RESEARCH ARTICLE

Quality culture in action for a respiratory course: A dynamic CQI process at an engineering based allopathic medical school

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Abstract: Carle Illinois College of Medicine (CIMED) opened its doors in 2018 as an allopathic medical school under provisional accreditation by the Liaison Committee of Medical Education (LCME) and in 2014, the LCME mandated that all U.S. medical schools implement the process of internal continuous quality improvement (CQI). Here, the authors take a retrospective look at how CIMED utilized frequent and granular student feedback to contribute to continuous quality improvement (CQI) during the school's Respiratory course, by citing specific examples of changes and student satisfaction outcomes from the inaugural class (2018) to the second class (2019). The authors outline how this cycle of evaluation and action can effectively incorporate students into the CQI process to enhance student success via faculty-student partnership. Furthermore, the authors discuss the nuance of feedback interpretation by the involved faculty and advocate for CQI based on a deeper understanding of the student experience such that change initiated by CQI may extend beyond benchmark data collection. The authors discuss how dynamic feedback may be helpful in achieving equipoise between long-standing principles of medical pedagogy and newer trends in medical education, while still maintaining student satisfaction and continuing to develop a culture of quality improvement.

Keywords: quality culture, respiratory course, CQI, CIMED, LCME, medical education

1 Introduction

The goal of any medical school basic science curriculum is to teach students the necessary knowledge in a way that is both relevant and memorable. Many schools have a mechanism of ensuring that this is achieved through a curriculum review process that calls for faculty and students to work together to improve their curriculum for better student outcomes [1, 2]. U.S. medical schools have widely acknowledged the need for student feedback in this process. The doctors and scientists that facilitate graduate medical training recognize that as medicine rapidly evolves, so too does the experience of the student-learner and thus, their input in the process is paramount [3–5]. The Liaison Committee on Medical Education (LCME) in 2014 required that medical schools implement an internal Continuous Quality Improvement (CQI) processes intended to improve programmatic quality and monitor compliance with accreditation standards [4, 5].

Curricular reform and the LCME accreditation process are valuable opportunities for student input, however, there are few publications on how best to incorporate students in these endeavors [6, 7]. For the most part, medical schools have not adequately engaged the student body in academic design [10] and experts are asking how to facilitate this engagement [5]. From the literature available, it is unclear how schools use feedback from medical students to enhance courses and if the changes enacted truly improve curriculum delivery [11].

The Carle Illinois College of Medicine (CIMED) is an allopathic medical school under preliminary LCME accreditation and is the first to completely integrate engineering principles into the curriculum throughout the four years. At its outset, in 2018, CIMED sought to incorporate student feedback to shape courses, student life, and ultimately produce MDs who actively participate in solutions to clinical problems both in and outside of direct patient care. Here, we take a retrospective look at how student feedback was received and incorporated into CIMED's Respiratory block, citing specific examples of changes and student satisfaction outcomes from the inaugural group (2018) to the second class (2019). We outline how this cycle of evaluation and action can effectively incorporate students as part of the CQI process

to monitor fulfillment of accreditation standards while enhancing student success via faculty-student partnership. Furthermore, we discuss the difficulty in interpreting student feedback and advocate for CQI based on a deeper understanding of the student experience such that change may extend beyond benchmark data collection. We believe dynamic feedback, may be helpful in achieving equipoise between long-standing principles of medical pedagogy and newer educational approaches that include PBL, flipped classroom, TBL, CBL, and virtual/online reality modalities [4, 5]. Such a model contributes to a culture of quality with iterative processes necessary for adjusting medical education to changing conditions in health care [12].

2   CQI for addressing shifts in medicine

Accreditation aims to not only ensure the quality of medical education and promote continuous improvement but ultimately, to yield optimal patient care [12–17]. The LCME does not define specific requirements for the internal CQI process. Each individual institution is to define its own set of standards to make CQI meaningful and effective. CQI is critical because while the accreditation process serves as a stimulus to identify problems and create solutions for upcoming review, this schema leaves gaps for much needed improvement beyond the scope of baseline medical education standards. Accreditation reviews do not occur at an optimal rate to facilitate the iterative process necessary to ensure an internal culture of quality improvement that will push schools towards excellence in medical education [18, 19]. Furthermore, there is little evidence of clear linkages between accreditation and the betterment of medical education [13]. Rather, a true "culture of CQI" is believed to foster adherence to best-educational practices and allow for closer evaluation of accreditation and its impact on the education of future physicians [11, 20].

