Developing a Quality Improvement and Patient Safety Toolbox: The Curriculum
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Abstract
Introduction: Quality improvement and patient safety are important elements of quality patient care. National medical boards and graduate medical education accreditation guidelines support integrating formal quality improvement and patient safety efforts into training and practice. In order to design and implement effective quality improvement projects, fundamental knowledge and tools are imperative. We sought to develop a formal quality improvement curriculum for house staff early in their training to give them insight and tools for longitudinal engagement. Methods: This curriculum contains guides for four facilitated sessions: introduction, value stream mapping, root cause analysis, and patient safety. Each session has a knowledge component to be delivered outside of class and a practice component whereby participants use their knowledge to participate in a group activity using a quality improvement tool. Results: This curriculum has been provided to more than 80 house officers over 3 years. Knowledge assessment showed improvement on all assessed categories of the training. Engagement in longitudinal quality improvement projects by trained residents has also improved. Discussion: This curriculum provides succinct fundamental tools to learners seeking to undertake longitudinal quality improvement projects. While initially designed for physician trainees, the tools and training are not specific to that group and can be used broadly for interested facilitators.

Keywords
Root Cause Analysis, Resident Education, Patient Safety, Quality Improvement, Value Stream Map

Educational Objectives
By the end of this curriculum, learners should be able to:

1. Describe the value of quality improvement techniques in the greater context of health care quality and safety.
2. Compare several tools used in quality improvement and identify how to incorporate these in developing quality improvement projects.
3. Apply principles of quality improvement to perform exercises in the 5S process, value stream mapping, root cause analysis, and patient safety monitoring.

Introduction
The Accreditation Council for Graduate Medical Education (ACGME) requires that residents receive training in quality improvement (QI) and actively participate in interdisciplinary clinical QI and patient safety programs.1 Lifelong participation in QI is a component of maintenance of certification for all physicians. Integrating QI education into an already busy pediatric residency curriculum requires interactive and engaging teaching techniques. Current state analyses suggest that several models of this training exist but few have formal curricula; those that do have scant evidence for ideal format or outcomes.2-4 Understanding the fundamentals of QI allows meaningful participation in lifelong projects. Teaching first-year residents about QI methodology allows them to understand the principles and develop their own projects early in their residency careers. We reorganized and expanded our pediatric resident QI
curriculum to increase residents’ knowledge and to permit them to be involved in more meaningful QI projects during residency. We have continued development of this resource to suit a broad range of professional backgrounds and nonpediatric trainees after recognition that these skills provide a key foundation for longitudinal projects.

This curriculum provides an innovative flipped classroom model of QI educational delivery designed to meet the needs of busy learners. To date, MedEdPORTAL has limited QI educational resources, and our resource builds upon the basic framework of those that are available. This field of medical education is fairly young, and building blocks such as these are essential to the development of learners who understand the systematic nature of QI science.

**Methods**

Based on the expectation of lifelong participation in QI, the ACGME requires that residents receive training and actively participate in QI. This educational series was designed to train house staff about basic QI techniques early in their training to allow them to more meaningfully participate in longitudinal QI projects during their residency. It consists of a facilitator guide (Appendix A) and four online modules teaching principles of QI partnered with four in-person workshops to review and utilize the new concepts.

Ideally, the group should consist of two to eight learners with one facilitator. While the curriculum was designed with physician trainees in mind, it can also be helpful to include nonphysician learners and physicians who lack QI backgrounds. The ideal facilitator would be a health professional with knowledge of QI basics. We recommend that the facilitator has participated in QI at the local level prior to implementing this curriculum.

Since this is a flipped classroom model, learners are expected to review modules assigned prior to the classroom session in order to prepare for the in-class exercise.

At our institution, this curriculum is provided during the first year of residency for pediatric residents and in the first or second year of training for combined internal medicine and pediatrics residents. This curriculum has been used since 2012 to give baseline training to the house staff prior to required participation (based on residency review committee guidelines) in QI/patient safety.

This curriculum is given over four afternoon sessions, each lasting 1 to 2 hours, during a non-inpatient rotation to maximize ability of learners to meaningfully participate. Learners are expected to view the session’s online module prior to discussion (except in session 1) in order to maximize in-class time. Preclass work usually takes approximately 30 to 45 minutes per session. Examples are provided in each module.

**Session 1: Introduction to QI and the 5S Process**

Facilitators can prepare with the QIPS Toolbox Session 1 Guide (Appendix B). The curriculum starts off with learners and the facilitator reviewing the Introduction to QI & 5S module (Appendix F), an overview of expectations of the curriculum. While the learners have received these ahead of time, reviewing the slides during the classroom session usually best facilitates this discussion. This module then describes the basics of QI, including background; six sigma; plan, do, study, act (PDSA); and lean. There is a more intensive discussion of visual QI projects and 5S principles. The learners are then asked to find a location to identify as their 5S project for the month. Homework is then assigned to photograph their location and complete a 5S project of that location by the last session of the course. An overview of expectations is also reviewed this session.

**Session 2: Value Stream Mapping (VSM)**

Facilitators can prepare for session 2 with the QIPS Toolbox Session 2 Guide VSM (Appendix C). Learners are expected to review the QIPS VSM Module (Appendix G) as preparation. Session 2 begins with learners brainstorming ideas for processes that they find flawed within their current daily work. The group is led by the facilitator using a whiteboard, large paper, or virtual whiteboard to complete a VSM of a mutually agreeable process. The group members start by identifying the customer, key stakeholders, and a starting
and ending point. They then identify each step in the process as well as the process time, wait time, and first-time quality. Lastly, the group calculates the overall process time, overall wait time, and overall first-time quality. If time allows, the team can vote on areas that are most feasible and impactful to address in a QI project. The session concludes with the group analyzing their VSM to determine one or more sites of waste that could be targeted for a root cause analysis (RCA).

