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Aligning Medical Student Curriculum with Practice Quality Goals: Impacts on Quality Metrics and Practice Capacity for Students

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INTRODUCTION

The practice of medicine occurs primarily in the ambulatory environment[1] where providers have many competing demands, including health record documentation and patient volume expectations. Subsequently, medical student education has not been a priority for providers, health systems, or community practices.[2,3] Yet, accrediting and professional organizations, such as the Association of American Medical Colleges, American Academy of Family Physicians, Ambulatory Pediatric Association, Society of General Internal Medicine, and the Liaison Committee on Medical Education, recommend education in ambulatory settings.[4-7]

The demand for ambulatory sites has been amplified, with over 30 medical schools created since 2010,[8] expanding medical school class sizes to address physician shortages,[9] and competition for sites from other

health professions students. This expansion resulted in a shortage of training sites, particularly with community-based preceptors.[8] The Alliance for Clinical Education proposed options to address the preceptor crisis,[2] including increased financial remuneration, educational relative value units, employment requirements, continuing medical education or maintenance of certificate credits, and increasing time and space for teachers.[2,8,10] These solutions have been only partially successful due to lack of funding, increased provider burnout, decreased efficiency due to students, or decreased patient access.[11]

One recommendation that did not involve additional cost[2] was identifying activities medical students could perform that add value to the clinic. Pediatric community-based preceptors suggested creative scheduling to maximize patient flow in clinics or working with nurses to do patient intakes or vaccinations as options.[12] Additionally, Penn State Hershey trained students as patient navigators, care transition facilitators, or quality improvement extenders.[13,14]

These recommendations for recruiting preceptors coincided with parallel pressures on outpatient practices to meet quality metrics. Reimbursement is increasingly tied to meeting such metrics, but practices do not have the resources to dedicate to quality improvement

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efforts. Incorporating medical students into quality improvement efforts could potentially transform students from a practice burden to valuable asset and improve the educational value of ambulatory rotations. While there have been studies (eg, UCSF microsystems clerkship[15]) on curriculum with the goal of directly improving care,[16-21] there are few published recommendations for systematically incorporating all medical students into ambulatory population health efforts.[2,22] There have been no published data on the impact of such intiatives on faculty recruitment.

In our large public medical school, we systematically implemented a curriculum for students, intentionally emphasizing the value students bring to ambulatory practices and ambulatory practices to students. With a required population health curriculum, we sought to demonstrate that student participation in quality initiatives would make educating students more beneficial to health systems while improving student confidence in quality improvement skills. A secondary aim was that the anticipated number of practices engaged in teaching students would increase as students proved to be valued assets in achieving quality metrics.

> ### PERSPECTIVES VIEWPOINTS
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> - Ambulatory preceptor recruitment is possible when students add value.
> - Quality improvement, a value-added skill, can be taught to medical students.
> - When students do quality improvement activities that align with the practice goals, practices are able to accommodate more learners.

METHODS

Our school of medicine is a large medical school with more than 180 students per class. In March 2016, the school implemented a new clinical curriculum with a focus on longitudinal outpatient experiences. Approximately one-third of the class is based at campuses around the state with alternative curricular models, such as longitudinal integrated clerkships. This study focused on the 128 students who remain at the main campus and participated in a 16-week ambulatory course for junior medical students that replaced the family medicine, internal medicine, and pediatric block schedules. Each student was assigned 2 days in an adult primary care (internal medicine or family medicine) practice and 1 day in a general pediatric practice every week. The remaining 2 days per week were for lectures, electives, hospice, quality improvement, and self-directed learning Table 1.

Curriculum

A population health and quality improvement curriculum, including engagement in a quality improvement project for all 128 students at the main campus, complemented the traditional clinical curriculum. Students completed 7 Web-based Institute for Healthcare Improvement modules during the first 6 weeks (Table 2).[23] In 4 interactive classroom sessions throughout the 16 weeks, students learned about social determinants of health, variance, interprofessional teams, and gaps between best evidence and practice. Students also learned quality improvement strategies used to close quality gaps in a population and were required to try to improve a clinic metric using plan-do-study-act cycles.

