

Outcomes of Different Clerkship Models: Longitudinal Integrated, Hybrid, and Block

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Abstract

Purpose

To examine student perceptions and learning outcomes of three different third-year clerkship models: a yearlong, longitudinal, integrated clerkship (LIC); six-month clerkships with continuity (hybrid); and traditional, discipline-specific block clerkships (BCs).

Method

The authors compared the perceptions regarding the clerkship year and the hidden curriculum, as well as the pre- and postclerkship academic performance, of third-year medical

students participating in LIC, hybrid, and BC models between 2006 and 2010.

Results

Generally, LIC students rated the following clerkship experiences higher than did the hybrid and BC students: faculty teaching, faculty observation of clinical skills, feedback, and the clerkship overall. Students in the LIC observed more positive role-modeling behaviors and had more patient-centered experiences than BC students. All students preferred to see patients more than once, work within a consistent site or system, and work with a stable group of peers and faculty mentors

over time. Whereas students in both the LIC and the hybrid models outperformed their BC counterparts in clinical skills, student performance on the U.S. Medical Licensing Exam Step 2 (clinical knowledge) was equivalent across models.

Conclusions

Key differences in student experiences and outcomes between the continuity clerkship models (LIC and hybrid) and BCs reinforce the literature and the educational framework for continuity in clinical learning. The benefits to student outcomes seem to increase with greater opportunities for continuity.

Advocates for continuity in clinical learning environments assert that longitudinal relationships with patients and faculty members provide substantial opportunities to sequence and advance learners' competence, to actively involve learners in physician-like roles, to support patient-centered values, and to reduce the observer role that students often take as they are shuffled from one specialty rotation to another.^{1,2} Clinical education is a social learning process that, when optimally designed to facilitate longitudinal relationships, allows learners to gradually become substantial participants in a community

of practice.^{3,4} In these communities of practice, patient care occurs through continuous, collective activity; the relationships among physicians, their patients, and their colleagues are key to learning and, ultimately, to quality patient care.³ As such, students should train in an environment where educational methods resemble and reinforce these collective and continuous relationships. Yet, such relationships are difficult to establish and maintain in the fragmented and discontinuous work environment of traditional, discipline-specific block clerkships (BCs).²

Continuity in clinical education includes longitudinal experiences, such as following patients from diagnosis through treatment, from inpatient to outpatient care; learning through a curriculum that comprises sequenced experiences with appropriately increasing difficulty and interdisciplinary integration; and building ongoing relationships with supervising clinical teachers over an extended period of time.¹ Internationally, many medical schools have developed clerkships that incorporate varying models of continuity.⁵⁻⁹ These models vary in structure from 6- to 12-month, fully integrated, continuity clerkships, referred to as "longitudinal integrated clerkships" (LICs); to half- or full-year clerkships in

a single site that offer differing levels of integration, which we refer to as "hybrid" clerkship models.^{1,10,11} LICs are defined as clerkships in which students participate in the care of patients over time, develop learning relationships with the clinicians who care for these patients, and do so by participating in the clinical disciplines simultaneously.⁶ Hybrid clerkships include varied features of LICs (e.g., students participate in the care of patients and build learning relationships with the clinicians who care for those patients but within three distinct clerkships that may not occur simultaneously). Both these clerkship models with continuity (LIC, hybrid) are in contrast to the traditional BCs in which students complete each of their clerkships sequentially and do not receive a deliberate role in patient care or structured learning relationships with clinicians.

Research suggests that students who participate in clerkship models with continuity (LIC or hybrid) perform better than or equivalent to their BC peers in clinical skills and knowledge acquisition.^{5,8-10} Students who participate in these clerkship models with continuity also experience progressively higher levels of patient care responsibilities,^{7,9,12} demonstrate greater flexibility in addressing their own educational needs,⁹ and have a positive view of educational

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continuity.^{7,8} In addition, students who participate in LICs sustain higher patient-centered attitudes, receive more feedback from faculty, and report more satisfaction with the curriculum than students in BCs.^{5,8}

Given these positive findings, questions remain about how much continuity is required to achieve the desired outcomes. Our institution provides an ideal environment for examining this question because we have run three different clerkship models in parallel: (1) a yearlong LIC, (2) two 6-month clerkships with continuity (hybrid), and (3) traditional, time-limited, discipline-specific rotation BCs. For the three clerkship models in this study, we compared the student outcomes that investigators have examined in prior studies^{5,8,10,13,14} of clerkship models with continuity:

- students' perceptions of their clerkships,
- students' descriptions of their clerkship experiences,
- students' perceptions of the hidden curriculum and of patient-centered experiences, and
- measures of students' pre- and postclerkship academic performance.

