Association of Third-Year Medical Students’ First Clerkship With Overall Clerkship Performance and Examination Scores

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A NECTODAL EXPERIENCE AT THE University of Illinois College of Medicine has led to a common assumption that third-year medical students whose first clerkship is internal medicine generally are more efficient, have a higher degree of clinical understanding, and perform better in their subsequent clerkships. Taking the internal medicine clerkship first has been the strong recommendation of department heads1,2 and the preference of students (Loren Zech, MD, Washington Hospital Center, Washington, DC, written communication, August 2009). During academic year 2002-2003, the clinical faculty considered changing the clerkship sequence to provide all students with an early internal medicine experience. In evaluating this curricular change, a review of the literature did not provide sufficient evidence regarding the influence of early internal medicine exposure on student performance.

Studies have demonstrated the importance of clerkship sequence on aspects of performance in select clerkships,3,6 and their findings support that students perform better on subject examinations as they progress through the academic year.3,4 In recognition of these findings, the National Board of Medical Examiners changed its method of reporting score analyses to students and administrators according to the quarter in which the examination was taken during the academic year. Reports now include different national mean information for each quarter of the academic year.

Context Anecdotal experience has suggested that third-year medical students whose first clerkship is internal medicine may have superior performance throughout the academic year.

Objective To determine whether the order of clerkships by specialty is associated with student performance.

Design, Setting, and Participants Clerkship performance records of medical students at all 4 campuses of the University of Illinois College of Medicine who completed their third-year core clerkships from July 2000 through June 2008 (N=2236) were reviewed.

Main Outcome Measures Analysis of covariance was used to test for between-group differences (by first clerkship) in mean National Board of Medical Examiners subject examination scores (range, 0-100), preceptor ratings of clerkship clinical performances (range, 12-30), total overall clerkship grades (range, 12-30), and United States Medical Licensing Examination (USMLE) Step 2 scores, adjusted for sex, campus, and USMLE Step 1 score.

Results First clerkship specialty was significantly associated with mean subject examination scores (family medicine, 71.96 [95% confidence interval (CI), 70.90-72.98], internal medicine, 73.86 [95% CI, 73.33-74.39], obstetrics/gynecology, 72.36 [95% CI, 71.64-73.04], pediatrics, 73.11 [95% CI, 72.38-73.84], psychiatry, 72.17 [95% CI, 71.52-72.81], surgery, 72.37 [95% CI, 71.73-73.02]; P.<.001) and overall clerkship grades (family medicine, 24.20 [95% CI, 23.90-24.90], internal medicine, 25.33 [95% CI, 25.07-25.60], obstetrics/gynecology, 24.68 [95% CI, 24.32-25.05], pediatrics, 24.92 [95% CI, 24.59-25.27], psychiatry, 24.61 [95% CI, 24.33-25.01], surgery, 24.97 [95% CI, 24.64-25.30]; P=.01). There was no significant association with preceptor ratings or USMLE Step 2 scores. Pairwise comparisons for mean total overall clerkship grades showed a significant difference for students taking internal medicine first compared with obstetrics/gynecology (mean difference, 0.65; 95% CI, 0.18-1.12), psychiatry (mean difference, 0.66; 95% CI, 0.20-1.12), and family medicine (mean difference, 0.93; 95% CI, 0.37-1.50).

Conclusion Among students at 4 campuses of a US medical school, clerkship order was significantly associated with performance on clerkship subject examinations and overall grades but not with clerkship clinical performance or USMLE Step 2 scores.

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demic year so that medical schools may factor in the experience of the student as he or she progresses in the curriculum.7

Although research supports that students perform better in clerkship examinations later in the year, we are not aware of any studies that have addressed whether knowledge is gained as a result of a certain clerkship specialty. According to reported experience, we hypothesized that knowledge gained in the internal medicine clerkship may improve performance in later clerkships. We therefore assessed whether there is an association between first clerkship specialty and overall performance throughout the third-year clerkship sequence.

METHODS

This retrospective study was approved for exemption by the University of Illinois institutional review board. Records of third-year clerkship performance were reviewed from July 2000 through June 2008. During this period, 2236 students who completed all 6 core clerkships (internal medicine, family medicine, surgery, pediatrics, psychiatry, and obstetrics/gynecology) were identified for study inclusion. Of the 2236, 20 did not have USMLE Step 1 scores available in the data record and were excluded from all explanatory models. Data on student performance were obtained from all 4 campuses of the University of Illinois College of Medicine (Chicago, Peoria, Rockford, and Urbana).