Faculty Development

Faculty development sessions were offered twice during each 16-week block and included 2 hours of interactive learning. Thirty-six faculty members (approximately 50%) attended at least one session and many attended several sessions. Student attendance was required to promote discussion of practice projects with faculty. Faculty participants learned details of the student curriculum, how to choose a project for a student, and how to align student work with practice priorities. Faculty participants learned about and worked with students on driver diagrams and aim statements. We discussed types of change and sustainable changes (ie, ones in which students worked out new processes for existing staff) vs nonsustainable changes (calling patients to come to clinic). The curriculum is now publicly available at www.med.unc.edu/teachingskills.

Practices

Practice types included university academic practices, university health system-owned and -affiliated

Table 1	Sample Schedule for a Given Student Week				
AM week 1	Orientation: session A*	Adult clinic	Peds clinic	QI time at clinic*	Adult clinic
PM	Adult clinic PM	Adult clinic	Peds clinic	Subspecialty experience	Study time
AM week 2	Adult clinic	Adult clinic	Peds clinic	QI time at clinic*	Session B*
PM	Adult clinic PM	Adult clinic	Peds clinic	Subspecialty experience	Study time

*Designated time for quality improvement work (QI).

Table 2	Population Health and Quality Improvement Curriculum Over 16 Weeks
Week 1: Orientation	Differences in what is recommended and the actual care delivered
Session A—1.5 h	Social determinants and impact on care delivery
	Using quality improvement methods to improve the health of a population
	Group activity: Make a driver diagram to improve asthma care in a clinic setting
Weeks 2-4: Online	IHI Open School courses QI101-105
	Developing a SMART aim statement, driver diagram (Web-based slides)
Week 3: Session B—1 h	Scope of the project, aligning with practice priorities
	What to measure
	Choosing a driver for your first PDSA cycle
	Process vs outcomes measures
Week 5: In the practice	Try out first PDSA and record results
Week 6: Online	Peer formative feedback with QIPAT+ on PDSA; revise and change as needed
	Faculty office hours (2 h) for assistance with QI (call or in-person)
	IHI Open School courses Triple Aim and Patient Family-Centered Care Modules
Week 7: Online	Turn in first PDSA assignment for faculty formative grading with QIPAT
Week 8: In the practice	Perform subsequent PDSAs
Week 9: Session C—1 h	Showing data and building momentum in practice presentations
	Social determinants of health and decreasing or increasing variance
	Balance measures
Week 12: Session D—30 min	Sustainability and use of transitions form to pass knowledge to next student
	How to make a QI# poster to be presented week 15
	Meet with next student placed in practice

IHI = Institute for Healthcare Improvement; PDSA = plan-do-study-act cycle; QI = quality improvement; QIPAT = quality improvement project assessment tool; SMART = specific, measureable, actionable, relevant, timely.

Sessions involve face-to-face time with course director. Other curriculum was Web-based and self-study.

practices, community health centers, and private practices with no health system financial affiliation.

Outcomes

Student self-report on measures specific to quality improvement skills and teamwork on our mid-point survey and end of medical school survey were collected. A second outcome was to determine if students aligned quality projects with institutional goals. A third outcome was final presentation of their work at a poster session. Finally, we identified the number of training sites pre- and postimplementation of this curriculum to determine if the new curriculum increased clinical placement opportunities.

The surveys were administered to students twice during medical school. After 18 months in medical school, the first survey was completed before beginning required clinical rotations, so students had brief exposure to the quality improvement curriculum at this point. The second was at the end of medical school, which is approximately a year after experiencing the quality improvement curriculum. Students responded to questions using Likert scales for each item.

Clinical-quality metrics were evaluated using monthly published dashboards for university and community clinics. These dashboards represent institutional or systems priorities for quality improvement activities. Because we recommended to students and faculty that they align student projects with priority activities, we compared dashboard metrics to metrics on which students worked. Private practice quality dashboards were unavailable, but we were able to sort projects based on measures to get some sense for care priorities in private practices.