Method

Participants and setting

Between 2006 and 2010, 612 third-year medical students completed their clerkships at the University of California, San Francisco (UCSF). We employed a case-control posttest evaluation study design to assess differences among LIC, hybrid, and BC models. The UCSF institutional review board approved the research protocol.

Clerkship models at UCSF

At our institution, the seven required clerkships (in family and community medicine, internal medicine, neurology, obstetrics-gynecology, pediatrics, psychiatry, and surgery) occur during the third year of medical school. The curricular oversight body guiding the development of our clerkship models with continuity (LIC, hybrid) has required that each of these clerkship models include both of the following educational principles:

1. Continuity of site, curriculum, faculty, and peer cohort; and
2. Continuity in patient care with increasing responsibility as competence develops.

The clerkship models with continuity employed similar means of addressing each principle, as described below.

The LIC is based at the UCSF Medical Center (San Francisco, California) and integrates all seven core clerkships over a full year. Clinical settings are largely ambulatory, with six weeks of interspersed inpatient training throughout the year (during weeks when students do not have a scheduled preceptorship). Students work with a preceptor in each discipline, have an assigned advisor to guide them through the year, experience a stable peer cohort across the year, and participate in a curriculum that emphasizes patient-centered and student-driven learning.¹³ The LIC currently accommodates approximately 10% of students in the third year.

Both hybrid clerkships are six months in length, occur at different major urban teaching hospitals, and include a stable peer cohort, an assigned faculty advisor who oversees each student's clinical learning progression, and a core weekly curriculum similar in content to material covered during the various disciplines in the BC model (described in greater detail below). Clinical experiences are divided between inpatient and outpatient settings.

The first hybrid clerkship, which occurs at the San Francisco General Hospital (city and county hospital; San Francisco, California), integrates two clerkships (internal medicine and family medicine) followed or preceded by a third clerkship of choice (surgery, obstetrics-gynecology, or pediatrics). This hybrid clerkship entails a curriculum that emphasizes caring for the underserved. The second hybrid clerkship occurs at the San Francisco Veteran's Affairs Medical Center (San Francisco, California), comprises four consecutive BCs (in internal medicine, neurology, psychiatry, and surgery) in varying order, and includes a curriculum that emphasizes communications, clinical skills, and professional identity

development.¹⁰ Together, the two hybrid clerkships currently accommodate approximately 30% of students in the third year.

In all three clerkship models with continuity (LIC and the two hybrid), enabling structures and processes support students in acquiring a panel of patients to follow in continuity. The structures and processes for acquiring patient panels for each clerkship model with continuity are developed based on optimal methods for continuity at the site and in each discipline.

The BCs take place at numerous sites including all three major medical centers mentioned above. They range in length from four to eight weeks, provide clinical experiences in outpatient but predominantly inpatient settings, and include a longitudinal (the preceptor remains constant) ambulatory preceptorship of 22 half-day sessions integrated throughout the year in a clinical field of interest to the student. The BC currently accommodates approximately 60% of students in the third year.

Late in their second year, students enter a lottery system and rank all four available clerkship choices (LIC, two hybrid, BC). During this study, all students who requested the LIC or BC received their first choice. With rare exceptions, students interested in hybrid clerkships received their first or second choice. The most frequent second choice for students interested in the hybrid clerkships was the BC.

Measures

In this study, we assessed four cohorts who participated in the hybrid and BC models (academic years 2006–2007 through 2009–2010), and we assessed three cohorts of students who participated in the LIC (academic years 2007–2008 through 2009–2010). Because the LIC is the newest of the three models, it provided one year's fewer data to include in the analysis.

Overall perceptions. We used two measures to assess the students' perceptions of their third year: their survey-based evaluations of the clerkships and comments garnered from student focus groups.

Students evaluated their clerkship experiences on a standardized course evaluation form, choosing ratings from poor (1) to excellent (5). We compared LIC, hybrid, and BC student responses to four sentinel items measuring (1) the quality of faculty teaching, (2) the adequacy of faculty members' direct observation of students' clinical skills, (3) feedback on students' performance, and (4) the overall quality of the clerkship. These items constitute a set of institutional benchmarks for clerkship quality; the middle two consistently receive the lowest ratings at UCSF and are the most difficult to improve. Completion of clerkship evaluations is required by all students and linked to their ability to view their assessments. We examined only the evaluation scores for those clerkships included in a given model program (i.e., if a model did not include surgery, then we did not include the surgery clerkship evaluation scores in the analysis for that model).

