Why Not Wait? Eight Institutions Share Their Experiences Moving United States Medical Licensing Examination Step 1 After Core Clinical Clerkships

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Abstract

The majority of medical students complete the United States Medical Licensing Examination Step 1 after their foundational sciences; however, there are compelling reasons to examine this practice. This article provides the perspectives of eight MD-granting medical schools that have moved Step 1 after the core clerkships, describing their rationale, logistics of the change, outcomes, and lessons learned. The primary reasons these institutions cite for moving Step 1 after clerkships are to foster more enduring and integrated basic science learning connected to clinical care and to better prepare students for the increasingly clinical focus of Step 1. Each school provides key features of the preclerkship and clinical curricula and details concerning taking Steps 1 and 2, to allow other schools contemplating change to understand the landscape. Most schools report an increase in aggregate Step 1 scores after the change. Despite early positive outcomes, there may be unintended consequences to later scheduling of Step 1, including relatively late student reevaluations of their career choice if Step 1 scores are not competitive in the specialty area of their choice. The score increases should be interpreted with caution: These schools may not be representative with regard to mean Step 1 scores and failure rates. Other aspects of curricular transformation and rising national Step 1 scores confound the data. Although the optimal timing of Step 1 has yet to be determined, this article summarizes the perspectives of eight schools that changed Step 1 timing, filling a gap in the literature on this important topic.

Historically, students take the United States Medical Licensing Examination (USMLE) Step 1 before clerkships; however, there are compelling reasons to examine this practice. According to data published by the Association of American Medical Colleges in 2015–2016, 130/142 of accredited medical schools have their students take Step 1 of the USMLE during their first or second year of medical school.[1] This typically occurs following completion of the basic science curricula, after a dedicated study period of variable duration. Passing Step 1 is often a requirement for advancement to clinical clerkships.[2] A number of schools are undergoing curricular revisions that shorten the traditional two-year preclerkship curricula to 18 months or even 1 year,[3] and an increasing number are altering or have altered the timing

of Step 1 to follow completion of the core clerkships. Other schools are still contemplating where to best place Step 1 to optimize student learning and performance.

Context

Research on the timing of Step 2 Clinical Knowledge (CK) suggests that student performance declines over time after completion of the core clerkships.[4] A similar decline in scores might be predicted for Step 1 as the distance from completing the foundational sciences increases. Ling et al[5] found a 6.4% decrease in overall performance on USMLE Step 1 basic science items administered in unscored sections of USMLE Step 2 CK. The magnitude of the decline varied by discipline, with the steepest occurring in biochemistry (17.5%). This and other studies by the National Board of Medical Examiners (NBME) examining basic science knowledge retention[6,7] raise the concern that students may not perform as well on Step 1 questions after clerkships.

Other studies suggest that Step 1 performance could improve with clinical exposure. Petrusa et al[8] investigated the performance of medical students

from years 1, 3, and 4 on sample Step 1 questions. Their results demonstrated that students with more clinical experience performed better, suggesting that moving Step 1 after clerkships might raise scores. Unfortunately, the study was limited by a small sample size and the use of practice questions rather than the actual USMLE exam.

At this time, consensus on the impact of moving Step 1 after the core clinical years on student outcomes is lacking. In the absence of empirical data, schools are looking to peer institutions for guidance to aid them in decision making and advocating to their administrations. Numerous queries on the optimal timing of Step 1 are appearing on medical education listservs,[9] and there is a need for a collated resource of institutions that have made the change. This article offers the perspective of eight medical schools: Duke University School of Medicine, Perelman School of Medicine at University of Pennsylvania, New York University School of Medicine, Uniformed Services University of the Health Sciences, Vanderbilt University School of Medicine, Weill Cornell Medical College, Yale University School of Medicine, and University of Michigan Medical School. These schools have either

realigned or are in the process of moving Step 1 to after completion of the core clinical clerkships. Here we discuss our rationale, the logistics, outcomes, and lessons learned, to begin to address the gap in the literature on this important topic.

Rationale

The primary reasons our institutions cite for moving Step 1 after the core clerkships are to help improve retention of foundational science, to promote more integrated basic science learning in clinical contexts, and to better prepare students for the increasingly clinical focus of Step 1.

