

Longitudinal Pedagogy: A Successful Response to the Fragmentation of the Third-Year Medical Student Clerkship Experience

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Abstract

A longitudinal clerkship was designed at Harvard Medical School (HMS) in 2004–2005 to emphasize continuity, empathy, learner-centeredness, and patient-centered care. In 2005–2006, the curriculum was piloted with eight students who voluntarily enrolled in the third-year curriculum, which focused on longitudinal mentorship and feedback, interdisciplinary care, integration of clinical and basic science, and humanism in patient care. Eighteen traditional curriculum (TC) students at HMS who were comparable at baseline served as a comparison group. SHELF exams and OSCE performance, monthly and end-of-year surveys, and focus groups provided

comparisons between pilot and TC students on their performance, perceptions, attitudes, and satisfaction. Pilot students performed as well as or better than their peers in standardized measures of clinical aptitude. They demonstrated statistically significant greater preservation of patient-centered attitudes compared with declining values for TC students. Pilot students rated the atmosphere of learning, effective integration of basic and clinical sciences, mentorship, feedback, clerkship satisfaction, and end-of-year patient-care preparedness significantly higher than TC students. The authors conclude that implementation of a longitudinal third-year curriculum, with only modest alterations in

existing clinical training frameworks, is feasible and effective in meeting its stated goals. “Exposing” the hidden curriculum through specific longitudinal activities may prevent degradation of student attitudes about patient-centered care. Minimizing the disjointed nature of clinical training during a critical time in students’ training by providing a cohesive longitudinal curriculum in parallel to clinical clerkships, led by faculty with consistent contact with students, can have positive effects on both professional performance and satisfaction.

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Medical educators are growing acutely aware of the remarkable impact of economic, social, and technologic forces on academic health centers and the training of medical students or residents within these institutions. Recently, educational initiatives and reforms have been launched in medical schools across the country that incorporate redefined philosophical principles,^{1–5} innovative curricular content,^{6–10} and more dramatic reorganization in architectural clerkship design.^{11–16} Specific problems and deficits in traditional undergraduate medical education include a lack of student-centered curricula, erosion of students’ empathy, disconnected preclinical and clinical training, and lack of longitudinal experiences.

Traditional third-year curricula require medical students to switch from rotation

to rotation, often moving from hospital to hospital, and frequently spending a month or less with a given team of health care providers. There is generally little cross-talk between clerkship directors, limiting direct communication regarding specific concerns, strengths, or interests of a particular student. The transient nature of students’ experience is compounded by brief interactions with their respective teams, who are managing a higher patient volume than in years past, further restricting time for teaching, feedback, and mentorship. Opportunities for direct observation of students are limited, and few, if any, faculty gain an overall perspective on the development and maturation of the student during this critical year of training.

Patient experiences in the academic health centers of the 21st century are often equally fragmented. Shortened length of stay, truncated physician time at the bedside, advanced technological procedures and molecular diagnostics, and erosion of empathetic care can result in an isolating and dehumanizing experience for the hospitalized patient.^{17–19}

There is growing awareness of the role of the hidden curriculum and the unrecognized transmission of attitudes and beliefs relating to patient care and professional values that occurs in this context.^{20,21} Erosion of empathy has been well documented, and of particular concern is the diminution in patient-centered attitudes demonstrated by senior medical students compared with students in their earlier years of training.^{22–24}

As part of the overarching curricular reform at Harvard Medical School (HMS), we sought to address the principal problem of fragmentation in third-year medical education at our hospital. We approached the deficiencies we identified in the traditional curriculum by creating a pilot program that was rooted in longitudinal mentorship and feedback, interdisciplinary care, an emphasis on humanism and patient-centered care, and consistent integration of the basic and clinical sciences. Unlike other solutions that shift the locus of teaching primarily to community settings^{12–14} or require restructuring of hospital-based clerkship

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architecture,¹⁶ which may be met with resistance from medical school faculties and department chairs, this program can be overlaid on the existing framework of the traditional clerkships, creating a complementary, student-centered, longitudinal experience.

Design of the Pilot Curriculum

Philosophy and planning

The pilot program was part of the HMS curriculum and offered a parallel and alternate third-year longitudinal clerkship for a subset of volunteer students. It was designed during academic year 2004–2005, and it was implemented in academic year 2005–2006. The core emphasis of the design was the notion that the student is the focus of the educational mission. Program assessment was overseen by the Center of Evaluation at HMS, with routine appraisal of students' attitudes, skills, and behaviors, as well as overall program performance, and comparison with the standard curriculum. The leadership of the Center for Education and the Carl J. Shapiro Institute for Education and Research at Beth Israel Deaconess Medical Center,²⁵ in concert with the undergraduate medical education committee at our hospital, a group composed of the clerkship directors from all departments as well as the directors for the Patient–Doctor (PD) I and II courses at HMS, outlined a program that was based on the following six interrelated principles:

1. Designing a student-centered curriculum
2. Providing patient-centered care
3. Fostering humanism in patient care
4. Providing a longitudinal primary care experience
5. Integrating clinical and basic science throughout the longitudinal curriculum
6. Emphasizing a cross-disciplinary approach to patient care

These fundamental principles created the structure of the curriculum, which was then translated into 10 specific objectives (List 1), addressed through a series of longitudinal innovations in the pilot curriculum.