We invited all students who participated in a clerkship model with continuity (39 LIC and 136 hybrid) to participate in focus groups at the end of the clerkship model. We also invited 15 randomly selected students from the BC model to participate in focus groups at the end of the third year. Participation in all focus groups was voluntary, and the groups consisted of only those students who had received invitations and agreed to participate. We provided the participants with lunch (as is the usual custom for curricular focus groups at UCSF), and we deidentified data from all the focus group participants. The team conducted 12 focus groups in total (3 cohorts of LIC students, 3 cohorts each of students from each hybrid model, and 3 cohorts of BC students). We asked students in the focus groups to

1. Reflect on their overall experiences in the clerkship model or year;
2. Discuss their experiences engaging in patient care and, if relevant, continuity of care;
3. Discuss their experiences over time within a given site or system or across multiple assigned sites;
4. Discuss interactions with peers either in their cohort (clerkship models with continuity) or generally (BC); and
5. Describe mentorship during the clerkship year.

A research assistant recorded notes during the focus group sessions.

Perceptions of the hidden curriculum.

To compare students' perceptions of the hidden curriculum across the different clerkship models, we administered the Communication, Curriculum, and Culture (C³) instrument to all students at the end of their third year.¹⁵ Participation in the C³ survey was voluntary, and we did not offer incentives to complete it. The instrument comprises 29 items in three content areas: role modeling, students' experiences, and support for students' actions. For the role modeling items, students indicated how often they observed clinical teachers model certain behaviors with patients, from never (1) to always (7). For example, one item asked students to indicate how often they observed residents communicating concern for and interest in patients as unique people.

For the items on student experiences, students indicated how often they experienced positive "learning relationships," how often they had received information or teaching on conveying "bad news to patients," and how often they had observed patients being treated as "objects," from very often (1) to never (5). For example, students were asked to indicate how often they heard other students telling stories about patients that tended to portray the patients as diagnoses rather than as unique human beings. We reverse-scored the four items addressing learning relationships" (e.g., "During your third or fourth year of medical school, an attending or house officer observes you while you interview a patient and provides you with feedback on your bedside manner").

Finally, for items covering the support of students' actions, the students indicated how encouraging their instructors were when the students themselves engaged in patient-centered behaviors, from discouraged (1) to strongly encouraged (5). For example, students rated the extent to which instructors encouraged them when they tried to develop rapport with patients. We averaged the item scores in each content area to calculate three overall content scores for the instrument. Higher scores indicated

more positive perceptions of the hidden curriculum.

Academic performance. We measured academic performance with both pre- and postclerkship variables.

Because students were allowed to rank and were almost always assigned to their preferred clerkship models, we compared preclerkship academic performance variables for LIC, hybrid, and BC students to determine whether differences existed prior to beginning clerkships. Preclerkship variables comprised first-time scores on the Medical College Admission Test (MCAT) Physical Science section, Biological Sciences section, and Verbal Reasoning section—as well as first-attempt scores on the United States Medical Licensing Examination (USMLE) Step 1, which students must take before commencing their clerkships.

Grading at the end of the clerkships is norm-based on a three-point scale: honors, pass, or fail. Students' clerkship grades are based on observational ratings by clinical supervisors and clerkship-specific examination scores. We measured honors received by totaling the number of honors received in the seven core clerkships.

Postclerkship clinical skills are assessed at the end of the third year using an eight-station clinical performance examination (CPX). All eight medical schools in the California Consortium for the Assessment of Clinical Competence develop and use this examination, which covers a range of clinical scenarios including acute, chronic, behavioral, and ill-defined problems. Standardized patients use checklists and global ratings to assess students' performance at individual stations. The score for this exam is based on two skills areas: data gathering (history taking and physical examination) and communication skills. Scores for each skill range from 0% to 100% correct. Finally, we assessed postclerkship knowledge using students' first-attempt USMLE Step 2 Clinical Knowledge score. We did not use the USMLE Step 2 Clinical Skills score because it is simply pass/fail, and, with rare exception, all of our students pass.

Data analysis

We used descriptive statistics to present student demographics. We examined the

relationships between clerkship model (LIC, hybrid, or BC) and overall clerkship perceptions and between clerkship model and academic performance variables using one-way analysis of variance. We adjusted comparisons of postclerkship academic performance for baseline differences in preclerkship academic performance variables. To determine the effect of clerkship model on students' perceptions of the hidden curriculum, we used a multivariate analysis of variance (MANOVA). We further analyzed significant findings through post hoc univariate analyses using Scheffe tests to account for unequal group size. The study had 90% power to detect a minimum of 0.3 absolute difference in the C^3 results as derived from the literature describing the reliability and validity of the C^3 .¹⁵ We used SPSS (version 19; Chicago, Illinois) for the analyses. One of the investigators (A.T.) and a research assistant conducted the analysis of the qualitative focus groups data using open coding methods.¹⁶ To ensure that we accounted for students' experiences across clerkship models, we reported on themes that arose in at least two of the three clerkship models (LIC, hybrid, BC) and presented the variations on those themes by clerkship model in the results.