At our institutions, we see a concern amongst faculty that students prepare intensively for Step 1, pass the exam, and promptly forget their basic science. Research in medical education shows that students retain two-thirds to three-fourths of knowledge at one year, and slightly below 50% at two years in the absence of deliberate retention and retrieval practices.[10] We believe that students cannot afford to forget significant portions of their scientific foundations. We want their foundational knowledge to be enduring, to enable students to delve into the biochemical and molecular basis of disease when working with patients. As part of curricular reform, our institutions have all moved to more integrated, organ-system-based approaches and employed deliberate strategies to ensure that students revisit the basic sciences in the clinical setting. We believe that placement of Step 1 after the core clerkships adds to these instructional efforts by tapping into student motivation to review basic science content. Assessment is one of the most powerful motivators of student learning.[11] Thus, the timing of the exam has the potential to influence study behaviors by making the material more "relevant."

Over time, Step 1 has become increasingly clinically focused, with longer and more complicated vignette-style question stems. We believe it makes pedagogical sense that having clinical experience prior to taking the examination may improve scores. Students at our institutions have anecdotally reported that taking the exam after the core clerkships has

allowed them to read and analyze the clinical vignettes quickly and with greater comprehension. Students presumably use pattern recognition and can "think fast," rather than using slower, more analytical thinking during the exam.[12] Additionally, students have commented that practice with the NBME clinical subject "shelf" exams facilitates more effective and efficient progress through the clinical stem questions on Step 1.

Logistics

There are a number of logistical issues associated with changing the timing of Step 1 that span the curricular continuum. For peer institutions to best learn from our institutional examples, they must be able to determine whether our practices are applicable to their curricula. Table 1 outlines the logistical details surrounding Step 1 at each of our eight schools, detailing timing and curricular features of import. Appendix 1 offers the logistical details of additional schools making this change, and there are likely others. Duke University and the University of Pennsylvania have the longest experience with placing Step 1 after the core clinical clerkships, with 24 years and 19 years, respectively. The other schools made the change more recently as part of their curriculum transformations.

Based on our collective experiences to date, we have identified key facets of the preclerkship curricula to consider when determining the optimal timing of Step 1, including the duration of the basic science curriculum, the type of curriculum, and grading policies. The length of the preclerkship curriculum in our eight schools ranges from 45 to 60 weeks, excluding vacations. All but one school (Duke) report having single-pass curricula, organized around organ systems, where scientific disciplines are interwoven and the basic and clinical sciences are integrated. Duke has a two-pass curriculum of normal systems followed by abnormal systems.

Preclerkship student assessment at most institutions is pass/fail, with only a few reporting discriminatory grading. Some institutions assist students in Step 1 preparation by offering either the NBME subject exams or customized exams spaced throughout the preclerkship years. Two institutions offer the Comprehensive

Basic Science Examination (CBSE) as a summative experience similar to Step 1 to help students consolidate knowledge before entering clerkships. These preclerkship curricular features are detailed for each institution in Table 1.

We have also identified important features of the clinical curricula to consider, including the total duration of the core clinical clerkships, grading policies, and whether or not schools use the NBME clinical subject examinations. These core clinical curricular features are also detailed in Table 1. Notably, in addition to traditional clerkship didactics, our schools all use a variety of pedagogical strategies for deliberate science integration in the clinical setting, including linkage of specific clerkships with basic science disciplines (i.e., surgery and anatomy), special days dedicated to deep science dives, weeklong intersessions, four-week selectives, and the deliberate encouragement of self-directed, patient-based scientific inquiry. Several institutions have invested in question banks, and two schools use learning platforms to help provide the testing effect of spaced repetition of basic science content during the clinical years. We highlight these curricular features because we believe they help foster retention and retrieval of basic science knowledge, and drive the integration of basic and clinical science learning, complementing the change in Step 1 timing.