Experts contend that the link between meeting accreditation standards and the quality of medical education is difficult to establish as meaningful and feasible outcome metrics are challenging to identify. There is a growing interest to utilize large datasets on clinical outcomes, experience of care and health system performance to assess program quality, linking accreditation to societal accountability [22]. The impact of accreditation has been historically measured by graduate outcome exam scores [13]. While Step 1 scores can be used as a proxy for student outcomes and are a critical measure of a student's medical knowledge, their weight continues to be questioned, as resident success and program satisfaction with incoming trainees has ultimately not correlated with these metrics [22, 23]. With scarcity of objective data to evaluate candidates, it is reasonable that residency programs have grown dependent on these high-stakes numeric snapshots for initial evaluation of candidates. We posit that CQI will play a vital role in measuring alignment with standards and informing whether they are congruent with the vision of the medical community and the society it works to serve.

3   Curriculum structure at CIMED

The paper herein describes how CIMED's CQI process utilized student feedback to assist in the evolution of the basic sciences Respiratory course [11, 24]. The first 1.5 years at CIMED are dedicated to teaching basic and clinical science knowledge in a systems-based approach that revolves around problem based learning (PBL) [25–27].

In addition to PBL sessions, the students take part in traditional lectures, clinical activities, and engineering lab sessions. The clinical activities serve as an introduction to practicing medicine and provide students with the basic skills of history taking, physical exam, clinical reasoning and clinical workflow. Additionally, interprofessional sessions with students from adjacent healthcare tracks are utilized to simulate the professional environment and coordination of patient care.

4   Feedback structure

One important aspect of CIMED's CQI process includes gathering and acting on specific, granular student feedback. For all courses in the first year, weekly feedback was submitted about the courses, PBL sessions, engineering labs, exams and student affairs concerns that transpired over the course of the week. Feedback was solicited via an anonymous form and during office hours with the course directors. In addition, at the end of the course, evaluations were performed to determine student satisfaction and to evaluate instructors that led various activities. The response rate of these end-of-course evaluations was greater than 80% for both classes. Between teaching the respiratory course in 2018 and 2019, the course was evaluated by

a curriculum oversight committee (COC) which was designed to identify any gaps in material covered. The COC consists of course directors, students from each class, and various faculty members.

During the first iteration of the course, a team of faculty reviewers met weekly to review student feedback. The frequency of evaluation of the ongoing course allowed reviewers to capture the student experience in real time. This, paired with the flexibility and responsiveness of the course directors and school faculty, led to meaningful changes between the first and second iterations and contributed to the beginning of a culture of CQI at CIMED.

5 Results

The evolutionary changes of the respiratory course at CIMED between the first two years of teaching was directly based on student feedback (Table 1). The first area of student concern was an interprofessional simulation of an acute asthma attack. This activity, offered in collaboration with local respiratory therapy students, was designed to be an interactive opportunity for students to reinforce treatment for asthma and practice skills necessary for an emergency setting. Opportunities like these are rare and exciting for first year students. In the feedback provided afterwards, students noted that a more sufficient understanding of the underlying mechanisms of asthma and treatment would have better equipped them for practicing the goals of care via simulation. In the second year, based on this feedback the simulation session was pushed from the first to the third week of the course. This gave students a chance to learn and process asthma pathology, physiology, and treatments before being put into a simulated emergency setting. The difference in timing served to reduce stress and make the event more effective in the second year.

Table 1   How student and COC feedback shaped changes in a respiratory course between the first cohort (2018) and second cohort (2019)

