Title

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Abstract

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Problem—Systems-based practice focuses on the organization, financing, and delivery of medical services. The American Association of Medical Colleges has recommended that systems-based practice be incorporated into medical schools' curricula. However, experiential learning in systems-based practice, including practical strategies to improve the quality and efficiency of clinical care, is often absent from or inconsistently included in medical education.

Intervention—A multidisciplinary clinician and non-clinician faculty team partnered with a cardiology outpatient clinic to design a nine-month clerkship for first-year medical students focused on systems-based practice, delivery of clinical care, and strategies to improve the quality and efficiency of clinical operations. The clerkship was called the Action Research Program. In 2013–2014, eight trainees participated in educational seminars, research activities, and nine-week clinic rotations. A qualitative process and outcome evaluation drew on interviews with students, clinic staff, and supervising physicians, as well as students' detailed field notes.

Context—The Action Research Program was developed and implemented at the University of California, San Francisco, an academic medical center in the U.S. All educational activities took place at the university's medical school and at the medical center's cardiology outpatient clinic.

Outcome—Students reported and demonstrated increased understanding of how care delivery systems work, improved clinical skills, growing confidence in interactions with patients, and appreciation for patients' experiences. Clinicians reported increased efficiency at the clinic level and improved performance and job satisfaction among medical assistants as a result of their unprecedented mentoring role with students. Some clinicians felt burdened when students shadowed them and asked questions during interactions with patients. Most student-led improvement projects were not fully implemented.

Lessons Learned—The Action Research Program is a small pilot project that demonstrates an innovative pairing of experiential and didactic training in systems-based practice. Lessons learned include the need for dedicated time and faculty support for students' improvement projects, which were the least successful aspect of the program. We recommend that future projects aiming to combine clinical training and quality improvement projects designate distinct blocks of time for trainees to pursue each of these activities independently. In 2014–2015, the University of California, San Francisco School of Medicine incorporated key features of the Action Research Program into the standard curriculum, with plans to build upon this foundation in future curricular innovations.

Introduction

At the turn of the 21st century, the Institute of Medicine published two reports that drew attention to widespread problems with healthcare quality, safety, and cost in the U.S. and recommended re-conceiving of health organizations as "complex adaptive systems" in order to usher in an era of reform.[1,2] The Accreditation Council for Graduate Medical Education (ACGME) followed suit and applied a systems-level model to its accreditation standards for

medical residents in the U.S., issuing six new core competencies in 1999. [3] Of these, systems-based practice,* in particular, requires attention to how medical services are organized, financed, and delivered, such that trainees "demonstrate an awareness of and responsiveness to the larger context and system of health care and the ability to call effectively on system resources to provide optimal health care" (p. 2). [5] The American Association of Medical Colleges expanded ACGME's mandate by recommending that systems-based practice be incorporated into the medical school curriculum. [6]

A variety of strategies have been used to help medical trainees shift from an exclusive focus on the physician-patient encounter to approaching health care delivery as a complex adaptive system. [7–9] However, systems-based practice has proven difficult to define and operationalize, and efforts to integrate a systems approach into medical education have been sporadic and primarily located at the post-graduate level. [10] To date, systems-based practice learning in medical schools has been neither widespread nor well documented, with notable exceptions including experiential programs in student-run clinics. [11,12].

To address this persistent deficiency, the University of California, San Francisco (UCSF) School of Medicine piloted a nine-month clerkship for first year medical students focused on systems-based practice, patients' experiences of clinical care, and strategies to improve the delivery of care and clinic work processes. The faculty team included two clinicians, an epidemiologist, a social scientist, and a biostatistician – all with experience in implementation science and quality improvement theory and methods. Developed in partnership with UCSF's Cardiovascular Care and Prevention Center, the clerkship was called the Action Research Program (ARP). The name was intended to evoke the melding of experiential learning, implementation research, and modest but rapid quality improvement efforts. The ARP curriculum combined didactics on delivery system characteristics and implementation science with hands-on training in a cardiology outpatient clinic.

We present here a description of ARP and a mixed methods assessment of its impact on students and the participating ambulatory practice. To our knowledge, this is the first program of its kind, representing an innovative approach to orienting first year medical students toward semi-autonomous clinical work, systems-based practice and strategies for improving patient satisfaction and the quality and efficiency of care.