Characterization of Student Groups

Each of the campuses differs in its core mission, and the diversity of medical students and large student body size allowed for assessing associations with first clerkship among a broad population. For example, at the Urbana campus 85% of the students are members of the dual-degree MD/PhD program; they typically enter the medical school curriculum full time at the beginning of their second year of medical school after completing the graduate degree, which may alter their performance in their clerkships. At the Rockford campus, the rural medicine program (emphasizing primary care) is a large part of the curriculum. In Chicago, underrepresented minority students account for 25% of the student body, related to the urban health program. In each campus, there are also a large number of traditional-track students.

Description of Core Clerkships

The internal medicine core clerkship at all campuses lasts 12 weeks, with an average of 66% inpatient training. There are typically 15 hours per week of formal instruction. Pediatrics, obstetrics/gynecology, psychiatry, and surgery are all 8 weeks, with 50% or more of the time spent in the inpatient setting. Formal instructional hours within each of these 4 core clerkships are similar, averaging 8 hours per week. The greatest variation across the campuses occurs during the family medicine clerkship: students train from 4 to 6 weeks, spending on average 80% of their time in the ambulatory setting and 6 hours per week in formal instruction. All clerkships require students to maintain a patient log that details their required clinical encounters for each specialty. Faculty members on college-wide curriculum committees oversee the comparability of clerkship experiences across the 4 campuses.

Clerkship Assignments

Initial clerkship order was assigned differently among the campuses. In 2 campuses (comprising 25% of the participants), there was a lottery after completion of the second academic year, in which students could select their clerkship sequence order. In 1 campus (comprising 58% of the participants), there was a lottery system that placed students in preset tracks that included different clerkship specialty orders paired with various institutions. In 1 campus (comprising 17% of the participants), there was administrative assignment, taking into account student submitted requests. At all campuses, a small number of students who delayed beginning clerkships may have entered the clerkship sequence in a nonrandom way, depending on availability of clerkship positions. Those students were determined to compose less than 2% of the student body.

Data Collection

Academic records were reviewed to obtain the order of clerkship specialty and performance on the United States Medical Licensing Examination (USMLE) Step 1 test. For each clerkship, the preceptor categorical grade of students’ clinical performance (converted to a 2- to 5-point scale), subject examination score (range, 0-100), and the final overall clerkship grade awarded (a combination of these scores weighted two-thirds clinical performance and one-third subject examination) were ascertained. For the study, initial clinical clerkship grade and first subject examination performance were included in all analyses for any student with more than 1 attempt at a clerkship or subject examination. The analyses reflected the grading procedure used by the College of Medicine to calculate the final overall clerkship grade, which included conversion of the initial preceptor letter grade to a numeric score, combination with numeric subject examination score, and conversion of total combined score back to a letter grade (Table 1).

For analyses, clerkship grades and clinical performance scores were converted from an ordinal score system of “unsatisfactory,” “proficient,” “advanced,” and “outstanding” to a numeric score of 2, 3, 4, or 5. These scores were scaled in proportion to the university scale for ease of interpretation. Although the university assigned 0 points to unsatisfactory grades, the analysis converted this to 2 points to limit the effect of this clerkship grade when placed along the relative scale of 3 to 5 used for the remaining grade categories. Only 5 “unsatisfactory” grades were earned among any of the participants in the study. For study inclusion, each student had to have completed all 6 clerkships, so no incompletes were present among the student
population. For the purposes of this study, a total clinical performance score and total overall grade were created by summing the 6 numeric scores of all 6 clerkships, creating a possible score of 12 to 30 points for each. A mean subject examination score was created by totaling all 6 specialty subject examinations and dividing by 6 to create a possible score ranging from 0 to 100.

**Statistical Analysis**

Preliminary analyses, including 1-way analysis of variance and χ² tests, were used to evaluate differences in the baseline characteristics of students enrolled in each first clerkship group, including sex, USMLE Step 1 score, and campus of attendance. To evaluate the overall association with a student’s first clinical clerkship, analysis of covariance was used to test for between-groups mean differences in subject examination scores, preceptor ratings on clerkship performance, overall clerkship grade, and USMLE Step 2 scores as a function of initial clerkship specialty while controlling for continuous variables (USMLE Step 1 score) and categorical variables (campus and sex). The Levene test for equality of variance was used to test the assumption of homogeneity of variance. Sum of squares type III tests were used in all calculations of statistical significance of analysis of covariance model variables to allow for the assessment of the addition of each factor/covariate to the model. Analysis of covariance models were evaluated with inclusion of second-order interaction terms, but because of minimal significance of interaction (of only 2 interaction terms in any of the 4 models) and an overall decrease in model fit, these interactions were not kept in the final models.