Of the eight institutions represented, six mandate students to take Step 1 after the core clinical clerkships, and two provide flexible options (i.e., students may take Step 1 immediately following the basic science curricula or after clerkships). The time provided to prepare for Step 1 varies from four to eight weeks, and averages six. Of note, Duke, which has the longest experience administering Step 1 after the clerkships, offers the shortest guaranteed study period, though students may negotiate with their research mentor for additional time if needed. Institutions generally offer some flexibility as to when students take Step 2 CK, but most require it by December of the fourth year. Some institutions allow students to take Step 2 CK before Step 1. In practice, few students have exercised this option, though some students do take the exam soon after Step 1, and many take it earlier

Table 1

Logistics of the Preclerkship Curricula, Clinical Curricula, and Step 1 and 2 Examinations, at Eight Schools Where the United States Medical Licensing Examination Step 1 Is After Core Clerkships[a]

Characteristic	Duke University School of Medicine	Perelman School of Medicine at the University of Pennsylvania	New York University School of Medicine	Uniformed Services University of the Health Sciences	Vanderbilt University School of Medicine	Weill Cornell Medical College	Yale University School of Medicine	University of Michigan School of Medicine
When did you move Step 1 timing after the clinical year?	Since inception of USMLE in 1992	Class of 2001 (1997 matriculants)	Class of 2014 (2010 matriculants)	Class of 2015 (2011 matriculants)	Class of 2017 (2013 matriculants)	Class of 2018 (2014 matriculants) (made optional)	Class of 2019 (2015 matriculants)	Class of 2020 (2016 matriculants)
Details of the preclerkship curricula								
What is the length of the basic science curriculum?[b]	45 weeks	55 weeks	60 weeks	57 weeks	49 weeks	56 weeks	54 weeks	48 weeks
How are organ systems taught?	Two pass (sequential normal followed by abnormal)	Single pass (normal taught simultaneously with abnormal)	Single pass (normal taught simultaneously with abnormal)	Single pass (normal taught simultaneously with abnormal)	Single pass (normal taught simultaneously with abnormal)	Single pass (normal taught simultaneously with abnormal)	Single pass (normal taught simultaneously with abnormal)	Single pass (normal taught simultaneously with abnormal)
What type of grades do you assign in the preclerkship years?	Pass, Fail	Pass, Fail semester 1, then Honors, Pass, Fail	Pass, Fail	Honors, Pass, Fail	Pass, Fail	Pass, Fail	Pass, Fail	Pass, Fail
Do you use NBME basic science subject exams?	Periodic customized NBME exams	No	No	Customized NBME exams	Customized NBME exams	No	No	Periodic customized NBME exams
Do you offer the CBSE exam at the end of the basic science curriculum?	No	No	No	No	No	Yes, low stakes	No	Yes, low stakes
Details of the clinical curricula								
What is the length of the core clinical curriculum?[b]	52 weeks	48 weeks	48 weeks	48 weeks	41 weeks	48 weeks	48 weeks	48 weeks
What types of grades do you assign during core clerkships?	Honors, High Pass, Pass, Fail	Honors, High Pass, Pass, Fail	Honors, High Pass, Pass, Fail	Honors, Pass, Fail	Pass, Fail	Honors, High Pass, Pass, Fail	Honors, High Pass, Pass, Fail	Honors, High Pass, Pass, Fail
Do you use NBME clinical subject "shelf" exams in clerkships?	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes

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Table 1
(Continued)

Characteristic	Duke University School of Medicine	Perelman School of Medicine at the University of Pennsylvania	New York University School of Medicine	Uniformed Services University of the Health Sciences	Vanderbilt University School of Medicine	Weill Cornell Medical College	Yale University School of Medicine	University of Michigan School of Medicine
What are examples of basic science integration during core clerkships?	Tutorials to highlight basic science underpinnings of common clinical conditions, clerkship didactics, attending rounds	Fridays (all day) have case-based sessions and didactics that integrate science and clinical medicine, attending rounds	Two 1-week intensive intersessions and 4-week selectives that integrate basic science and clinical medicine	Spaced education, distance learning, small-group discussions, journal clubs, etc.	1-week review of common lab tests and pharmacology, anatomy and physiology reviews, EBM activities, neuroanatomy bootcamp, monthly diagnostics and therapeutics course, self-directed patient-based learning	Didactics in clerkships, small-group case-based discussions, attending rounds	Didactics in clerkships, online sessions, attending rounds	Deliberate alignment of certain science disciplines with clerkships (i.e., anatomy, pathology, and surgery); Science Fridays (active learning deep science dives 2–3 hours/week); self-directed patient-based scientific inquiry
Details concerning Step 1 and Step 2 CK								
Is Step 1 timing after clerkships mandatory or flexible?[c]	Flexible: Students may opt to take Step 1 after the basic science year. Most students (~99%) take the exam early or midway through the M3 (research) year	Mandatory right after clinical clerkships	Mandatory after clinical clerkships	Mandatory right after clinical clerkships	Mandatory right after clinical clerkships	Flexible: Students may opt to take Step 1 after the basic science curricula or after clerkships. Most (~80%) take it early	Mandatory after clinical clerkships, but timing varies. Must be completed by December of M4 year	Mandatory after clinical clerkships, but timing varies. Must be completed by May of M3 year
How long is the Step 1 study period?	4 weeks and more time available during M3 research year	4–6 weeks	6–8 weeks	5–6 weeks, more if vacation time is used	6 weeks, more if vacation/elective time is used	6 weeks, more if use vacation/elective time is used	6 weeks, more if vacation/elective time is used	6–8 weeks