Program Development

Recognizing that the first year medical school curriculum does not adequately cover systems-based practice, quality improvement, and implementation science, nor does it provide students with opportunities for sustained experiential learning in a single clinical setting, several faculty members affiliated with UCSF's Implementation Science Program decided to design a program to help remedy these deficiencies. After about six months of planning, and with an intention of further adapting the curriculum as the pilot unfolded, ARP was approved by the medical school and an outpatient cardiology clinic offered to

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*According to the U.S. Accreditation Council for Graduate Medical Education (ACGME) competency in SBP is "manifested by actions that demonstrate an awareness of and responsiveness to the larger context and system of health care and the ability to effectively call on system resources to provide care that is of optimal value." [4]

collaborate as a host site for students' clinic-based learning. The ARP pilot launched in August 2013. The nine-month program's primary goals were to: 1) provide first year medical students with didactic and hands-on experience in systems-based practice, clinical care delivery, quality improvement strategies, and implementation science educational principles and methods; [14] 2) increase students' appreciation of patients' experiences with ambulatory care; 3) improve the quality and efficiency of clinical care delivery; and 4) enhance patient, provider and staff experience.

Faculty, staff and material resources that were gathered to support ARP included: a) four core faculty members supported by an institutional grant at 10% FTE (full-time equivalent) each; b) a program manager supported at 50% FTE; c) the cardiology clinic's practice chief and practice manager, each of whom donated approximately 2–3 hours per week during the ARP pilot; d) staff medical assistants who agreed to supervise students during their rotations in the cardiology clinic; e) project management software that was used to organize and distribute program materials and products; and f) a meeting room at the medical school. The coalescing of these individuals and resources into the ARP pilot was initiated by the faculty lead, RG, who had collaborated previously with other faculty members and the clinic's practice chief.

Once the ARP faculty team was in place, a total of six student participants (three women and three men) were selected through a competitive application and interview process and an additional two students (both men) joined the program in month seven. These two students had expressed interest in ARP during the initial recruitment phase but were not selected for participation at that time. They were invited to participate in the final months of the program so that faculty could assess the program's fit for students who were not pre-selected. Program participation for these students was focused almost exclusively on the clinic-based experiential learning component, with veteran ARP students serving as mentors for the new students.

During ARP, all of the students were committed to traditional preceptorships in clinical settings other than the Cardiology practice, in order to fulfill curriculum requirements for first year medical students. However, ARP's nine half-day sessions in the cardiology practice served as credit for the student participants' first year "selective", an alternative to additional time in a traditional preceptorship. The medical school piloted the "selective" option for only half of the ARP students; the other half pursued additional traditional preceptorship time in addition to participating in ARP. ARP seminars were considered an elective and did not replace standard medical school course content. All students received academic credit through the UCSF Medical School's Foundations of Patient Care course.

Training Activities

Students participated in four concurrent sets of program activities: a) experiential learning in the cardiology clinic; b) reflective learning through writing fieldnotes; c) didactic learning and synthesizing through weekly seminars; and d) clinic-based quality improvement projects. See Figure 1 for timeline.

Experiential Learning in the Cardiology Clinic

Clinic-based experiential learning took place during weekly, half-day clinic sessions in sequential rotations of nine consecutive weeks. At the conclusion of the program, each student had spent four hours per week (1–5p.m.) in the clinic for nine weeks, for a total of 36 hours. Two students participated in each rotation, and a total of four rotations were completed during the course of the nine-month program, such that all eight students were able to participate in this arm of the program.

During clinic sessions, students were trained by staff medical assistants to welcome patients, assess and record blood pressure and other vital signs, and administer electrocardiograms. Students were also instructed by physicians to discuss after-visit summaries (AVS) with patients, and make pre- and post-visit phone calls to patients to confirm appointment times and treatment plans. The initial agreement with the cardiology clinic stipulated that students would not observe patient-clinician interactions in the exam room, in order to reduce the teaching burden placed on clinicians. In practice, however, supervising physicians often invited students to observe clinical exams when it was convenient or useful to do so, such as for those patients with whom the student would be reviewing an AVS.