Students

In February 2005, all second-year students at HMS were given the option of

List 1

Objectives of the Pilot Longitudinal Clerkship Curriculum, Beth Israel Deaconess Medical Center 2005–2006

Optimizing the educational environment

- Enable students to feel integrated into their clinical teams and the hospital system
- Provide timely, accurate, and meaningful longitudinal mentorship and feedback
- Utilize a range of simulation technologies to ensure that students have an opportunity to develop clinical and leadership skills in a safe environment

Integrating longitudinal curricular innovations

- Build a longitudinal curriculum that emphasizes interdisciplinary care of patients and the links between basic and clinical science
- Develop a student writing portfolio to facilitate self-reflection and to identify areas of strength and weakness based on logged clinical experiences during the clerkship
- Refine skills in the practice of evidence-based medicine
- Enhance practice of empathy in patient care interactions

Strengthening clinical performance

- Solidify history and physical exam skills in both in-patient and out-patient sectors
- Develop critical thinking with regard to data analysis and formulation of differential diagnosis
- Appreciate the progress of disease states in a given patient over time

enrolling in one of three pilot programs (Cambridge Hospital, Beth Israel Deaconess Medical Center (BIDMC), or Brigham and Women's Hospital) for their third-year clinical requirements. Students requesting a pilot program listed their site preferences. If more students chose a site than places were available, a lottery determined the student assignment. Eight students volunteered, and all were enrolled in the first pilot year of the longitudinal third-year clerkship at our hospital. Each student rotated through medicine, surgery, obstetrics–gynecology, neurology, psychiatry, and radiology at BIDMC, and pediatrics at Children's Hospital of Boston. Students received unified mentorship from faculty who oversaw their development, coordinated longitudinal curricular activities, and provided consistent feedback throughout the year. The basic structure of the rotations (total months, overall distribution of inpatient and ambulatory experiences, and call responsibilities) was the same as that for students who participated in the traditional third-year HMS curriculum. In parallel with their rotations, pilot students participated in a longitudinal curriculum as detailed below (Table 1). Traditional curriculum (TC) students did not participate in the longitudinal curriculum unless otherwise indicated below (primary care clerkship [PCC], PD III course, and clinical physiology grand rounds were experiences shared by both groups of students but with modifications as detailed below). In addressing the universal tension

between providing additional curricular experiences at the expense of time away from clinical rotations, we chose an average of two hours of educational activities per week (scheduled weekly from 4:00 to 5:30 PM, and one evening session per month) to minimize conflict with rotation activities. Students were also permitted to leave their clinical rotations for isolated periods of time if clinic or “longitudinal” patients (see below) were being seen in the hospital, with an estimated frequency of one to two such encounters per month. We included comparison of SHELF exam and OSCE scores between pilot and TC students in our outcome measures to assess whether “time away” from rotations affected performance on these standardized measures of clinical knowledge and performance.

Overview of the longitudinal curriculum

Transition week. Before beginning their clerkships, the students participated in a full-time transition experience designed to provide them with essential tools to function as contributing members of their inpatient teams from the first day of their core clerkships. The transition-week didactics included essentials of clinical radiology and resuscitation, evaluation and management of inpatient emergencies, and an introduction to educational resources. It incorporated case-based sessions cofacilitated by interdisciplinary faculty, and use of the simulation center and skills lab (List 2). In contrast, TC students

Table 1

Summary of Longitudinal Clerkship Curricular Components and Their Respective Objective Categories, Beth Israel Deaconess Medical Center, 2005–2006

Curricular component	Content	Frequency	Objective
Transition week	Essentials of inpatient management and introduction to educational resources	One week, full-time, before starting longitudinal clerkship	Student integration into hospital; clinical proficiency
Primary care clerkship*	Ambulatory care	Weekly	Longitudinal patient care; clinical proficiency
Case conference	Multidisciplinary, student-led case presentations with facilitated discussion	Biweekly	Student-centered learning; interdisciplinary care; humanism in patient care
Patient–doctor III curriculum (PD III)*	Longitudinal Harvard Medical School course focusing on patient–doctor relationship	Woven into other curricular components	Student-centered learning; humanism in patient care
Basic science correlation conference	Paper case designed to teach first principles: Derivation using a basic science approach to pathophysiology of answers to clinical problems	Biweekly	Integration of basic and clinical science; interdisciplinary care
Clinical physiology grand rounds*	Student case presentation, faculty-led review of pathophysiology, and active investigator discussion of relevant research	Monthly	Integration of basic and clinic science
Writing and literature program	Writing portfolio consisting of case write-ups with evidence-based medicine references and reflections, with didactic faculty review; six book clubs at faculty homes	Monthly writing; Quarterly portfolio review; Bimonthly book clubs	Development of writing and communication skills; humanism in patient care
Reflection sessions	Learner-centered sessions focused on discussion of written or verbal reflections related to patient care	Monthly	Student-centered learning; humanism in patient care
Virtual patient	Four computer-simulated longitudinal encounters with a patient (pregnancy, diabetes mellitus, chronic obstructive pulmonary disease, lung cancer)	Quarterly	Longitudinal patient care; clinical proficiency
Longitudinal patient	Student involvement in all interdisciplinary appointments of an obstetrics–gynecology patient; faculty mentor for reflection on experience of pregnancy, clinical findings, and systems issues	Variable	Interdisciplinary care; longitudinal patient care; humanism in patient care

* Traditional curriculum students participated in these curricular components as well, although they were structured differently in that curriculum.

participated in a weeklong hospital orientation, including sessions on basic life support, case presentation, note-writing, and phlebotomy skills. They had an introductory meeting led by fourth-year students and faculty on the basics of ward activity. One session was focused on common hospital emergencies.