(Table continues)

Table 1
(Continued)

Characteristic	Duke University School of Medicine	Perelman School of Medicine at the University of Pennsylvania	New York University School of Medicine	Uniformed Services University of the Health Sciences	Vanderbilt University School of Medicine	Weill Cornell Medical College	Yale University School of Medicine	University of Michigan School of Medicine
Do you offer any Step 1 study aids?	Yes: • Access to question bank and associated practice exams	No	No	Yes: • Provide one CBSSA exam token • Spaced repetition • Access to question bank and associated practice exams	Yes: • Provide one CBSSA exam token	Yes: • Provide one CBSSA exam token	Yes: • Provide one CBSSA exam token	Yes: • Provide one CBSSA exam token • Spaced repetition
When do students take Step 2 CK?	By December of M4 year	By December of M4 year	Before or after Step 1, by March of M4 year	By September of M4 year	By February of M4 year	By December of final (M3 or M4) year	Before or after Step 1, by December of M4 year	Before or after Step 1, by December of M4 year
Do your students need to pass Step 1 and 2 to graduate?	No	Yes	Yes	Yes	No	No	Yes	Yes

Abbreviations: USMLE indicates United States Medical Licensing Examination; NBME, National Board of Medical Examiners; CBSE, Comprehensive Basic Science Exam; EBM, evidence-based medicine; CK, clinical knowledge; M3 / M4, medical school year 3 and 4; CBSSA, Comprehensive Basic Science Self-Assessment.
[a]Information based on 2016 entering students; policies may have changed over time.
[b]Length of basic science and clinical curricula in weeks not including vacations.
[c]For medical degree students only (timing is different for MD/PhD students).

than ever before. The majority completed Step 2 CK prior to the submission of their data to the Electronic Residency Application Service in mid-September. Most schools require passing both Step 1 and Step 2 as a prerequisite for graduation. Although some schools have expressed concerns about stacking USMLE Step 1 and Step 2 CK close together, this has not, in our experience, been a significant issue. Some students have found it helpful to have the option to take both exams in rapid succession or to spread them out.

Outcomes and Lessons Learned

Arguably, the most desirable outcomes of moving Step 1 after the core clerkships are students' deeper mastery and retention of the foundational sciences and integration of basic science and clinical learning, but direct measures of these outcomes are elusive. One measurable objective outcome is performance on Step 1.

Although we do not teach to the USMLE exams, we recognize the importance of Step 1 scores for our students, and we want to ensure noninferiority or improvement in performance with the change in exam timing. At the institutional level, our schools have reported higher mean Step 1 scores after changing the timing of Step 1 to post clerkship. Duke has consistently high Step 1 scores, but they do not have comparison data from before the change, which occurred more than 20 years ago. The University of Pennsylvania overhauled its curriculum in 1996, and their students have consistently demonstrated mean scores 20 points above their pretransformation average. New York University has 4 years of data, showing an average 7- to 12-point improvement in mean scores, with the smallest change occurring the first year after the transformation. Notably, they report that their MD/PhD candidates, who may serve as an internal control group, take the exam directly after the basic sciences. This group, while scoring above the national average, does not score as highly as the students who take it later. The Uniformed Services University of the Health Sciences has 3 years of data demonstrating improved Step 1 scores. This was manifest by an 11-point improvement the first year after the change, a 13-point improvement in the second year, followed by a slight (1- to 2-point) return toward baseline in the

third year, but still with aggregate scores remaining higher than the historical baseline. Vanderbilt has 1 year of data. Acknowledging that scores fluctuate from year to year, they compared the single year (postclerkship Step 1 mean) against the average performance over the prior 4 years of data. The mean score improved by 9 points. They reported "cautious optimism" with this delta, suggesting that students may have been nervous about the change, and hence more motivated in their studies. At Weill Cornell, students may choose to take Step 1 either before or after the core clerkships. For the first 2 years of the new curriculum, approximately 80% opted to take the exam during the "traditional" time immediately following the basic science curriculum. Scores are still pending for students who opted to take the exam after clerkships. Yale and the University of Michigan do not yet have their first year of data.