Three medical assistants and four physicians were particularly active in educating and supervising ARP students. Students also worked with the clinic's practice chief and practice manager to identify areas for improvement in clinic operations and develop strategies to address these needs, and they observed and interacted with other clinic staff in the course of their clinical activities. The specific amount of time that students spent on these different activities during clinic sessions was variable, but they reported actively interacting with clinicians, patients and/or staff throughout each four-hour session.

Student activities were evaluated and expanded upon continually as the program developed. For example, students in the first rotation developed a collaborative role with medical assistants. Subsequently, the second set of students expanded their role – in consultation with ARP faculty and the clinic's practice chief – to include more time observing patient-clinician encounters and discussion the AVS with patients. The evolution of students' role in the clinic continued throughout the entire ARP pilot. This dynamic approach enabled students to be active participants in the creation of the clerkship and in shaping their own role in the clinic.

Reflective Writing

Students articulated and reflected on their clinical experiences in written field notes. A one-hour training session with ARP faculty prepared students for this activity. They were instructed to write a minimum of one page per week as soon as possible after their clinic rotation, with an emphasis on content rather than structure and grammar in order to minimize self-censorship. In their field notes, students were asked to describe and critically reflect on: a) their activities and evolving role in the clinic, b) impressions of how the clinic operates, c) what it is like to interact with patients and hear their stories; and d) clinic needs and possible topics for students' improvement projects. Students' narratives were submitted to the entire ARP team at the end of each week through a secure web-based forum, and all

ARP faculty and students were asked to read the latest field notes before the following week's seminar. Field notes were not graded, but at least 15 minutes were allotted during each weekly seminar for faculty and students to respond to and discuss the previous week's submissions.

Weekly Seminars with ARP Faculty and Clinic Leaders

The third activity consisted of weekly, two-hour seminars with ARP faculty and guest speakers. The clinic's practice chief and practice manager were invited to these seminars and attended periodically. Sessions included didactic lectures, experiential trainings and discussions of students' clinic activities and improvement projects. Lectures and trainings included topics relevant to systems-based practice and implementation science, and were designed to support students' entry into the clinic environment (see Table 1). Most of the didactic content listed in Table 1 was presented during weekly seminars in the first three months of ARP, whereas seminars in the remaining weeks of the program were primarily devoted to discussion of students' clinic rotations and improvement projects.

Improvement Projects

In collaboration with the cardiology clinic's practice chief and practice manager, and in consultation with ARP faculty, all students were asked to identify potential areas for improvement in the clinic's operations. Possible topics included workflow, patient experience, and follow-up communication with patients. Projects were to be conceived and carried out independently by students, but were not required for their successful completion of ARP. Faculty and clinic leaders provided input on feasibility and implementation methods on an as-needed basis for each project proposed. The amount of time that students spent on their improvement projects was at their discretion.

Evaluation Methods

It was important to the ARP faculty team that participating students and clinic staff be involved in evaluating the program. Therefore, students were asked to contribute as co-authors of this article. In addition, the cardiology practice chief and practice manager were invited to review the findings at each stage of the analytic process. The following sources were drawn on to inform our mixed methods evaluation:

1. Semi-structured exit interviews and surveys with all eight students after completion of their rotation. Students were asked to quantify and then comment on any changes in their knowledge and skills and to assess the degree of support they received during the program. For example, the students were given the following question and then asked to comment: *How would you rate your confidence with navigating APEX (e.g. finding the information needed to make pre-visit phone calls, enter medical reconciliation) before the program? What about after the program?* (1=poor; 5=excellent). Interviews and surveys were conducted by a research assistant.

2. Narrative field notes submitted by students after each clinic session.

3.   Semi-structured interviews with six staff medical assistants at the program mid-point and again after the final student rotation. Interviews explored students' performance and interactions with medical assistants, and the perceived impact of students on clinic functioning and patient experience. Interviews were conducted by SA, CB, and HN.

4.   Semi-structured interviews with four physicians who had regular contact with ARP students. Physicians were asked to evaluate students' performance, reflect on interactions with students, and assess the program's overall impact on staff, patients, and the clinic. Interviews were conducted by SA.

The authors decided that audio recordings would be too intrusive for each of these sets of interviews, therefore detailed handwritten notes – including verbatim quotes when possible – served as interview transcripts.