Results

The study included clerkship evaluation and academic performance data from 563 of 612 third-year students (92%) who completed clerkships between 2006 and 2010. Across three years, 39 (7%) completed the LIC; across four years, 136 (24%) completed the hybrid models, and 388 (69%) completed the BC. Across all models, distribution by gender and by age of student was consistent with the class overall. Because of the voluntary nature of student participation in focus groups and the C^3 survey, student response rates varied and are reported in the results section of each measure.

Overall perceptions

Students in the LIC rated all four clerkship benchmarks (faculty teaching, adequacy of observation of clinical skills, feedback on performance, and overall clerkship) significantly higher than the BC students, with the exception of the internal medicine clerkship, which all students rated uniformly highly (Table 1). LIC students also rated the clerkship

benchmarks significantly higher than the students in the hybrid clerkships did in the majority of cases. In the surgery clerkship, the BC students rated the faculty teaching, direct observation, and feedback benchmarks significantly higher than hybrid model students did, but both the BC and LIC groups rated the "clerkship overall" similarly.

We conducted focus groups with 135 students. For the LIC focus groups, 37 (95%) of the 39 invited students actually participated. For the hybrid clerkship focus groups, 71 (52%) of 136 invited students participated. Finally, for the BC, 27 of the 45 (60%) invited students participated. Table 2 displays the number of students who participated in the focus groups, key themes raised (whether through positive, negative, or neutral comments), the number of groups in which each theme was discussed, and the number of students discussing each theme (we did not record the sessions verbatim, so we do not include quotations here). The greatest distinctions in themes discussed were between students in the clerkship models with continuity (LIC, hybrid) and the BC.

Students in the clerkship models with continuity (LIC, hybrid) perceived their third-year education positively and felt that the strengths of the clerkship year outweighed any challenges. These students expressed sadness that the program had ended and described the experience as "amazing." Students in the LIC realized the significant benefits of their experience close to the end of the year as the extent of their professional development became evident. In contrast, BC students did not discuss their overall satisfaction with the clinical year (Table 2).

In the clerkship models with continuity and BC focus groups, students highlighted the educational value of seeing the same patients more than once. Students, including those in the BC group, reported that when continuity with patients occurred, it contributed to their learning and to patient care. Students reported on two forms of continuity with patients: deliberate and fortuitous. Deliberate continuity occurred with the panel patients whom students followed throughout their clerkship models with continuity. Students reported that, in these cases, they themselves were able to make a

positive impact on their panel patients' care and that they often became their patients' advocates. Opportunities for deliberate continuity were more limited in the hybrid clerkships; for example, a patient's follow-up appointment might be scheduled past the end of the model's six-month duration. Opportunities for fortuitous continuity with patients arose occasionally in all clerkships and contributed to students' understanding of patient care. Examples included students who completed more than one BC at the same site and saw a patient again, scheduled or unplanned, on a different service.

Students reported that working within a single site or system for an extended period was beneficial to their learning. Most BC students thought that changing sites made the third-year experience more challenging, requiring time to become acquainted with new systems and cultures. Hybrid model students appreciated that not having to relearn systems allowed them to focus on learning and patient care. Moreover, being at the same site gave students opportunities to develop ongoing relationships with faculty members and to feel like team members. LIC students focused less on their site and more on the academic health care system. These students described challenges of working in multiple clinics and hospitals within a given system, and they offered suggestions for how to maximize their time and opportunities to learn about patient care.

Students who participated in clerkship models with continuity, and those in BCs who had the opportunity to work with a peer cohort, valued this aspect of learning. Students in the clerkship models with continuity reported that the peers in their cohort allowed them to support, learn from, and help one another; they shared and discussed patient cases which enhanced their learning. These students often identified patient types lacking in their peers' panels and provided suggestions for managing difficult patient interactions. The ability to share experiences with peers provided a support network that made the clerkship experience less overwhelming. Finally, regular cohort meetings or weekly seminars solidified peer relationships.

Table 1

Ratings of the Quality of Faculty Teaching, of the Adequacy of Observation of Clinical Skills, of Feedback on Performance, and of Overall Clerkships by University of California, San Francisco, Students Who Participated in Different Clerkship Models, * 2006–2010