There are other unintended outcomes to moving Step 1 or offering a choice of timing. For example, a lesson learned from Weill Cornell's experience was that allowing students autonomy concerning when to take the exam resulted in a notable increase in anxiety. Students worried that they were making a choice in the absence of clear data that might significantly impact their performance and possibly career plans. Students tended to fall back on tradition, choosing to take the exam early. Duke also offers flexibility in the timing of the exam, but their longer experience with taking the exam after the core clerkships leads ~99% of students to take the exam late. At Vanderbilt, students were concerned that they might decide on a particular specialty, then need to reconsider their career choices relatively late if their Step 1 score was not competitive, and thus their candidacy for certain residency positions was not as strong as they might have otherwise anticipated. Although the scores may be somewhat predictable, based on prior performance (i.e., basic science class cumulative scores, CBSE and NBME shelf exam scores), the fact remains that a small number of students may be confronted with a real limitation.

Discussion and Next Steps

The optimal timing of Step 1 has yet to be determined, but an increasing number of medical schools are starting to deviate from tradition, and early outcomes from

our institutions are promising. As new schools develop, and older institutions undergo curriculum transformation, they might carefully consider where to place Step 1 to align best with their pedagogical aims, rather than simply following the status quo. If major goals for learning include fostering retention of basic science knowledge and the integration of basic and clinical science, then placement of Step 1 after the core clerkships may help drive this process by tapping into student motivation.

A few institutions (i.e., Duke and the University of Pennsylvania) moved the timing of Step 1 many years ago, but most institutions have implemented this change relatively recently. One might question why there is this seemingly sudden trend to move the timing of Step 1 as represented by our eight schools and others (Appendix 1). Perhaps schools now feel they have a "morsel of permission" to follow others, or perhaps the centennial Flexner Report is pushing schools to change. In *Educating Physicians: A Call for Reform of Medical School and Residency*, Cooke et al[13] emphasize the need to strengthen the connections between formal and experiential knowledge, by providing more clinical exposure earlier in medical school, and more opportunities for deep science learning later in training. This notable work has prompted rethinking of many major structural and architectural aspects of medical curricula, of which Step 1 timing is one.

In their plea to reassess the role of USMLE Step 1 scores on residency selection, Prober et al[14] noted: "Because students recognize the high stakes of USMLE, they prioritize learning what they believe to be important for the test during their preclerkship courses. They are emotionally stressed about perceived disconnects between what they need to learn for the test and what they need to know to care for their patients and prepare for lifelong learning." Repositioning Step 1 may help students connect the basic sciences to patient care and shift the focus in the preclerkship years away from memorization of facts, toward developing habits of learning that will prompt them to ask deep scientific questions when confronted with complex patient problems. Of course, a change in Step 1 timing alone is not sufficient to overcome a curriculum in which

these connections are not modeled and reinforced in other ways. This is why we firmly believe that other structural changes should accompany the change in Step 1 timing, though a discussion of such changes is outside the scope of this article.

For institutions concerned about student performance on Step 1, our collective experience suggests noninferiority, if not slight improvement, when Step 1 is placed after clerkships.

Our current outcomes data are aggregate and not amenable to statistical analysis. Thus, they should be interpreted with caution. To date, we have not looked at the effect of the change in Step 1 timing on residency match rates, but this is another avenue for future exploration.

It seems logical that a year of clinical training may improve student performance on clinically based vignettes. The modest rise in scores may be further influenced by students' total time on task. Although most institutions that change the timing of Step 1 also shorten the preclerkship curriculum, students generally spend between 6 and 12 additional months learning medicine before taking the exam.