The constant comparative method was used for data analysis. Constant comparison is an iterative, grounded-theory based approach in which inductive reasoning is used in an effort to stay close to participants' understandings of a phenomenon.[17, 18] After repeated readings of the interview notes and students' fieldnotes, SA identified major themes and developed a coding framework. SA reviewed and modified the thematic framework in discussion with all authors, after which she coded the data and developed a draft of the findings, which focused on the impact of the program on students and the clinic and lessons learned from implementing the program. All authors, as well as the collaborating clinic's practice chief and practice manager, then reviewed and commented on the preliminary findings. Illustrative quotations were selected for key themes, and a draft of the manuscript with embedded quotations was circulated among the authors for revision.

As a set of activities designed to bring about positive changes in the delivery of health care, and to educate medical students in systems-based practice, the evaluation of ARP reported here was exempt from review by the institutional review board.

Results

Impact on students

Understanding how delivery systems work—Over the course of the program, students demonstrated increased knowledge of clinical care as a complex system (see Figure 2). One student recounted: "I knew a lot of the different discrete pieces that were part of a patient encounter but didn't really understand as well how they all fit together...I think that was really what I got from the training." Students' grasp of how health systems work ranged from identifying the "structural problems" faced by individual patients, such as difficulties with insurance coverage and transferring medical records between institutions, to an appreciation of the contributions of non-physician staff. Their close contact with medical assistants, for example, made a strong impression on students, as in this reflection: "Before I came I thought that MAs [medical assistants] do vitals, med recs, all these things with the patients, but...they really run the clinic..."

Students with prior training in health care delivery systems, on the other hand, found some of the didactic components of ARP to be of limited benefit. A student with a graduate degree in healthcare management, for example, reported that the clinic rotations were the most valuable educational component of ARP. Moreover, students' understanding of health care as a complex system appeared to develop primarily around the organization and delivery of care, as in this student's post-rotation reflection: "I feel confident in how systems work, especially the flow of clinic and flow of patients in and out of clinic and who is supposed to do what." An in-depth understanding of other aspects of health care systems, such as the complexities of health care financing, on the other hand, was less apparent in ARP students' field notes and exit interviews. This is likely due to the clinic rotation's strong emphasis on clinical work and work processes.

Developing clinical skills—Physicians, medical assistants and students themselves all noted the development of students' patient care skills, and the eventual integration of each two-person cohort into the clinic team. "Towards the end they were like one of us," said a medical assistant. In his field notes, a student reflected on an early encounter with a patient: "I performed his new patient intake (weight, height, blood pressure, temperature, respiratory rate, oxygen saturation, ECG) with the help of one of the medical assistants, and I feel confident now that I can do these skills on my own."

Students contrasted their ARP experience as "contributing member[s] of a team" with other clinical experiences they were having as first year medical students, in which they often felt they were inconveniencing patients and physicians in the more passive role of observer. As one student explained, "That's one of things I liked about the cardio clinic…it is a little bit repetitive but you actually get to master some skills…in medical school, we fly through everything so quickly but we don't really master anything…" Students also recognized the value of legitimate participation in a clinical care team so early in their training, as in this student's reflection: "It was valuable to experience being part of a team, a contributing member of a team and owning responsibility even as first year students."

Although some ARP students had had clinical experience prior to medical school, few had had training or practical experience with the electronic medical record (EMR). Our survey results demonstrate that ARP students experienced a larger increase in perceived knowledge about the EMR over the course of the clerkship than in any other knowledge category (see Figure 2). Although students received didactic training in UCSF's EMR early in the ARP clerkship, they did not find the session very helpful because it did not focus on the specific EMR-related activities that the students were required to perform in the clinic. On the other hand, students consistently described how their clinic experiences – and the guidance of the MASs – contributed to an increase in their skills and confidence using the EMR.

It is important to note that some students felt frustrated by not learning more traditional "clinical content" during their rotation. The desire to learn clinical skills prompted some students to ask clinicians for permission to observe patient-clinician interactions in addition to performing their MA-type duties. This was acceptable to most clinicians, but some were reluctant to add teaching time to their clinic duties and felt compelled to remind students that the primary learning objectives of ARP were systems-based practice and identifying areas

for improvement of clinic workflows and care delivery. As one physician explained, "Having an extra set of hands was very helpful for the MAs [medical assistants] and the clinic overall...[but] I often had to say no [to requests to observe in the exam room]."