Sessions	Student Perspective (First Cohort)/COC	Change in Respiratory Course (Course Directors)	Student Perspective (Second Cohort)
Interprofessional Education Session on Asthma with Respiratory Therapy students from another school	Beneficial, but would be better if we knew more about asthma as the session was in Week 1 where we are still understanding basis of respiratory diseases. Session was too soon in a 5- week course.	Course directors move session from Week 1 to Week 3 in agreement with feedback.	Sees benefit of the change in Week 5, feel they have a good knowledge base and clinical reasoning. Consider the interprofessional education session as engaging.
Active Learning sessions on pneumonia via TBL and PBL.	Need more coverage with bacteria and bugs, could not cover the microbes in depth as the week seems packed. Suggested to include more knowledge on microbial pathogenesis. COC also suggests including more microbial coverage in the course.	Course directors add small group discussion on a variety of bacteria previously missed in PBL.	TBL better suited for learning for microbes and offers more learning opportunities. PBL supplementation by small group discussion considered valuable.
Radiology sessions on X-rays and CT scans in pulmonology	Sessions were offered together, and time allotted for labs was short, suggestions to separate the sessions. Coverage of X-rays and diagnostic reasoning combined with CT scans in 2 hours was overwhelming.	Course directors devoted more time allotment to X-rays and CT scans in separate sessions. Small groups extended to three hours with one hour of introduction and then separate sessions for X-rays and CT with diagnostic reasoning.	Knowledge for relevant imaging perceived adequate by students. Sessions included stepwise evaluation of X-ray and opportunity to practice evaluation as well as intro to MRI/CT scans.
Traditional lecture on basic respiratory pathologies	Overwhelming amount of material to cover in 2 hours, including lung and tumor pathology.	Course directors expanded lecture series from 2 hours to split into three sessions of an hour each. 1 lecture on neoplastic and 1 on non-neoplastic pathology was added.	Material perceived as manageable by students. Lectures were a solid introduction to many pathologies and laid foundation of good pathology knowledge.
Learning session on Acute (ARDS) and Neonatal Respiratory Distress Syndrome (NRDS)	Topic missing in the course suggested by COC. COC rates course as good identifying only one of topic of NRDS/ARDS missing.	Course directors add lecture on NRDS added that included pathophysiology, diagnosis, and treatment of NRDS/ARDS.	Added session was perceived as sufficient to cover NRDS/ARDS.

Note: COC – Curriculum Oversight Committee

Student and COC feedback also helped identify that the instruction on microbiology in the respiratory course had knowledge gaps. The initial class had one team-based learning activity (TBL) that was focused on pneumonia and related microbiology. Since only one TBL was offered and the timing was early in the course, some important microbiology topics were omitted.

In the second year of the course offering, missed microbiology concepts were added in PBL and timing of the TBL was adjusted. In particular, an engaging task where students investigated the pathogenesis, etiology and diagnosis of important microbes in respiratory pathology was added to one of the PBL sessions in order to encourage students to focus more on microbiology in their self-study.

Another example of student feedback impacting learning surrounded the lectures on radiology and pathology. The first iteration only had one radiology session and one pathology lecture. While the lectures were able to cover most of the necessary content for the block, temporal allowance for knowledge accumulation was perceived as lacking. In the radiology session for example, students covered relevant X-ray/CT findings, but the lesson did not allow them time to practice evaluating normal and pathological X-ray/CT evaluation on their own. In the second year, an additional radiology session took place in small groups to allow students time to develop basic radiology skills. In the first iteration of the course, the pathology lecture covered both neoplastic and non-neoplastic pathology in one two-hour session. Student feedback illustrated that students felt overwhelmed and unable to fully comprehend the sheer volume of material discussed during the given time. For the subsequent year, the respiratory pathology lectures were split into multiple, shorter segments that were easier to consume and were well received.

Finally, by the end of the course, student responses and COC evaluation suggested that ARDS/NRDS was a topic that was not well covered in outside sources and perhaps not learned in-depth during the five-week course. This prompted the addition of a learning session on ARDS/NRDS. The additions and changes made to the respiratory curriculum not only ensured that the respiratory course covered necessary medical knowledge, but they also served to limit student stress and increase content retention. The process in this course, we believe, was made possible by a structure of feedback that was consistent and frequent allowing the course directors to accurately capture the student experience during the course. This allowed for reasonably fast alterations (from one class to the next) in order to address the exact needs of a group of students at a specific time and place. Although, the end of course evaluations showed a high rating in its first offering as a whole, the respiratory course received an even higher rating in the second year that reinforced that changes made to the course had been well received. The course received reviews that suggested increased satisfaction in the course as well as student perception of improved competency in medical knowledge and patient care, illustration of clinical relevance, and sufficient opportunity for self-directed learning. Not all requested changes can be made or should be, necessarily. Resource considerations and genuine disagreement need not be a barrier to progress if all stakeholders share a common vision and remain open and committed to the work necessary to reap the benefits of this iterative process.