PCC. The PCC at HMS is a nine-month course during the third year, which is detailed elsewhere.²⁶ Although all third-year students participate in this course, the experience of the pilot curriculum students differed in that they began the PCC six months earlier than TC students, so that ambulatory care and longitudinal patient care traversed all 12 months of the clerkship. We also ensured that the pilot curriculum students' primary care preceptors practiced at and admitted to our hospital to facilitate students' participation in their patients' care

for subspecialty ambulatory visits or testing, and inpatient hospitalizations or surgery.

PD III curriculum. All HMS students participate in a longitudinal course focusing on the patient–doctor relationship. During the third year, curricular topics include literacy and health, cross-cultural competency, medical error, professional boundaries in patient care, physician health, end-of-life care, medical ethics, the “difficult patient,” and communicating bad news. In the traditional curriculum, these topics are addressed in “pull out” sessions in which students return to the medical school from their clinical sites. The pilot curriculum wove these topics into the yearlong hospital-based case conferences, reflection sessions, writing workshops,

and virtual patient experiences to facilitate more seamless application of these content areas to bedside care.

Case conference. Students each presented a total of six patient cases in the course of the year during these biweekly sessions. Discussions were facilitated by a core faculty member and physicians from varying disciplines, as well as physical therapists and/or social workers, depending on the nature of the case. The goals of these sessions included integration of clinical and basic science through facilitated discussion, emphasis on interdisciplinary care, and student-centered learning. Students each wrote a one- to two-page, evidence-based paper on a key diagnostic or management question related to three of their cases.

List 2

Didactic Sessions from the Transition Week Component of the Longitudinal Clerkship Curriculum, Beth Israel Deaconess Medical Center

- **Essentials of Clinical Radiology:** Use of case based sessions focusing on chest, abdomen, brain, and bone radiology; reinforcing links between radiographic images, anatomy, physiology, and physical examination findings; and led by both a radiologist and a clinician to model interdisciplinary care.
- **Essentials of Resuscitation:** Use of the simulation center to learn and practice the basics of airway management and circulatory support.
- **Essentials of Evaluating and Managing In-Patient Emergencies:** Use of the simulation center and case based scenarios to review the underlying basic and clinical science principles and management of five common in-patient emergencies (acute hypotension, respiratory distress, chest pain, seizure, and agitation). Didactic sessions were followed by experiential opportunities for patient management.
- **Introduction to Educational Technology Resources:** Introduction to the simulation center, computer lab with virtual patient cases, and skills lab for practice of technical skills such as physical diagnosis and suturing.
- **Hospital orientation:** Introduction to the medical center as well as its mission and priorities, the details of the curriculum, the information support systems, and an opportunity to meet the clerkship directors and student mentors.

Basic science correlation conference.

Students were given paper cases, key references, and a series of guiding questions before these biweekly, case-based conferences, facilitated by interdisciplinary faculty. The central goals were integration of basic and clinical sciences and use of first principles to *derive* answers to clinical problems with a mechanistic mindset and scientific reasoning, rather than *memorizing* lists of differential diagnoses or rote answers.

Clinical physiology grand rounds. This monthly evening session included student presentation of a case followed by faculty-led interactive review of the basic pathophysiology relevant to the patient. Another faculty member then led a discussion of his or her case-related research, with an emphasis on overarching themes and research principles at the student level, and an opportunity to probe experimental design to address the clinical problems encountered. These sessions were open to all HMS students. During the course of the year, attendance was longitudinal for pilot students and episodic for TC students who had the opportunity to attend during the isolated month(s) they were rotating through BIDMC.

Writing and literature program.

Students each developed a writing portfolio with monthly entries, including case write-ups with brief reviews of the literature, topical summaries, longitudinal patient experiences, and personal reflections. These were reviewed

quarterly by course faculty. Students engaged in peer review of their written work as a means of providing and receiving feedback and developing editing and revision skills. Monthly reflection sessions were based on learner-centered topics elicited from written or verbal reflections shared and discussed among the group on a voluntary basis. Students also participated in six literary “book clubs” during dinner sessions held in the evening at the home of a faculty member.

Virtual patient. A Web-based program²⁷ simulating a patient-care interaction was developed for four cases: pregnancy, diabetes mellitus, chronic obstructive pulmonary disease, and lung cancer (including end-of-life care). The virtual simulation allowed the students to “see” the patient for several visits and to address relevant issues in medical care longitudinally.

Longitudinal patient experience.

Students were each assigned to an obstetrics–gynecology patient. They were encouraged to attend all of their patient’s outpatient medical visits, surgical evaluations, nutrition counseling sessions, and social services interactions, as well as any admissions for acute illnesses. Ultimately, the students participated in the labor and delivery. Each student was assigned a longitudinal patient mentor who helped contextualize the patient-centered experience and who guided self-reflective and learning agendas. Students kept a journal about

their experience focusing on three domains: the subjective experience of pregnancy through their patient’s eyes, the clinical underpinnings of their patient’s experience or complications, and systems issues related to care.