Interacting with patients—Although we did not directly assess patients' perspectives about students' presence in the clinic, both clinic staff and students themselves were overall pleased with students' interactions with patients. An exit survey indicates that students' confidence in communicating with patients increased over the course of ARP (see Figure 2). However, this change was not as pronounced as knowledge and skills in other areas, in part because most of the students started with a high degree of confidence – and prior experience – interacting with patients as a member or observer of a clinical team. Both physicians and MAs noted students' ability to put patients at ease, with some students in particular excelling in this capacity. "They were very professional and interested in patients," said a physician, and a medical assistant reported that several patients had commented about enjoying their interactions with the medical students.

In addition, students' semi-autonomous participation in clinic activities enabled them to gain confidence in interactions with patients and immediately incorporate what they learned in order to improve patients' experiences in the clinic. For example, a student noticed that a patient was reticent to ask questions of his physician during an exam. Afterwards, while meeting alone with the patient, he said, "I took the AVS as an opportunity to address his feelings about wasting the time of the physicians and he responded very positively and was able to open up and ask all the questions that he did not previously ask before."

ARP students also noted that, for today's medical students, learning to read and make entries in the EMR goes hand in hand with learning to interact with patients, since these activities are often performed simultaneously by clinicians. One student explained that, as his skills with the EMR increased, he was increasingly able to focus on the patient: "From the first day I could navigate [the EMR] if I did it in a room by myself. Having to navigate [the EMR] with the patient in the room with me as was very hard the first couple times. It got easier. By the fourth week, there was no problem." ARP students' clinic activities thereby provided valuable opportunities to practice the difficult balancing act of reading and making entries into the EMR while interacting with patients.

Impact on clinic

Workflow—Clinic staff emphasized their perception that students' participation had a positive impact on the clinic's efficiency and atmosphere. The "overall pressure level was lower" on the days that the students were there, said one physician. Similarly, a medical assistant reported that the students "help improve our workflow during times when we are short staffed. Also students were able to reduce wait times and get the patient check-in process started on time." Physicians' and MAs' enthusiasm about the students' contributions also extended to the two students who joined ARP during its final two months.

Supervising physicians were also pleased by the efficiencies and quality of care improvements gained by students' review of AVS printouts with patients: "The first 28 minutes of a new patient visit are used to make a diagnosis. Only 2–5 minutes are spent

telling the patient what to do. This doesn't serve the patient well. Students can help bridge this gap by going over the AVS." Another physician, however, mentioned that although the students had a positive influence on the clinic as a whole, their efforts did not make her clinical work easier.

Physicians who were active in supervising the students suggested that the time students spent making pre- and post-visit phone calls with patients resulted in improvements in some patients' adherence to treatment plans. Several of the students, however, were frustrated by the amount of time they spent trying (often unsuccessfully) to reach patients by phone and said that they would have preferred to spend that time interacting with clinicians and patients in the clinic itself.

During ARP there was some tension around the topic of students observing clinicians in the exam room and the impact of this activity on clinicians' workload. On the one hand, students found great educational value in shadowing clinicians, and they pressed for more time to observe clinician-patient interactions. Some of the physicians who supervised the students, on the other hand, were ambivalent about incorporating extensive observation into the students' role in the clinic. As one physician put it, "I don't have time for that. I had to force myself not to be in that role. I even felt guilty sometimes." This situation was exacerbated by individual differences in students' manner of interacting with clinicians. One physician narrated her experience with three of the students: "[Student A] combined eagerness to learn with respect for my time...[Students B and C] weren't as good at discerning when it was o.k. to ask questions [in the exam room] and when it wasn't."

Expanded medical assistant role—Medical assistants are not typically asked to serve as mentors or educators for medical students, but they played a critical educational role in ARP. This resulted in a strong sense of satisfaction among most of the medical assistants, as in the following statement by a medical assistant who interacted with students throughout the nine-month program: "Being able to teach someone something that I know, especially somebody that's going to be a doctor, is quite exciting." Moreover, some medical assistants felt that the learning went both ways and that they were gaining knowledge from the ARP students: "I really enjoy having them around. We learn things from them as well because of their educational background."