Rotation	Overall quality of faculty teaching, mean rating ± SD (95% CI)				Adequacy of direct observation of students' clinical skills, mean rating ± SD (95% CI)				Adequacy of feedback on students' performance, mean rating ± SD (95% CI)				Overall clerkship, mean rating ± SD (95% CI)			
	LIC	Hybrid	BC	P value	LIC	Hybrid	BC	P value	LIC	Hybrid	BC	P value	LIC	Hybrid	BC	P value
Family medicine	4.5±0.6 (4.3, 4.8)	4.3±0.7 (4.1, 4.4)	4.2±0.8 (4.1, 4.3)	.03 [†]	4.4±1.0 (4.0, 4.6)	3.8±1.1 (3.6, 4.1)	3.7±1.0 (3.6, 3.8)	.001 [†]	4.4±1.0 (4.0, 4.7)	3.9±0.9 (3.7, 4.2)	3.7±1.0 (3.6, 3.8)	.001 [†]	4.4±0.8 (4.1, 4.7)	4.1±0.8 (3.8, 4.3)	4.0±0.9 (3.9, 4.1)	.02 [†]
Internal medicine	4.8±0.4 (4.7, 5.0)	4.6±0.6 (4.5, 4.7)	4.7±0.5 (4.6, 4.7)	.1	4.2±1.0 (3.9, 4.5)	3.9±0.9 (3.7, 4.1)	4.0±0.9 (3.8, 4.1)	.2	4.5±0.8 (4.3, 4.8)	4.2±0.8 (4.1, 4.3)	4.3±0.8 (4.3, 4.4)	.2	4.7±0.6 (4.5, 4.9)	4.5±0.7 (4.4, 4.6)	4.5±0.7 (4.4, 4.7)	.2
Obstetrics–gynecology	4.4±0.8 (4.1, 4.8)	4.0±0.9 (3.8, 4.2)	3.9±1.0 (3.8, 4.0)	.01 [†]	4.3±0.9 (3.9, 4.7)	3.6±1.1 (3.3, 3.8)	3.5±1.1 (3.5, 3.7)	.001 [†]	4.0±1.1 (3.6, 4.3)	3.4±1.1 (3.2, 3.7)	3.5±1.2 (3.3, 3.6)	.03 [†]	4.4±0.8 (4.0, 4.7)	3.7±1.1 (3.5, 3.9)	3.9±1.0 (3.8, 4.0)	.01 [†]
Pediatrics	4.7±0.6 (4.5, 4.9)	4.4±0.7 (4.3, 4.6)	4.2±0.9 (4.1, 4.3)	.001 [§]	4.4±0.6 (4.1, 4.8)	3.7±1.1 (3.4, 3.9)	3.5±3.7 (3.5, 3.7)	.001 [†]	4.4±0.7 (4.1, 4.7)	3.9±1.0 (3.6, 4.1)	3.8±1.1 (3.7, 3.9)	.01 [†]	4.5±0.7 (4.2, 4.8)	4.2±0.8 (4.0, 4.4)	4.1±0.9 (4.0, 4.1)	.01 [†]
Psychiatry	4.8±0.4 (4.5, 5.0)	4.3±0.7 (4.1, 4.5)	4.4±0.8 (4.3, 4.5)	.01 [†]	4.9±0.3 (4.6, 5.0)	4.2±0.9 (4.0, 4.4)	4.2±0.9 (4.1, 4.3)	.001 [†]	4.7±0.5 (4.4, 5.0)	4.2±0.9 (4.0, 4.5)	4.2±1.0 (4.1, 4.3)	.01 [†]	4.7±0.5 (4.4, 5.0)	4.4±0.8 (4.1, 4.6)	4.3±0.9 (4.2, 4.4)	.01 [†]
Surgery	4.3±0.8 (4.0, 4.5)	3.8±0.7 (3.6, 4.0)	4.2±0.8 (4.1, 4.3)	.002 [†]	3.7±1.1 (3.3, 4.0)	3.0±0.9 (2.7, 3.2)	3.4±1.1 (3.3, 3.5)	.004 [¶]	3.6±1.1 (3.2, 3.9)	3.0±1.1 (2.8, 3.3)	3.4±1.1 (3.3, 3.5)	.02 [¶]	4.0±0.8 (3.7, 4.3)	3.7±1.0 (3.4, 3.9)	4.0±1.0 (3.9, 4.1)	.06

*Thirty-nine students participated in a longitudinal integrated clerkship (LIC), 136 participated in a hybrid clerkship model, and 388 participated in a block clerkship (BC). SD indicates standard deviation; CI, confidence interval.

[†]Significant difference is between LIC and BC.

[‡]Significant difference is between LIC and hybrid and BC.

[§]Significant difference is between LIC and hybrid; and BC.

[¶]Significant difference is between LIC and BC; and hybrid.

Table 2

Frequency of Mention* (by Number of Students and by Number of Focus Groups) of Common Themes in Longitudinal Integrated Clerkship (LIC), Hybrid Clerkship, or Block Clerkships (BCs) Models in Focus Groups of Students at the End of the Clerkship or at the End of the Year, University of California, San Francisco, 2006–2010

Item counted	Clerkship models					
	LIC		Hybrid		BC	
	No. of students	No. of groups	No. of students	No. of groups	No. of students	No. of groups
Total participants	37	3	71	6	27	3
Themes mentioned						
Overall satisfaction	21	2	52	5	0	0
Continuity with patients	22	3	39	4	14	3
Continuity within a site/system	6	1	34	5	6	1
Continuity with a peer cohort	37	3	20	3	12	2
Continuity with faculty and mentorship	13	2	51	5	18	3

*The authors counted any mention of a theme—be it positive, negative, or neutral.