Our interpretation of the process, as described here, is not without bias or limitations. A robust system of implementing CQI into medical programs is an effort in its infancy. CQI, when "explicit, intentional and systematic," [29] should serve to address the pitfall of 'solutionism,' in manufacturing educational changes. Though our effort described here was explicit and intentional, as a new medical school, the path toward solidifying our standard for CQI is still in the making. The opportunity to give written feedback sometimes led to vague or emotional statements from students that were difficult to interpret. This could be remedied by prompting students with more specific questions and by helping students better understand their role in the CQI process; shifting their point of view from a consumer of medical education to an active participant in the process. One useful tactic to expand this idea is to host formal focus groups where faculty can ask pointed questions about the perceptions of the course and allow students time to think and expand on their ideas. These session would also offer students to play a role in brainstorming solutions and tailoring the course even more to their specific needs.

We acknowledge that the strength of student input in curricular development is only examined here in one course, over two classes of students. Additionally, we do not yet have data on standardized testing or residency placement against which to weigh these academic changes. Furthermore, student-faculty revision cycles are but one aspect of a larger CQI process necessary for creating a true culture of improvement—an endeavor that calls for buy-in and effort from multiple stakeholders. It is to be determined which approach to CQI is most effective, but there is little denying that the value of student input will remain paramount.

6 Discussion

The nature of medicine is an evolving practice, its current state is marked by an emphasis on decisions that are evidence-based. This value is reflected in the tools and resources currently at hand (*e.g.* UptoDate). It is reasonable to expect the structure of medical education to follow suit. As the profession in this country explores the value based care model which

aims to bring the focus back to quality of life outcomes for patients, medical schools likewise should foster a continuous cycle of improvement that re-ignites the importance of the quality of medical education beyond the standards that only exams or subjective data can measure. A student's ability to hear the needs of their patients and their capacity to think critically about the issues beyond the required syllabus are tenants of longitudinal learning and responsible medical practice that have always been heralded as core values of this profession. Increasing the frequency of curricular review with purposeful intention should ensure a culture of quality improvement. The responsibility of maintaining a curriculum that is effective requires an ongoing dialogue between students and faculty to ensure quality education that can ultimately improve patient outcomes.

As explained by professor Molly Worthen, institutions must be thoughtful in design and implementation of CQI as processes meant to enhance student and faculty experiences can easily become banal formalities [30]. These statements, and others, show how easy it is to lose the effectiveness of CQI in medical education [13]. The fast-paced nature of medicine should be reflected by a flexible medical curriculum. Our measurable outcomes should not be static targets rather, they should aim to create curricula that allow students to be physicians equipped to handle tomorrow's challenges and suited to fulfill the expectations of their academic mentors and most importantly, their patients. The mechanism of collecting student feedback described above serves as an example of de-routinizing CQI in medical education. By emphasizing the importance of active listening to parse out granular, nuanced feedback rather than a rote process with specific, static goals, CIMED is practicing the inclusion of student feedback in developing a culture of CQI that we hope will improve the CIMED curriculum for years to come.

7   Conclusion

While the LCME requires CQI as part of the accreditation process, the description for what that means is very loosely described. Each medical school sets its own standards and processes for meaningful and effective CQI. Unfortunately, CQI can become more of an exercise in busy work wrapped up in rote, repetitive processes to help schools reach static outcomes that may or may not help their students become great doctors. The role of medical education extends far beyond what an exam score can measure and so should CQI. CQI that is based in active listening and student feedback has the ability to help redesign medical schools' curricula in a way that decreases stress, increases knowledge and inspires better patient care through critical thinking.

Most medical students are unaware of quality improvement at their institutions. We hope that our inclusiveness of students in the CQI will pave the way for institutions that wish to revamp the CQI processes. We believe in incorporating continuous student feedback in a more formal CQI process that will offer cadence to curricular change and improve the quality of the CQI process.

8   Limitations

Due to the confidential nature of medical education, the authors have chosen to omit specific statistics pertaining to the end of course evaluations collected by Carle Illinois College of Medicine. As we continue to improve the processes for CQI at CIMED, we are waiting for the class of 2022 to graduate to measure the true success of the curriculum in enhancing student outcomes.

Conflicts of interest

No conflict of interest was reported by the authors.

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