Clinicians also noted the beneficial effect of ARP on staff medical assistants, reporting improved morale among staff over the course of the program. This change appeared to spill over into medical assistants' work with the entire clinic team. In the words of one physician: "I saw a real improvement in their [medical assistants] performance, and I attribute this to their role with med students. This wasn't something I ever expected...they were very proud and it made them feel more part of the team."

For their part, students quickly developed an appreciation of MAs' work and how it fits into the constellation of activities in the cardiology clinic. The student survey, for example, showed a striking increase in perceived knowledge about MAs' roles and the impact of MAs' activities on clinic operations over the course of ARP (see Figure 2). Equally important, students' fieldnotes and exit interviews demonstrated a strong sense of empathy

for MAs and their occasionally difficult relationships with clinicians. One student said that she now knows "what it's like to be an MA and that there is miscommunication between MAs and doctors…so I feel like that opened my eyes..."

Improvement projects—Over the course of the program, ARP students – in consultation with the practice chief and practice manager, identified numerous areas in which the functioning of the cardiology clinic could be improved. These included revising the clinic's health history questionnaire, developing patient education materials, and devising strategies to optimize the clinic's pre-visit communication with patients. During weekly ARP meetings, students participated in developing conceptual models to plan for these improvement projects. Although some ideas were implemented, such as creating a more inviting waiting area for patients, most did not move from conceptualization to full implementation. A physician explained that "students didn't have dedicated time for [improvement projects], so it got put aside." Students reported that they did not receive enough guidance from faculty on their improvement projects. ARP faculty agreed, concluding that, in retrospect, more time should have been spent planning and reporting on improvement projects during weekly program meetings, and that dedicated time during the clinic rotations should have been set aside for the projects.

Discussion

ARP demonstrates a successful pairing of experiential and didactic training in systems-based practice. Students gained clinical care delivery skills, knowledge about care delivery systems and improvement strategies, an appreciation for patients' experiences, and understanding of the roles of non-physician staff. Clinicians and staff perceived an improvement in medical assistants' morale as their role in the clinic expanded to include student mentoring. The effectiveness of the program hinged on the time commitment and support of clinic faculty and staff, including a practice chief and practice manager who attended meetings and ensured that students were welcomed in the clinic. The successful integration of two additional students in the final two months of the program suggests the generalizability of the clinic-based experiential learning component of the program to non-competitively selected participants.

Lessons learned include the need for dedicated time and faculty and staff support for students' improvement projects, which were the least successful aspect of ARP. We recommend that future project aiming to combine clinical training and quality improvement/ implementation science projects designate separate periods of time for trainees to pursue each of these activities independently. For example, a student could design, implement, and evaluate a quality improvement project in the final six months of the clerkship, after completing her/his 2–3 month clinical care delivery rotation. Alternatively, students could be instructed in methods for developing small tests of change, such as PDSA (plan-do-study-act) cycles. [19]

Another lesson we learned is the difficulty of conveying all aspects of systems-based practice to first year medical students. Although a wide range of topics was covered in the didactic sessions, students' most meaningful learning experiences took place in an

ambulatory clinic. Our goal for the experiential component of ARP was for students to understand how larger health systems work from the vantage point of a smaller clinical microsystem and from the perspective of patients. However, this approach limited students' acquisition of in-depth knowledge about other dimensions of systems-based practice, such as hospital systems, patient safety, financing and benefits, care coordination, population health, and patient advocacy. Future iterations of ARP might benefit by narrowing the primary educational goals to a small subset of the components of systems-based practice. However, we caution that a more segmented approach could limit students' ability to appreciate first-hand the complex, multifaceted nature of health systems – particularly as experienced by patients.

Limitations of this evaluation include a lack of assessment of patients' opinions about students' role in the clinic and whether the clinic system (and prototypes of students' improvement projects) provided a positive experience for patients. In addition, we were unable to obtain quantitative outcomes data to support clinic staff's claims about improvements in clinic functioning and the quality and efficiency of services provided by the clinic. Finally, it is important to note that the Action Research Program was a small pilot project and the findings presented here may be limited in their applicability to other settings and educational initiatives.

Conclusion

ARP successfully paired experiential and didactic systems-based practice training for first-year medical students in partnership with an outpatient cardiology clinic. Future iterations of the program could benefit from more dedicated time and faculty supervision for students' improvement projects, as well as more intensive focus on pre-selected aspects of systems-based practice. In 2014–2015, six additional UCSF clinic sites piloted the integration of systems-based practice learning with more traditional clinical skills instruction for small groups of first year students. In addition, as part of an ongoing process of reform, UCSF's School of Medicine incorporated key features of ARP into the curriculum with the intent of placing all first year medical students into clinical settings for experiential systems-based practice training.