After the second trimester, students made posters explaining their work and outcomes. The posters were presented at a dinner during which they were able to discuss their projects. Posters were judged by preceptors, asking students to explain the project and potential next steps in the process.

The effects on practice recruitment were measured by counting the number of potential student placements in each type of site before and after curriculum reform.

Analysis

Descriptive and inferential statistics were used to compare pre and post results. Data were analyzed using IBM SPSS version 25 (IBM, Armonk, NY).

This submission (#16-2401) was reviewed by the Office of Human Research Ethics, which determined that this submission did not constitute human subjects research as defined under federal regulations and did not require Institutional Review Board approval.

RESULTS

There were 128 students that completed the ambulatory course between March 2016 and February 2017. All 128 students completed all elements of the population health curriculum.

Student Outcomes

The anonymous mid-point survey asked, "How confident are you in your current ability to perform the following activities expected of students beginning clinical rotations including: Using standard approaches and measures of quality improvement to enhance patient care such as assessing a clinic's adherence to national clinical practice guidelines and its measured patient satisfaction levels?" Students rated their confidence as an average of 2.79 of 5, with 5 being the most confident. A second question asked, "How familiar are you with the basic terms and concepts of quality and safety, including Plan-Do-Study-Act cycles, aim statements, institutional reporting systems for near misses, and root cause analyses?" Student rated their familiarity as an average of 2.59 of 5, with 5 being the most familiar.

On the end of medical school survey, the question asked "How do you rate your ability to apply knowledge and skills of quality improvement and patient safety?" Students rated their ability as a 3.77 of 5 (1 = not at all; 2 = minimal; 3 = fair; 4 = good; 5 = great). Only 8.9% of students rated their skills as 2 or lower.

Poster sessions gave students an opportunity to display work and celebrate the impact the project had on the practice with providers and health system leaders.

Project Alignment

Student projects and alignment with practice or institutional measures are in Table 3. Projects aligning with practice dashboards included 85.0% (17/20) at academic practices, 86.4% (19/22) at university-affiliated practices, and 61.8% (21/34) at community health clinics. The top choices for projects in private practices included diabetes 17.3% (9/52), mental health 19.2% (10/52), and opioid 13.5% (7/52) monitoring.

Student Placements

Prior to the implementation of this innovation, assigning 16 students to clinics was a challenge. With the new longitudinal curricular format and inclusion of the quality improvement requirement, the number of potential student placements increased from 16 to 64. The number of community placements increased from 4 to 12, and the university-affiliated practice placements from 2 to 20. The number of private practice placements also increased from 10 to 30 training sites. There were a total of 75 pediatric, family medicine, and internal medicine faculty members involved, and the maximum placement needs per trimester was 45, leaving a net surplus of preceptors each trimester.

DISCUSSION

Aligning the school of medicine curriculum with health system needs so that students could meet those needs resulted in a surplus of available preceptors. Medical students have been an untapped resource for our primary care practices. Practices hosting students were able to align student projects with practice priorities. The additional help to improve care drove demand for students in practices. These findings add credibility to the recommendations for recruiting preceptors by demonstrating that students add value to the practice.[2,13]

While the majority of student projects aligned with practice priorities, not all did. Variation may be due to

Table 3 Project Choice and Number of Students in Each Area

Project Focus (Number of Practices)	Acad (n = 2)	AP (n = 20)	CHC (n = 6)	PP (n = 30)	Total Projects
Diabetes	4*	8*	4*	9	25
Colorectal cancer screening	3*	1*	11*	2	17
Breast cancer screening	1*	2*	2*	2	7
Cervical cancer screening	3*	6*	0*	0	9
HPV vaccination	0	1	2	4	7
Pneumococcal vaccine	2*	2*	0	0	4
Clinic flow	0	0	5	2	7
Falls	0*	0*	2	1	3
Blood pressure/HTN	0	0	3*	0	3
Chronic pain/opiate management	0	0	1*	7	8
Hotspotting/high utilizer patients	3	0	0	0	3
COPD	2*	0	0	0	2
Decrease ED visits	1*	0*	0	1	2
Mental health	1*	0*	0	10	11
Other	0	2	4	14	20
Total by site	20	22	34	52	128

Acad = university academic practices (practice and physicians at UNC School of Medicine); CHC = Community Health Centers; COPD = chronic obstructive pulmonary disease; ED = emergency department; HPV = human papilloma virus; HTN = hypertension; PP = private practices; UNC AP = university health system-owned and -affiliated practices (Practices and physicians owned by UNC Health Care System).
*Institutional or systems goal.

investigation of new areas for improvement (hot-spotting), research funding (domestic violence screening), or poor processes (vaccine timeliness, clinic flow, billing). Private practices had more variety in projects, likely due to a larger number of mentoring faculty or different practice priorities.