One concern amongst educators about delaying Step 1 is that students may lose a needed opportunity to consolidate basic science knowledge before clerkships and may not be as prepared for clerkships, potentially leading to poorer scores on NBME clinical subject exams, which many schools use as a measure of clerkship performance. Specifically, there is a concern for the effect on struggling students. The changes in aggregate scores that we report say nothing about low-performing students compared with high-performing students. In the future, we plan to study both class-based and individual student metrics to further characterize these potentially important effects.

Other factors complicate the interpretation of the improved Step 1 scores: There has been a slow but steady increase in national Step 1 averages.[15] From 2009 to 2015, mean scores increased from 221 to 229, with incremental changes of 0 to 3 points per year. Taking this into account, the deltas we report are likely smaller but still appear to show increases slightly

above overall trends. Another factor that influences interpretation of these outcomes is the measurement error of the USMLE. This provides an index of the imprecision for the examination, making these differences of unclear significance.[16]

Our observations have other limitations. Our institutions are not representative of all schools in terms of geographic representation, rankings, or baseline USMLE scores. The majority of these eight schools' mean USMLE scores before the change were above the national average, and failure rates were in the range of 0% to 4%. We do not know how a change in Step 1 timing would affect schools with significantly lower mean Step 1 scores and higher failure rates. Although our experiences may not be generalizable, we have attempted to provide as much information as possible about our curricular structures to make our experiences transferable. Finally, we should note that the outcomes on USMLE Step 1 scores reported in association with changing Step 1 timing are potentially confounded, as we are unable to separate the effects of changing the timing of Step 1 from the effects of other curricular transformations simultaneously occurring at our institutions.

Concluding Remarks

This article summarizes our eight institutions' experience with moving the timing of Step 1 after the core clerkships, filling an important gap in the literature. Early outcomes are promising, and as such, the practice warrants further investigation.

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Appendix 1
Logistics of the Preclerkship Curricula, Clinical Curricula, and Step 1 and 2 Examinations at Additional Schools Where the United States Medical Licensing Examination Step 1 Is After Core Clerkships[a]

Characteristic	Baylor College of Medicine	Columbia University College of Physicians and Surgeons	Herbert Wertheim College of Medicine of Florida International University	Western Michigan Homer Stryker M.D. School of Medicine	Frank H. Netter MD School of Medicine at Quinnipiac University	Harvard Medical School	Dell Medical School at University of Texas, Austin	Stony Brook University School of Medicine
When did you move Step 1 timing after the clinical year?	Class of 2001	Class of 2013	Class of 2013 (inaugural class)	Class of 2018 (inaugural class)	Class of 2019	Class of 2019	Class of 2020 (inaugural class)	Class of 2020
Details of the preclerkship curricula								
What is the length of the basic science curriculum?[b]	56 weeks	57 weeks	73 weeks	73 weeks	64 weeks	54 weeks	47 weeks	56 weeks
How are organ systems taught?	Two pass (sequential normal followed by abnormal)	Single pass (normal taught simultaneously with abnormal)	Two pass (sequential normal followed by abnormal)	Single pass (normal taught simultaneously with abnormal)	Two pass (sequential normal followed by abnormal)	Single pass (normal taught simultaneously with abnormal)	Two pass (sequential normal followed by abnormal)	Single pass (normal taught simultaneously with abnormal)
What type of grades do you assign in the preclerkship years?	Pass/Fail	Pass/Fail	Numeric grades	Pass/Fail	Pass/Fail	Satisfactory/ Unsatisfactory	Pass/Fail	Honors/Pass/Fail
Do you use NBME basic science subject exams?	No	No	No	Yes	No	No	No	Yes
Do you offer the CBSE exam at the end of the basic science curriculum?	Yes, passing score required to enter clerkships	No	No	Yes, offered a total of 4 times as a progress test	Yes	No, but offer a similar Step 1 substitute that is homegrown	Yes, offered a total of 4 times as a progress test	No
Details of the clinical curricula								
What is the length of the core clinical curriculum?[b]	52 weeks	48 weeks	48 weeks	48 weeks	42 weeks	48 weeks	46 weeks	48 weeks
What types of grades do you assign during core clerkships?	Honors, High Pass, Pass, Fail	Honors, High Pass, Pass, Fail	Numeric grades and Honors, Near Honors, Pass, Fail	Honors, Pass, Fail	Honors, High Pass, Pass, Fail	Pass, Unsatisfactory	Honors, Pass, Fail	Honors, High Pass, Pass, Low Pass, Fail
Do you use NBME clinical subject "shelf" exams in clerkships?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