Session 3: RCA

Facilitators can prepare for session 3 with the QIPS Toolbox Session 3 Guide RCA (Appendix D). Learners are expected to review the QIPS RCA Module (Appendix H) as preparation. Session 3 consists of practical application of RCA. The group may choose to use an adverse event or focus on the portion of their VSM targeted in the prior session. They work together to perform a fishbone/Ishikawa diagram or 5 Whys analysis using a whiteboard, large paper, or virtual whiteboard. If time permits, the other framework can be used as well, with either the same issue or an alternative issue.

Session 4: Patient Safety

Facilitators can prepare for session 4 with the QIPS Toolbox Session 4 Guide Patient Safety (Appendix E). The fourth session is dedicated to concluding the course and expanding the discussions to include the basics of patient safety. Learners are expected to preview the slides (Appendix I) prior to the session. During the session, the discussion is focused on use of an incident report, with review of examples from the module and, if time permits, filing of an actual incident report based on recent events. Discussion of culture of safety and timely hospital-wide initiatives to give examples is also recommended. Lastly, the group is exposed to recent institutional incident reports.

Grading

There is no formal grading assigned to this course; however, attending meetings is mandatory for passing this residency curriculum.

Assessment

Included are assessment questions (Appendix J) and a presurvey and postsurvey (Appendix K). Evaluation is twofold, encompassing both the curriculum and the individual modules. Level of experience and comfort in QI are assessed initially. Subsequently, some modules contain pretests and posttests with content-based assessment. These are included for the introductory module, the RCA module, and the VSM module. The module on patient safety does not have specific questions developed for assessment as the nature of this module already includes some assessment.

Results

This curriculum was designed and tested over the course of 2012-2013 and formally introduced as standard curriculum in July 2013. Initially, it was taught monthly over the 12 months of intern year; however, in 2014-2015, a transition was made to teach the curriculum earlier in the academic year in order to allow earlier exposure to fundamental QI information and subsequent selection of longitudinal (residency-long) projects. Surveys enclosed in this module can be implemented as paper tools or as online tools either embedded in the modules or distributed separately electronically. During our curriculum, we have these embedded in the modules with a link to the online survey for ease of data tabulation. As institutional use of online survey tools varies, we have chosen not to include these links in these modules but instead to include separate files with the survey questions available.

This curriculum has been provided to more than 80 house officers over 3 years. We have demonstrated an improvement in content knowledge of our residents as well as in their perceived readiness to participate in longitudinal QI projects. Presurveys and postsurveys were distributed for each module of the curriculum. Scores for all questions increased, as shown in the Table. Residents were more able to identify QI measures for health care effectiveness data and information set outcomes, as well as the steps of a PDSA cycle, and improved their knowledge of metrics used in QI after completing the curriculum. On 10.15766/mep_2374-8265.10385 Association of American Medical Colleges (AAMC)
preassessment, 77% of residents had no formal QI training, and 78% had never participated in a QI project. Out of a total score of 9, 67% gave scores of 5 or less on feeling comfortable implementing a QI project, while 74% gave scores of 5 or less on feeling comfortable developing a QI project. Only 3% of residents did not believe that QI principles could be an effective way to improve the medical care experience of their patients. We also mentor many of these long-term projects, and they have been more successful since the implementation of this curriculum.

Table. Improvement Noted on Questions by Subject Area in Pretest and Posttest Measurement (N = 54)

<table>
<thead>
<tr>
<th>Question</th>
<th>% correct on pretest</th>
<th>% correct on posttest</th>
</tr>
</thead>
<tbody>
<tr>
<td>IOM definition of quality</td>
<td>67</td>
<td>100</td>
</tr>
<tr>
<td>Human error in quality</td>
<td>50</td>
<td>52</td>
</tr>
<tr>
<td>HEDIS measures</td>
<td>22</td>
<td>48</td>
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<tr>
<td>QI measures for HEDIS</td>
<td>60</td>
<td>100</td>
</tr>
<tr>
<td>PDSA cycle 1</td>
<td>67</td>
<td>96</td>
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<tr>
<td>PDSA cycle 2</td>
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<td>100</td>
</tr>
<tr>
<td>5S</td>
<td>33</td>
<td>100</td>
</tr>
<tr>
<td>Use of VSM/RCA</td>
<td>97</td>
<td>100</td>
</tr>
<tr>
<td>Use of VSM</td>
<td>95</td>
<td>100</td>
</tr>
<tr>
<td>Steps to create VSM</td>
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<td>47</td>
</tr>
<tr>
<td>Identifying waste</td>
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<td>89</td>
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<tr>
<td>Identifying metrics</td>
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<td>82</td>
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</table>

Abbreviations: 5S, sort, straighten, shine, standardize, sustain; HEDIS, health care effectiveness data and information set; IOM, Institute of Medicine; PDSA, plan, do, study, act; QI, quality improvement; RCA, root cause analysis; VSM, value stream map.

Discussion

During our time teaching this curriculum, we have found that having one faculty member teach each session for a block improves the continuity for the group. This is advised but not imperative. Groups work best when there are two to eight learners involved. Fewer learners or larger groups lead to less robust discussion. It is also important to have access to the slide deck for reference during the sessions, as well as a whiteboard or virtual whiteboard for the RCA and VSM modules. This is best achieved in our setting by using a smart classroom but could also be achieved using a laptop and a whiteboard.

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References