Acknowledgments

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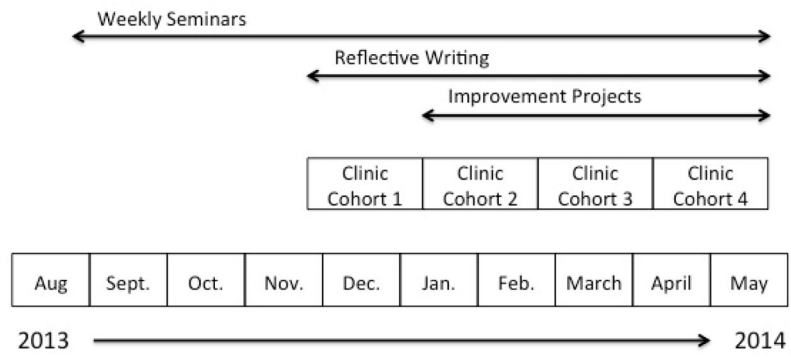
Figure 1.
Action Research Program Timeline
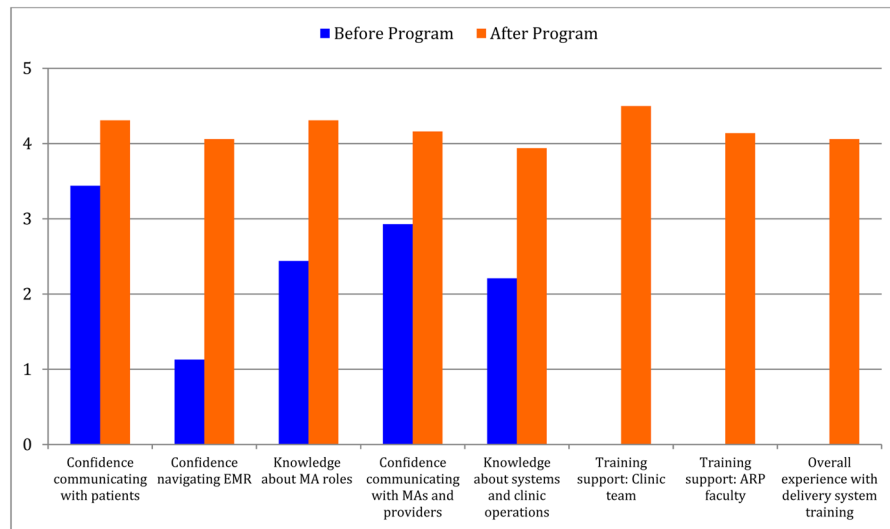
Figure 2.
Student Exit Survey Results

Table 1

Action Research Program Curriculum

Topic	Content
Health Care Systems: The Big Picture	Ecology of health care systems: structure and financing The changing landscape in the U.S.
Using the Electronic Medical Record	The Provider experience The Patient experience Systems-based data

Logic Models	Examples from research
	Building a logic model for the Action Research Program
	    Resources
	    Activities
	    Outputs
	    Outcomes

An Introduction to Implementation Science	Theoretical models: CFIR [14] and Precede-Proceed [15] Intervention design for behavioral and organizational change Using theory to guide intervention, evaluation and dissemination activities

Measurement Overview	Building a measurement strategy from the logic model
	    Activities
	    Outcomes/area of impact
	    Measurement tool
	    Details of Measurement

Qualitative data Collection and Analysis	Observational skills and field notes Creating interview guides Analyzing qualitative data
Mixed Methods	Reasons for combining quantitative and qualitative methods in implementation research Strengths and challenges of different mixed methods approaches
Patient Experience Measurement	Standardized surveys (e.g., Press Ganey/CGCAHPS) Patient Rounding in the waiting room
Communicating with Patients	AIDET® (Acknowledge, Introduce, Duration, Explanation, Thank) framework for communicating with patients [16] Building communication skills through role playing and peer feedback Health coaching
Medication Reconciliation	Medication reconciliation best practices Strategies to manage common barriers to medication reconciliation