Students reported varying experiences with mentorship in the third year. BC students wished for more mentoring, and some wished for a formal mentoring program. Overall, students in the clerkship models with continuity appreciated having assigned mentors, although they stated that the mentors were only sometimes effective because of time constraints. Because of familiarity and long-term presence at a site, continuity model students with unsuccessful assigned mentors were readily able to find other faculty

for mentorship. Students in clerkship models with continuity emphasized that the nonevaluative nature of mentoring was critical to its success.

Perceptions of hidden curriculum

The C³ survey was completed by 17 (44%) of the LIC, 49 (36%) of the hybrid, and 88 (23%) of the BC students. The MANOVA indicated significant differences for students who participated in the different clerkship models ($F = 2.6, df = 6, P < .02$). Post hoc analyses revealed that students in the LIC

perceived more positive role-modeling behaviors in their teachers and more patient-centered experiences (e.g., fewer instances of patients’ being treated as objects) than did BC students (Table 3). There were no significant differences between clerkship model participation and students’ perceptions of support for their own patient-centered behaviors.

Academic performance

Students who participated in clerkship models with continuity (LIC, hybrid) did not differ significantly in their preclerkship academic achievement from their BC peers, except that LIC students had slightly higher MCAT verbal scores than BC students (Table 4). We adjusted postclerkship analyses for baseline differences in MCAT verbal scores. On postclerkship performance, students in clerkship models with continuity performed significantly better on the data-gathering portion of the CPX than BC students. Students in clerkship models with continuity demonstrated a trend toward higher scores on USMLE Step 2 (Clinical Knowledge), although there were no statistically significant differences across clerkship models. We detected no differences either in CPX communication skills scores earned by, or in the number of honors received by, students across clerkship models.

Discussion and Conclusions

This study examined differences in students’ reported experiences and in their academic outcomes across three different clerkship models: LIC, hybrid, and BC. We found that students, regardless of the clerkship model they chose, preferred continuity during their clinical education—that is, opportunities to see patients and to work with a stable group of peers and faculty mentors over time.

Figure 1 summarizes the results and benefits of the three clerkship models. When the three models in this study are placed on a continuum of educational continuity, the BC affords the least, the hybrid models an intermediate amount, and the LIC the most continuity with patients, peers, curriculum, faculty, and a site/system. Students performed similarly on knowledge acquisition outcomes, regardless of point on the continuity continuum. As opportunities for educational continuity increased in

Table 3

Comparison of Perceptions of the Hidden Curriculum for 153 University of California, San Francisco, Third-Year Medical Students Who Participated in Longitudinal Integrated Clerkship (LIC), Hybrid Clerkship, or Block Clerkship (BC) Models, 2006–2010

Aspect of the hidden curriculum	Composite mean score ± standard deviation (95% confidence interval)		
	LIC (n = 17)	Hybrid (n = 48)	BC (n = 88)
Role modeling*†	5.6 ± 0.9 (5.3, 6.2)	5.1 ± 0.9 (4.9, 5.5)	5.0 ± 0.9 (4.8, 5.2)
Student experiences of patient-centered behaviors**	3.4 ± 0.5 (3.2, 3.7)	3.2 ± 0.5 (3.0, 3.3)	3.1 ± 0.5 (3.0, 3.2)
Support for students’ patient-centered actions‡	4.1 ± 0.7 (3.6, 4.5)	4.0 ± 0.8 (3.8, 4.3)	3.7 ± 1.0 (3.5, 3.9)

*Significant difference is between LIC and BC, $P < .004$, via multivariate analysis of variance.

† These items were scored on a seven-point scale, where 1 = never, 2 = rarely, 3 = less than half the time, 4 = about half the time, 5 = more than half the time, 6 = almost always, and 7 = always.

‡ These items were scored on a five-point scale, where 1 = very often, 2 = fairly often, 3 = occasionally, 4 = rarely, and 5 = never.

§ These items were scored on a five-point scale, where 1 = discouraged, 2 = neither encouraged nor discouraged, 3 = slightly encouraged, 4 = mostly encouraged, and 5 = completely encouraged.