Budget

The budget for the first year of the program was \$60,000 in addition to usual background costs of clinical rotations, which included support for the course director, core faculty, and longitudinal patient preceptors, as well as \$3,500 for materials and administrative support. Conference room and simulation space was provided by the medical center. Each longitudinal patient preceptor received \$1,500. The course director and core faculty received the remainder of the funds. The core faculty (ambulatory care coordinator, transition week and simulation coordinator, basic science correlation conference curriculum coordinator, and writing program director), along with the course director, served multiple roles, including moderator of case conferences and of basic science correlation conferences and reflection sessions, as well as simulation case leaders, student mentors, and writing instructors. Each core faculty member committed approximately two hours of student contact time each week; time spent for session preparation was not tracked. Funding was provided by the Carl J. Shapiro Institute for Education and Research, the Department of Medicine at BIDMC, and HMS. The PCC, an existing component of the traditional curriculum, was supported through the central HMS office.

Assessing the Curriculum

We carefully defined the desired outcomes of the pilot program (discussed above) and identified several different instruments and measures to specifically assess whether the pilot curriculum was achieving its stated goals. Eighteen volunteer HMS students who went through the traditional curriculum and standard rotations at the various Harvard teaching hospital sites served as a comparison group. Because the groups were not drawn randomly, we investigated whether the two groups were comparable at baseline using several measures of knowledge (MCAT and United States Medical Licensing

Examination [USMLE] Step I scores), attitudes (Patient Practitioner Orientation Scale (PPOS), assessing patient-centered care; and Task of Medicine Scale, ranking biomedical versus psychosocial priorities), and skills (OSCE performance before year three). Students also answered questions about their future plans in medicine. No between-groups differences were found on any of these baseline measures. Assessment of the pilot curriculum used the following quantitative and qualitative approaches.

Student-centered curriculum:

- Brief monthly “check-ins” comprising seven Likert scale (range of one to six) questions addressing the educational environment and clinical clerkship experience.
- Midyear and end-of-year focus groups to generate discussion about most and least satisfying aspects of the clerkship.
- An end-of-year survey assessing student ratings of 10 specific descriptors of clerkship experiences, self-reported preparedness in 18 patient-care categories addressing each of the core competencies, and student satisfaction with four categorical aspects of the pilot curriculum.
- Medical knowledge and clinical performance data, including USMLE subject exam scores in surgery, pediatrics, obstetrics–gynecology, and psychiatry; and the HMS Comprehensive Exam, consisting of a nine-station OSCE administered on the completion of all core clerkships.

Patient-centered care:

- Pre- and postclerkship assessment by the PPOS, a validated instrument that measures patient-centered beliefs.²⁸ The end-of-year survey also included some questions addressing patient-centered care.

Writing and literature program:

- Pre- and postclerkship writing surveys containing 18 Likert scale (range of one to five) questions querying students’ perspectives on academic writing, comfort with literature searches, confidence about writing skills, and perceptions regarding the role of reflective writing in fostering humanism in patient care. Comparison

students who did not participate in the writing and literature program were given the same surveys at the beginning and end of the year. Pilot students were encouraged, but not required, to submit a written piece to a scholarly journal.

We analyzed data using *t* tests (independent for between-group comparisons; paired for pre–post comparisons) or χ^2 , as appropriate. Student response rates were consistently high; however, the specific number of students for any given comparison may have varied slightly. Reported *P* values all reflect an alpha of 0.05, using the Bonferroni correction for multiple comparisons. Effect sizes were calculated and reported for each assessment.²⁹ We used SPSS statistical software, version 15 (SPSS, Inc., Chicago, Ill), for all data analyses. GraphPrism 4.0 (GraphPad, Inc., San Diego, Calif) was used for all figures.

Curriculum Outcomes

Student-centered curriculum

The students’ monthly “check-ins” were aggregated across the year, and the pilot versus TC student group means were compared. Pilot students recorded statistically significant higher scores than TC students in seven of seven categories, including the atmosphere of learning ($P = 0.008$), effective integration of basic and clinical sciences ($P = 0.007$), and access to faculty ($P = 0.005$). They also felt that they received more fair and accurate assessment, greater mentorship, more

useful feedback, and that they were more integrated into the hospital ($P < 0.001$ for each measure; Figure 1).

At the midyear focus group, pilot students reported the primary care clinic, the writing program, self-reflections, and the integration into the hospital community as the “most satisfying aspects” of their clerkship. They felt “more valuable to the team” and that they could “hit the ground running at the start of a rotation.” The end-of-year focus group stated that the longitudinal experience made the students feel “welcomed, known, and less anonymous to (hospital) faculty.” They felt it provided a “protected space for admitting to uncertainty.”

End-of-year survey comparisons showed that pilot students found their third-year clerkship to be more humanizing ($P = 0.04$) and less hectic ($P = 0.03$), marginalizing ($P = 0.006$), and frustrating ($P = 0.03$) than did TC students. Although not statistically significant, they also found the clerkship to be more rewarding ($P = 0.11$, effect size 1.0; Figure 2). Pilot students reported end-of-year preparedness that was as high or higher than that of TC students in all 18 patient-care categories that assessed knowledge and patient-centered care, including statistically significant differences in 6 of 18 categories: practicing evidence-based medicine, handling ethical dilemmas, involving patients in decision making, understanding the social context of illness, being a self-reflective practitioner, and dealing with uncertainty in medicine. Five additional measures did not achieve

