulation multiple times may benefit from making feedback-based modifications such as this one. Larger modifications to suit the educator have also been made; for instance, one group reported success after translating the simulation into Spanish for use with a multidisciplinary group of trainees.

Limitations

The most significant limitation of this simulation is the need for facilitators who have knowledge of both the basic principles of QI and how systemic change is made in health care. Departmental leaders within a hospital or clinic who focus on quality and safety make excellent facilitators, as do improvement specialists, who may be found in larger health systems. Time constraints often make it difficult to have many qualified experts together in one room. To alleviate this, we have found that near-peer teachers, such as a senior resident who has been previously involved with improvement initiatives acting as an expert with a group of intern physicians or medical students, have successfully been able to serve as improvement experts in the simulation. Other limitations include the time, space, and preparation needed to learn and run the simulation, which is complex and, by design, obtains different results every time it is run. Teams vary in their makeup and dynamics, which can create differing experiences for participants. Maximal learning is dependent on appropriate engagement from the QI facilitators, some of whom have found their teaching role within the team to be challenging if they do not often work with health professional trainees. Simulation leaders and QI facilitators often find it easier to run the simulation after having run it or participated in it once.

Conclusion

This simulation is an entertaining and educational addition to a QI curriculum that can serve to demystify QI for trainees. It builds competence and confidence to be able to affect change in the health care system, an important skill for all health care professionals.

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Ethical Approval

Reported as not applicable.

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