Table 4

Comparison of Measures of Pre- and Postclerkship Academic Performance for University of California, San Francisco, Students Who Participated in a Longitudinal Integrated Clerkship (LIC), Hybrid Clerkship (Hybrid), or Block Clerkship (BC) Model in Their Third Year of Medical School, 2006–2010

Academic performance variables*	Mean score \pm standard deviation (95% confidence interval)			P value
	LIC (n = 39)	Hybrid (n = 136)	BC (n = 388)	
Preclerkship				
MCAT Basic Science	12.03 \pm 1.5 (11.6, 12.5)	11.6 \pm 1.4 (11.3, 11.9)	11.6 \pm 1.5 (11.4, 11.7)	.2
MCAT Physical Science	11.6 \pm 1.9 (11.1, 12.2)	11.2 \pm 1.8 (10.9, 11.6)	11.6 \pm 1.8 (11.4, 11.7)	.2
MCAT Verbal	11.1 \pm 1.7 (10.5, 11.6)	10.9 \pm 1.4 (10.5, 11.0)	10.5 \pm 1.7 (10.3, 10.6)	.03 [†]
USMLE Step 1	227.2 \pm 20.8 (220.6, 233.8)	230.0 \pm 18.7 (226.5, 233.6)	227.6 \pm 21.8 (225.5, 229.7)	.5
Postclerkship				
Total honors received across seven clerkships	2.2 \pm 2.1 (1.6, 2.8)	2.3 \pm 1.9 (2.0, 2.6)	2.1 \pm 1.9 (1.9, 2.3)	.4
Mean CPX data gathering	70.1 \pm 6.5 (68.1, 72.1)	68.5 \pm 6.0 (67.4, 69.6)	67.0 \pm 6.6 (66.4, 67.7)	.004 [‡]
Mean CPX communication skills	72.8 \pm 5.8 (71.1, 74.5)	71.8 \pm 5.5 (70.9, 72.7)	70.9 \pm 5.4 (70.4, 71.5)	.06
Mean USMLE Step 2 CK	236.2 \pm 19.6 (229.1, 243.2)	234.3 \pm 18.6 (230.6, 238.1)	230.9 \pm 23.5 (228.6, 233.1)	.2

*MCAT indicates Medical College Admissions Test; USMLE, United States Medical Licensing Exam; CPX, clinical performance exam; CK, Clinical Knowledge.

[†]Significant difference is between LIC and BC.

[‡]Significant difference is between LIC and hybrid; and BC; adjusted for baseline differences in MCAT Verbal scores.

the hybrid and then the LIC models, performance on clinical skills improved and student perceptions of the clinical year became more positive. LIC students who experienced the greatest amount of continuity rated their teaching faculty, the faculty's observation of their clinical skills, the feedback they received, and the clerkship overall higher in almost all clerkship disciplines than did students who experienced the BC and hybrid models. In addition, LIC students also rated their experiences with patient-centered behaviors and positive role modeling higher than did the hybrid and BC students. Overall, as continuity increased, so did the benefits to student outcomes.

Our findings, like those of others, reveal that continuity is a powerful force in the clerkship experience.^{5,8,9} Students reported valuing the extended time and facilitated opportunities to care for patients, interact with faculty, and work closely with peers. Such continuity enables central engagement in the community of practice.⁴ Others report that this type of engagement facilitates the formation of the learner's identity as a physician-in-training and increases his or her sense of belonging to such a