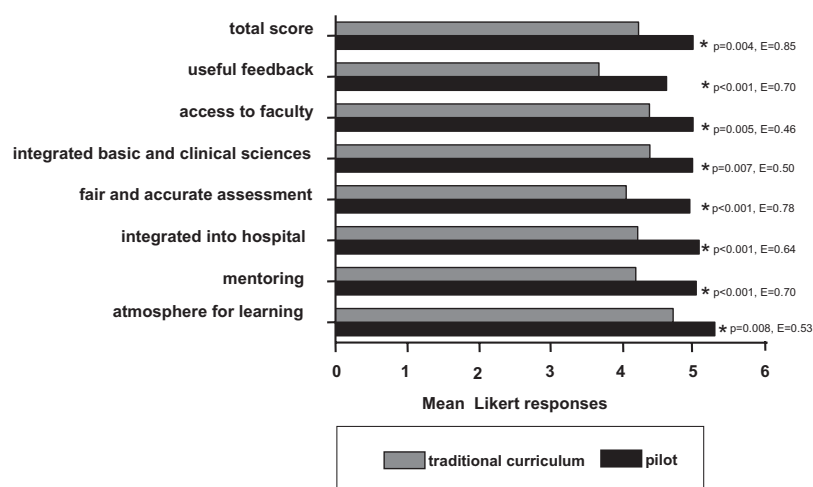


Figure 1 Comparison of mean aggregate Likert responses for monthly clerkship assessments between pilot students and traditional curriculum (TC) students. Pilot students reported statistically significantly higher scores in all categories (*).

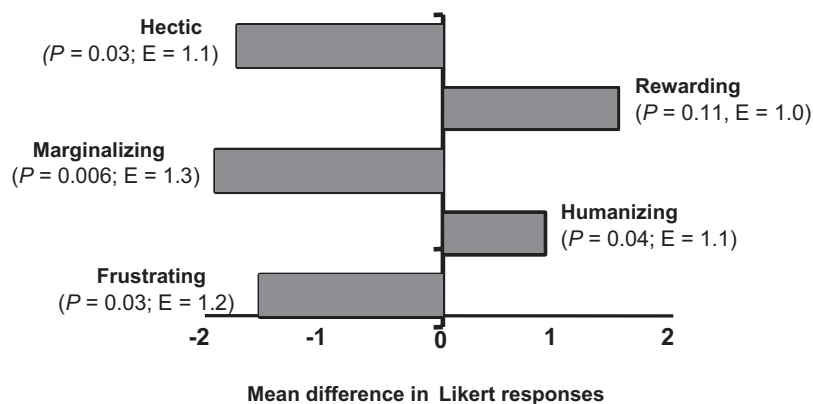


Figure 2 Differences between mean pilot and traditional curriculum (TC) end-of-year questionnaire responses to clerkship descriptors. Pilot students found their experience to be significantly less hectic, marginalizing, and frustrating, and more humanizing (*). There was no statistically significant difference in pilot and TC student perceptions of their relative experiences as rewarding (although effect size $E = 1.0$ in this category). In the remaining descriptor categories, differences were not statistically significant, with $E < 1.0$ (not shown).

statistical significance but showed effect sizes > 1.0 (Figure 3). Pilot students reported statistically significantly greater satisfaction in four of four categories describing their clerkship (Figure 4). They were also more likely to report “very often or often” involvement in seeing the patients they treated during their hospital stay after discharge than were students in the traditional curriculum ($P = 0.009$).

There were no statistically significant differences in the performance of the two groups on any of the subject exams or on the total score of the comprehensive

(OSCE) exam. Mean scores of the pilot students were higher than those of the comparison group in eight of the nine OSCE stations and in the total score (total 4 of 10 measures with effect size > 1.0).

Patient-centered care

Students’ beliefs about patient-centered care were addressed using the PPOS instrument. Higher total scores were associated with increased patient-centered attitudes and beliefs. At the beginning of the year, no significant differences existed between the scores of

the pilot and comparison students. At the end of the year, however, whereas the pilot students’ levels of patient-centered care remained virtually unchanged, the scores of the TC students declined significantly ($P = 0.009$). The end-of-year comparison showed that pilot students reported significantly more patient-centered attitudes than TC students ($P = 0.03$; Table 2).

Writing and literature program

Postclerkship writing survey results showed that pilot students were more likely to feel that their training emphasized humanism in patient care and that writing helped them connect with their patients and process their experiences on the wards, compared with their own presurvey results and with the responses of students who did not participate in the program. They also felt more confident about writing and better equipped to access resources, conduct a literature review, and submit a paper for publication. Of these seven measures comparing end-of-year pilot and comparison students, four (and the cumulative score) showed effect sizes > 1.0 . Pilot students responded as well or more favorably in 9 of 11 remaining measures, but these did not achieve statistical significance, and effect size was < 1.0 . Five manuscripts were prepared for publication by pilot students; to date,