(Appendix continues)

Appendix 1
(Continued)

Characteristic	Baylor College of Medicine	Columbia University College of Physicians and Surgeons	Herbert Wertheim College of Medicine of Florida International University	Western Michigan Homer Stryker M.D. School of Medicine	Frank H. Netter MD School of Medicine at Quinnipiac University	Harvard Medical School	Dell Medical School at University of Texas, Austin	Stony Brook University School of Medicine
What are examples of basic science integration during core clerkships?	Didactics in clerkships, online sessions, attending rounds	Didactics in clerkships, online sessions, attending rounds	Integrated longitudinal basic science threads in clerkship didactics or online modules, "core concepts in clinical medicine" (1 day, 2–3 times per clerkship for basic science PBL)	Didactics in clerkships, small-group case-based discussions, attending rounds	Flex weeks (3-week-long sessions that bring back narrative medicine, ethics, professionalism, and research methods/informatics)	Didactics in clerkships, attending rounds, specific emphasis on evidence-based medicine when ordering and interpreting tests	Spaced repetition/retrieval practice of basic science content	Didactics in clerkships, 1-week translational pillar at the conclusion of each 12-week block of clerkships, small-group case-based discussions, attending rounds
Details concerning Step 1 and Step 2 CK								
Is Step 1 timing after clerkships mandatory or flexible?[c]	Mandatory right after clinical clerkships	Mandatory right after clinical clerkships	Flexible (but only 2 students have ever taken it early—almost all take after clerkships)	Mandatory right after clinical clerkships	Flexible, rotating: Students take Step 1 during 1 of 7 blocks of third year, so some will take right after second year and some at end of third year	Mandatory right after clinical clerkships	Mandatory right after clinical clerkships	Mandatory right after clinical clerkships
How long is the Step 1 study period?	8 weeks	8 weeks	4–5 weeks with option of additional 4	5 weeks	6 weeks		Optional 4–8 weeks (hope with progress test that some students will recognize fully prepared and don't need a study period)	Flexible depending upon student's need; 4–8 weeks is typical, but there is the option for up to 4 weeks of additional time

(*Appendix continues*)

Appendix 1
(Continued)

Characteristic	Baylor College of Medicine	Columbia University College of Physicians and Surgeons	Herbert Wertheim College of Medicine of Florida International University	Western Michigan Homer Stryker M.D. School of Medicine	Frank H. Netter MD School of Medicine at Quinnipiac University	Harvard Medical School	Dell Medical School at University of Texas, Austin	Stony Brook University School of Medicine
Do you offer any Step 1 study aids?	Yes: • Provide one CBSSA token • Spaced repetition	Yes: • Provide one CBSSA token	Yes: • Provide one CBSSA token • Access to question bank and associated practice exams	Yes: • Provide one CBSSA token	Yes: • Provide one CBSSA token • Access to question bank and associated practice exams	No	Yes: • Spaced repetition	No
When do students take Step 2 CK?	By September of M4 year	Before or after Step 1, by November of M4 year	Before or after Step 1, by September of M4 year	After Step 1, by October of M4 year	TBD but after Step 1 within the M4 year	No later than December of graduation year	Before or after Step 1, by December of M3 year	After Step 1, by December of M4 year
Do your students need to pass Step 1 and 2 to graduate?	Yes	Step 1 but not Step 2	Yes	Yes	Yes	Yes	Yes	Yes
What is the length of the core clinical curriculum?[b]	52 weeks	48 weeks	48 weeks	48 weeks	42 weeks	48 weeks	46 weeks	48 weeks

Abbreviations: NBME indicates National Board of Medical Examiners; CBSE, Comprehensive Basic Science Exam; PBL, problem-based learning; CK, clinical knowledge; TBD, to be determined; CBSSA, Comprehensive Basic Science Self-Assessment; M3 / M4, medical school year 3 and 4.
[a]Information based on 2016 entering students; policies may have changed over time.
[b]Length of basic science and clinical curricula in weeks not including vacations.
[c]For medical degree students only (timing is different for MD/PhD students).