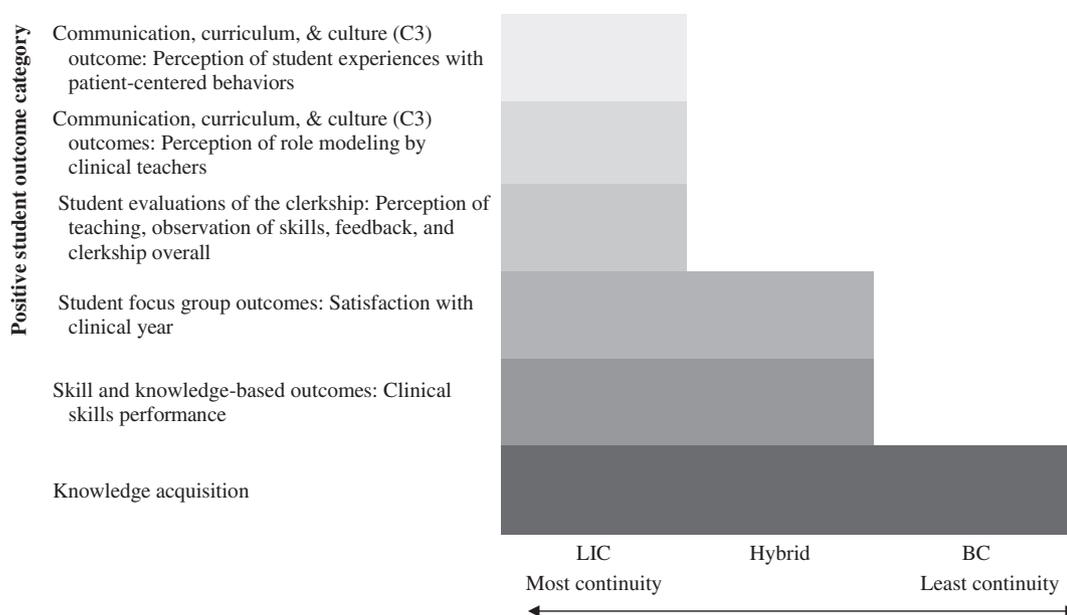


Figure 1 Comparison of positive student perceptions and academic performance outcomes for three clerkship models (longitudinal integrated clerkship [LIC], hybrid clerkship [hybrid], and block clerkship [BC]) at the University of California, San Francisco, 2006–2010. With greater duration and quality of educational continuity in the third year of medical school come improved outcomes. Clinical skills performance increases with the hybrid and LIC models; and, with the LIC model, students report more positive perceptions of the quality of faculty teaching, observation of clinical skills, feedback, clerkship overall, role modeling by clinical faculty, and patient-centered behaviors.

community.^{3,4} We found that engagement increased with more continuity in that students realized the educational value of seeing the same patients over time, being at the same site, and learning from peers.

Further, we found that some reasonable amount of time in the same site/system facilitated other aspects of continuity; for example, students reported that working within a consistent site or health system over an extended period of time promoted learning opportunities because they did not have to keep learning a new culture or system. However, others have created LICs absent of continuity of site or/system and have reported positive outcomes.^{6,9} Our data demonstrate that, for maximal benefit to students' clinical learning experience, continuity within a site or system must be accompanied by formally facilitated opportunities for continuity with patients, peers, and faculty.

We found that continuity with patients contributed to student learning about patient care, as demonstrated by the higher CPX scores of the students who participated in the clerkship models with continuity and by the students' own descriptions of how continuity relationships with patients both allowed them to serve as patient advocates and facilitated patient-preceptor relationships.

Others have found that students in clerkship models with continuity report a different view of the hidden curriculum and patient-centeredness than BC students.^{8,14} Our study confirms these findings; our students in the LIC model reported experiencing significantly fewer adverse effects of the hidden curriculum than did our BC students. Our study also aligns with previous findings that students in clerkship models with continuity assume more responsibility for patient care over time.¹² Faculty have greater knowledge of and confidence in their students' abilities and, thus, bestow on them increased levels of responsibility and autonomy for patient care.¹² Similarly, students in clerkship models with continuity may experience more patient-centered care because they know their preceptors better and observe them in action in a broader array of circumstances.

We found that facilitated opportunities for continuity with peers (e.g., cohort meetings, weekly seminars) during the clerkship year provide a much-needed support network and enhanced learning. Research has shown that the social system of peers supports both personal and professional growth at a crucial transition period of elevated anxiety.^{10,17,18} Our findings show that such a support system also challenges students to learn more about their own and their peers' patients. Delivering effective and high-quality health care today requires teams of health care providers and depends on how well team members communicate, coordinate care, and provide care for patients.¹⁹ We found that students in clerkship models with continuity lauded their peers whose presence provided opportunities for communication, discussion about patients and learning, and work as it occurs in contemporary health care systems.

Although all of the clerkship models in this study involved multiple, interdependent components, our study was not designed to determine the relative contribution of each component: continuity with a peer group, mentor, or patients; longitudinal integrated experiences; or ambulatory versus inpatient clinical experiences. Each of these components, individually or together, may provide "affordances" (i.e., opportunities to engage in work and retrieve the support needed to learn) that contribute to the continuity effect.²⁰ Further research is needed to identify the distinctive and essential success factors that each of these models promotes.

We believe that the clerkship models with continuity that we describe are the beginning of much-needed reform of clinical education at both the undergraduate and graduate medical education levels.²¹ Companion innovations that require further inquiry include developmentally sequenced mentoring and assessment, competency- and entrustment-based advancement instead of time-based advancement, and education and workplace system redesign.

The study has limitations worth noting. Students were from a single medical school which may limit the generalizability of this study to other locales, but we collected data from multiple years on three distinct clerkship

models, which allowed numbers adequate for detecting differences across models. Further, students chose their own clerkship models rather than receiving a random assignment. Allowing students to choose might have positively affected their perceptions of the clerkships as they selected the model that they felt best fit their needs; however, because most students received their first choice, student enthusiasm was equalized across models. In fact, the opportunity for students to individualize their clinical experience by choosing a model that fits their needs might be particularly important for successful clinical learning in the third year as students transition from the classroom to clinical settings, a time of high levels of stress and anxiety.^{17,18} Finally, because we studied these models for three or more years, we moved beyond the characteristic pioneer enthusiasm, which inflates ratings of new programs, to a steady state of operation.

In conclusion, the benefits to student experience and learning seem to increase with greater duration and quality of educational continuity. Longitudinal relationships with patients, teachers, and peers seem to strengthen students' patient-centered values, clinical skills, personal and professional development, and support networks—all of which are essential for a successful clinical experience. This research supports the call for increased continuity in clinical education.

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