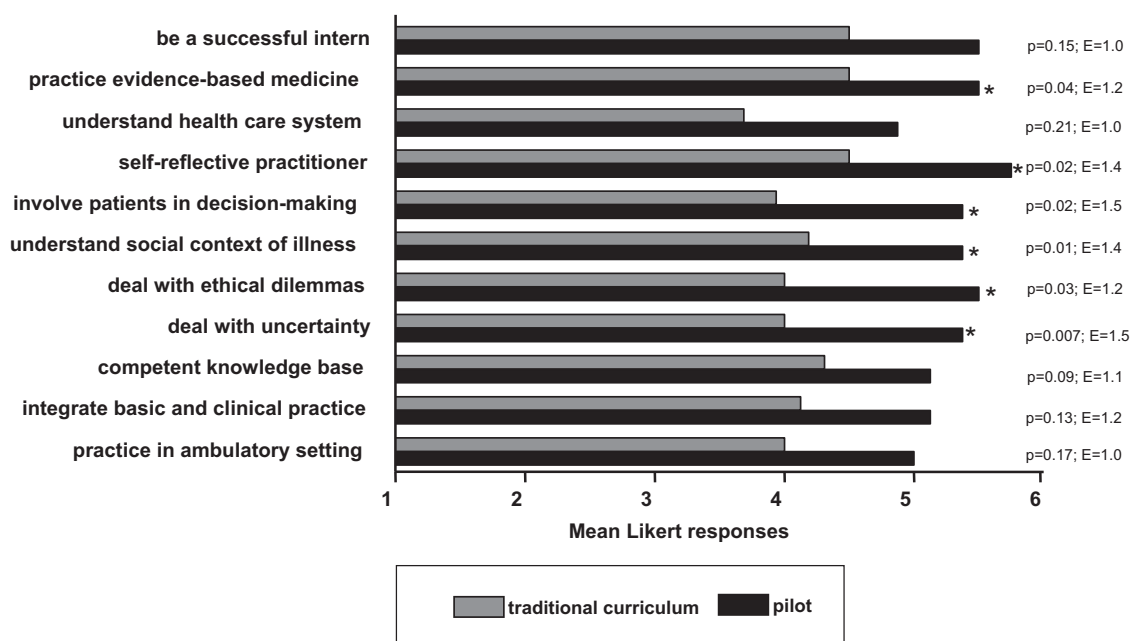


Figure 3 End-of-year student survey results, preparedness. Of 18 total categories, pilot students reported statistically greater preparedness than traditional curriculum (TC) in six categories (*); effect size (E) was > 1.0 in five additional categories (shown here). In the remaining seven categories, pilot students reported nonstatistically significant greater preparedness, with $E < 1.0$ (not shown).

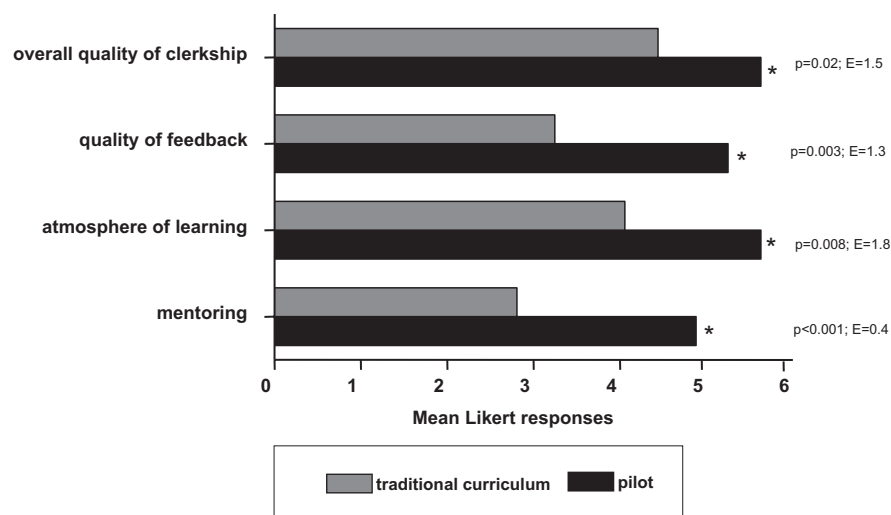


Figure 4 End-of-year student survey results, satisfaction. Pilot students reported statistically significant greater satisfaction than traditional curriculum (TC) students in four of four categories (*) of the end-of-year survey.

three have been submitted, and two were published in peer-reviewed journals.

Discussion

To address the challenges of educating medical students in a rapidly evolving medical education environment, we developed a pilot third-year clerkship that focused on longitudinal mentorship and feedback in a student-centered curriculum, emphasized humanism and patient-centered care, applied consistent integration of the basic and clinical sciences, and modeled a multidisciplinary approach to patient care. The continuity provided by a small group of faculty who met with students on a regular basis, regardless of the clerkship to which the student was assigned, made possible the consistent support, role modeling, and guidance that counterbalanced the otherwise fragmented nature of departmental clinical experiences.

Findings from our curriculum assessment suggest that a longitudinal third-year clerkship is both feasible and effective in improving mentorship, feedback, student integration into the hospital, confidence in evidence-based medicine, patient-centered care, reflective practice, and student satisfaction. Rather than rotating from hospital to hospital in the traditional curriculum, pilot students benefited from developing a strong “homebase” and its associated advantages: increased longitudinality of clinical patient care through the course of the year, familiarity with consulting teams despite change of rotation, the opportunity to get to know the residents and faculty, and a sense of shared mission with the hospital and its staff. The pilot students were defined as a cohort, shared a sense of community, and had a cohesive framework within which to interpret their clinical, educational, and personal experiences (afforded by convening

weekly as a group for curricular activities). Supervision of students’ activities through the course of the year by core faculty provided otherwise limited continuity in professional development during this critical time in training. A potential additional (but unmeasured) benefit of the pilot program was the opportunity for students to develop deeper, more supportive, and consistent relationships with each other during the course of a challenging year, as compared with the limited, short-lived peer contact that changes from rotation to rotation in the traditional curriculum. The structure of the new curriculum maintains elements of the traditional framework of core clerkships, but it is enhanced by parallel longitudinal experiences, thus making its implementation readily accessible to other centers. In our experience, although several department chairs were initially very resistant to the program, they ultimately agreed to the pilot because it was not viewed as intruding substantially on the traditional clerkships.