We believe that 3 elements were essential to our success: the increased length of the course; a more extensive population health and quality improvement curriculum that included aligning student assignments with practice needs and resources; and emphasizing student contributions during faculty development and during a poster session.

The longitudinal nature of the course improved student continuity with the practice, community, and curriculum. Students felt they were a part of the practice and held some of the responsibility for high-quality care. Their unique position in the practices made them nonthreatening to staff and providers. Repeatedly, students shared stories of identifying processes that were ripe for improvement. Students used these opportunities to identify where they could contribute to the practice goals for improvement and test changes over 16 weeks.

Over the course of the year, we fine-tuned the curriculum to meet the needs of the students and practices. The longitudinal nature of the course allowed for a curriculum to build in complexity over many weeks. It also allowed for feedback from many sources, including peers, course directors, and practice members. Preceptors received both formal curricular opportunities through faculty development and informal learning via the student presentations at their practices and the poster sessions.

Finally, emphasizing student successes in the form of student-led practice meetings and across practices with faculty development sessions increased preceptor and leadership enthusiasm for student engagement. After the second trimester, students were required to create posters explaining their project and to display them in practices. When we began the curriculum, faculty development sessions were a way to introduce, educate, and explain how students can add value to a practice. This content evolved into an end-of-course poster symposium with dinner to showcase student work. Health systems leaders and providers attended, demonstrating that student involvement can be a net positive for both the system and students. These leaders consequently asked more practices and providers to host students. We have found that this poster symposium also serves as an opportunity for informal faculty development. All participants are required to judge posters, and faculty members use the judging time as an opportunity to consider next steps in projects or new projects.

While the practices supported the students in their quality efforts, the most notable indicator of practice support for the curriculum was increased numbers of student placements. This increased engagement improved our capacity to accommodate all learners for both pediatric and adult experiences. We were able to engage health system leadership, both public and private, to encourage practices to host students. This curricular model, with the demonstrated outcomes and celebration of achievements, offers a potential solution for chronic shortages in ambulatory learning sites with which schools of medicine have been plagued.[2,3]

One limitation of this study is that it was a single institution with course directors skilled in quality improvement teaching and practice. However, students were able to apply classroom learning into projects. In addition, the curriculum covered only basic quality improvement skills. Most medical schools have faculty with this level of knowledge and expertise that could be implemented at other schools.

The length of the course may make this less generalizable to other medical schools. However, we had been using a similar quality improvement curriculum in a 4-week clerkship prior to the overall school curriculum reform. The longer course allowed students to do multiple plan-do-study-act cycles and potentially see greater impact. Students also began using a transitions worksheet to "pass on" advice and lessons learned to the next student.[24] Students frequently commented on this prior knowledge when continuing the project of a previous student. A shorter course could use a transitions worksheet, as we have done.

Notably, prior efforts by the school leadership to increase capacity had not been successful. Although the length of the new curriculum may have enticed practices to engage, invitations of health systems leaders to the symposia may have also raised the profile of the school, making them more likely to host students. Course directors heard from a variety of sources (embedded coaches, practice and care managers, and health systems leaders) that this curriculum really helped the practices and they wanted students placed in as many practices as they could. Highly performing or improving practices likely reflected well on those same leaders. These leaders consequently asked more practices and providers to host students.

In summary, providers and health systems were more likely to engage when students added value to the practice and their institutional leaders were made aware of that value. Students working on quality improvement priorities ultimately led to an increase in the number of practice sites willing to take students for ambulatory training.

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