The preservation of patient-centered attitudes and beliefs in the pilot students compared with the decline demonstrated in the traditional students (and described by others^{23,24}) is notable, and the specific factors that account for this finding merit further investigation. Several theories have been proposed regarding the deterioration of empathy, including the loss of idealism with which students enter the profession because of a “ceiling effect” at matriculation, as well as the role of the hidden curriculum in eroding core values during medical training. Also of interest is the potential impact of the *null curriculum*, topics which students may deem less important because they are not intentionally included in their designated studies.³⁰ Specific curricular focus on patient-centered care, humanism in patient care, and reflective practice may “expose” the hidden curriculum, and provide an “inoculation effect” that preserves students’ positive attitudes and protects against such degradation. This is compelling not only for the moral imperative to prevent loss of idealism as a result of medical training, but also because a correlation between empathy scores during third-year-of-medical-

Table 2

Patient-Centered Attitudes Over Time for Pilot and Traditional Curriculum Students, Beth Israel Deaconess Medical Center and Harvard Medical School*

Student group	Baseline (Fall 2005)	End of year (Spring 2006)	Paired <i>t</i> test <i>P</i> value
Pilot curriculum	5.14	5.13	0.967
Traditional curriculum	4.9	4.57	0.009
<i>t</i> Test <i>P</i> value	0.866	0.03	

* Mean Patient Practitioner Orientation Scale (PPOS) scores at the beginning and end of the third year, compared between pilot and traditional curriculum (TC) students. TC students showed a statistically significant decrement of patient-centered attitudes ($P = 0.009$) during the year, whereas pilot students showed preservation of these values ($P = 0.967$). The end-of-year comparison showed pilot students to be significantly more patient-centered than TC students ($P = 0.03$).

school and later residency performance has been demonstrated.³¹

The opportunity to engage in reflective practice and to discuss insights and shared experiences during the reflection sessions was highly valued by the students. Pedagogically, we anticipated that elements of the PD III curriculum would be most effective when weaved and integrated into multiple clinical experiences and curricular components, rather than isolated sessions dedicated to its content, because the former approach is most likely to encourage students to actively adapt and translate the principles of the PD curriculum as a routine part of bedside care.

The writing program provided students with an early introduction to both academic and reflective writing. Effective writing is implicit to the success of an academic physician, but formal education in medical writing is lacking. In addition to providing a link between learning about writing and the ability to read the medical literature, the program also increased students' comfort and experience with publication. The use of author–editor dyads and early introduction to the peer-review process gave students an opportunity to provide and respond to feedback. Because students often experience feedback as a unidirectional phenomenon, it raised awareness of characteristics comprising “good feedback,” as well as setting expectations for and the ability to assess meaningful feedback while on the wards. Practice with giving feedback may also help empower students to provide feedback in clinical contexts.

Our findings are limited by the small size of the pilot class. In the least, data from the assessment suggest that students in a longitudinal third-year curriculum perform no worse than in a traditional curriculum, and they may glean additional benefits. Given the small sample size, the finding of statistically significant benefits and large effect sizes is notable. Voluntary recruitment for the pilot program may have selected for highly motivated students, although a range of baseline indicators showed no significant differences between the groups at the time of enrollment. Finally, development and implementation of a longitudinal clerkship with a relatively high faculty-to-student ratio, particularly

in its first year of existence, required a considerable additional budget (\$7,500/student). However, a substantial part of the financing burden represented starting costs, and this would be expected to amortize during the ensuing years with program growth due to economies of scale. Our projected budget for academic year 2008–2009, when the program will be offered at our hospital to one third of the HMS class, is approximately an additional \$5,000/student.

The pilot program has doubled in size in its second year, and we anticipate enrollment of 50 students by the fourth year it is offered. Future directions include implementation of a “360 evaluation” of the program, to add the dimensions of both patient and faculty satisfaction, and continued exploration of ways to integrate learning materials across departments to an even greater degree. The longitudinal patient experience has been expanded to include patients in three sectors: obstetrics–gynecology, oncology, and bariatric surgery. We project a process of longitudinal follow-up of students to assess students' longer-term performance during residency and beyond. Students' projections about their own future career choices are being collected prospectively, and long-term follow-up of this cohort (and their traditional curriculum counterparts) will also assess whether the pilot curriculum may have influenced career choice.

Conclusions

Implementation of a longitudinal, third-year medical student curriculum is feasible and effective in improving student satisfaction, mentorship, and feedback, and reported integration of basic and clinical sciences. “Exposing” the hidden curriculum through specific longitudinal curricular activities may prevent degradation of student attitudes related to patient-centered care. Structured curricular change rooted in basic principles can affect meaningful outcomes when added to existing undergraduate clinical training frameworks. The traditional third-year curriculum is inherently fragmented, especially in medical schools with several different associated teaching hospitals. A “home base” can be provided through a single-site yearlong clerkship, a more cohesive framework for clinical and

educational experiences, and a sense of community as students are identified as a cohort and integrated into the hospital during the course of the entire year. A parallel third-year curriculum, coupled with longitudinal mentorship and feedback by supervising faculty, can minimize the fragmented nature of clinical training during a critical and transformational time in the lives of medical students, and this may have important effects on both professional performance and satisfaction.

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References

- Whitcomb ME. Medical education reform: Is it time for a modern Flexner report? *Acad Med.* 2007;82:1–2.
- Abrahamson S. Time to return medical schools to their primary purpose: Education. *Acad Med.* 1996;71:343–347.
- Regan-Smith MG. “Reform without change”: Update, 1998. *Acad Med.* 1998;73:505–507.
- Sweeney G. The challenge for basic science education in problem-based medical curricula. *Clin Invest Med.* 1999;22:15–22.

- 5 Cooke M, Irby DM, Sullivan W, Ludmerer KM. American medical education 100 years after the Flexner report. *N Engl J Med*. 2006;355:1339–1344.
- 6 McNeil HP, Hughes CS, Toohey SM, Downton SB. An innovative outcomes-based medical education program built on adult learning principles. *Med Teach*. 2006;28:527–534.
- 7 Hatala R, Keitz SA, Wilson MC, Guyatt G. Beyond journal clubs. Moving toward an integrated evidence-based medicine curriculum. *J Gen Intern Med*. 2006;21:538–541.
- 8 Ziv A, Ben-David S, Ziv M. Simulation based medical education: An opportunity to learn from errors. *Med Teach*. 2005;27:193–199.
- 9 Brinkman WB, Geraghty SR, Lanphear BP, et al. Effect of multisource feedback on resident communication skills and professionalism: A randomized controlled trial. *Arch Pediatr Adolesc Med*. 2007;161:44–49.
- 10 Cohn F, Lie D. Mediating the gap between the white coat ceremony and the ethics and professionalism curriculum. *Acad Med*. 2002;77:1168.
- 11 Worley P, Silagy C, Prideaux D, Newble D, Jones A. The parallel rural community curriculum: An integrated clinical curriculum based in rural general practice. *Med Educ*. 2000;34:503–504.
- 12 Worley P, Esterman A, Prideaux D. Cohort study of examination performance of undergraduate medical students learning in community settings. *BMJ*. 2004;328:207–209.
- 13 Worley P, Prideaux D, Strasser R, Magarey A, March R. Empirical evidence for symbiotic medical education: A comparative analysis of community and tertiary-based programmes. *Med Educ*. 2006;40:109–116.
- 14 Walters LK, Worley PS, Mugford BV. Parallel Rural Community Curriculum: Is it a transferable model? *Rural Remote Health*. 2003;3:236.
- 15 Hirsh DA, Ogur B, Thibault GE, Cox M. “Continuity” as an organizing principle for clinical education reform. *N Engl J Med*. 2007;356:858–866.
- 16 Ogur B, Hirsh D, Krupat E, Bor D. The Harvard Medical School–Cambridge integrated clerkship: An innovative model of clinical education. *Acad Med*. 2007;82:397–404.
- 17 Campo R. “The medical humanities,” for lack of a better term. *JAMA*. 2005;294:1009–1011.
- 18 Kirkpatrick JN, Nash K, Duffy TP. Well rounded. *Arch Intern Med*. 2005;165:613–616.
- 19 Spiro H. What is empathy and can it be taught? *Ann Intern Med*. 1992;116:843–846.
- 20 Gofton W, Regehr G. What we don’t know we are teaching: Unveiling the hidden curriculum. *Clin Orthop Relat Res*. 2006;449:20–27.
- 21 Haidet P, Kelly PA, Bentley S, et al. Not the same everywhere. Patient-centered learning environments at nine medical schools. *J Gen Intern Med*. 2006;21:405–409.
- 22 Haidet P, Dains JE, Paterniti DA, et al. Medical student attitudes toward the physician–patient relationship. *Med Educ*. 2002;36:568–574.
- 23 Hojat M, Mangione S, Nasca TJ, et al. An empirical study of decline in empathy in medical school. *Med Educ*. 2004;38:934–941.
- 24 Woloschuk W, Harasym PH, Temple W. Attitude change during medical school: A cohort study. *Med Educ*. 2004;38:522–534.
- 25 Rosenblatt M, Rabkin MT, Tosteson DC. How one teaching hospital system and one medical school are jointly affirming their academic mission. *Acad Med*. 1997;72:483–488.
- 26 Peters AS, Feins A, Rubin R, Seward S, Schnaidt K, Fletcher RH. The longitudinal primary care clerkship at Harvard Medical School. *Acad Med*. 2001;76:484–488.
- 27 Huang G, Reynolds R, Candler C. Virtual patient simulation at US and Canadian medical schools. *Acad Med*. 2007;82:446–451.
- 28 Haidet P, Kelly PA, Chou C; Communication Curriculum and Culture Study Group. Characterizing the patient-centeredness of hidden curricula in medical schools: Development and validation of a new measure. *Acad Med*. 2005;80:44–50.
- 29 Hojat M, Xu G. A visitor’s guide to effect sizes: Statistical significance versus practical (clinical) importance of research findings. *Adv Health Sci Educ Theory Pract*. 2004;9:241–249.
- 30 Nelson M, Jacobs C, Cuban L. Concepts of curriculum. *Teach Learn Med*. 1992;4:202–205.
- 31 Hojat M, Mangione S, Nasca TJ, Gonnella JS, Magee M. Empathy scores in medical school and ratings of empathic behavior in residency training 3 years later. *J Soc Psychol*. 2005;145:663–672.

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