After determination that a significant association existed between first clerkship and both subject examination and overall clinical grades, pairwise analyses with t tests with Bonferroni correction were completed to assess the mean difference in subject examination scores and overall clerkship grades for each possible pair of first clerkship rotations.

Statistical analyses were performed with SAS, version 9.2 (SAS Institute, Cary, North Carolina). All statistical tests were 2-sided, with an α of .05 for analysis of variance and analysis of covariance analyses, and Bonferroni-corrected α of .003 for pairwise analyses.

**RESULTS**

There were significant differences in baseline characteristics among the students in each first clerkship group (Table 2). Relatively fewer men were enrolled in family medicine and surgery and relatively more in pediatrics and obstetrics/gynecology (χ²[3] = 14.5; P = .01). The distribution of first clinical clerkship specialties was significantly different among the 4 campuses (χ²[3] = 146.3; P < .001). USMLE Step 1 scores were not significantly different by campus. However, there were significant differences across campuses for mean (SD) total clinical grade (26.0 [2.2], 26.5 [1.9], 26.7 [2.2], 27.5 [2.0]; F₃,₇₅₈ = 33.17; P < .001), mean subject examination scores (72.3 [6.6], 72.6 [6.4], 73.4 [6.4], 74.7 [6.8]; F₃,₇₅₈ = 6.61; P < .001), total overall clerkship grade (24.4 [3.4], 25.2 [3.2], 26.0 [2.8]; F₃,₇₅₈ = 11.8; P < .001).

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### Table 1. University of Illinois Third-Year Core Clerkship Grade Scale

<table>
<thead>
<tr>
<th>Subject Examination</th>
<th>Final Grade Conversion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Score (0–100)</td>
<td>Grading Conversion</td>
</tr>
<tr>
<td>0–61</td>
<td>0</td>
</tr>
<tr>
<td>62–68</td>
<td>2</td>
</tr>
<tr>
<td>69–73</td>
<td>3</td>
</tr>
<tr>
<td>74–81</td>
<td>4</td>
</tr>
<tr>
<td>≥82</td>
<td>6</td>
</tr>
</tbody>
</table>

**Grade Point Conversion**

- Unsatisfactory: 0
- Proficient: 6
- Advanced: 8
- Outstanding: 10

**Total Score and Final Grade**

- Unsatisfactory: 0–6
- Proficient: 6–8
- Advanced: 8–11
- Outstanding: 10–14

Abbreviation: NA, not applicable.

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### Table 2. Characteristics of Study Population by First Clerkship

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Family Medicine (n = 205)</th>
<th>Internal Medicine (n = 800)</th>
<th>Obstetrics/Gynecology (n = 334)</th>
<th>Pediatrics (n = 365)</th>
<th>Psychiatry (n = 350)</th>
<th>Surgery (n = 377)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>USMLE Step 1 score, mean (SD) [range]</strong></td>
<td>214.6 (26.8) [156-264]</td>
<td>215.6 (22.6) [151-267]</td>
<td>214.7 (24.1) [137-265]</td>
<td>214.3 (24.6) [139-272]</td>
<td>212.1 (24.0) [139-268]</td>
<td>211.5 (23.2) [130-263]</td>
</tr>
<tr>
<td><strong>Male sex, No. (%)</strong></td>
<td>111 (54.1)</td>
<td>334 (55.2)</td>
<td>204 (61.1)</td>
<td>215 (58.9)</td>
<td>184 (52.6)</td>
<td>183 (48.5)</td>
</tr>
</tbody>
</table>

Abbreviation: USMLE, United States Medical Licensing Examination.

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Table 3. Descriptive Outcome Measures by First Clerkship (n = 2216)\textsuperscript{a}

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Family Medicine (n = 194)</th>
<th>Internal Medicine (n = 603)</th>
<th>Obstetrics/Gynecology (n = 332)</th>
<th>Pediatrics (n = 362)</th>
<th>Psychiatry (n = 348)</th>
<th>Surgery (n = 377)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subject examination score\textsuperscript{b}</td>
<td>71.96 (70.90-72.98)</td>
<td>73.98 (73.35-74.39)</td>
<td>72.36 (71.64-73.04)</td>
<td>72.11</td>
<td>72.17</td>
<td>72.57</td>
</tr>
<tr>
<td>Total overall grade\textsuperscript{c}</td>
<td>24.20 (23.90-24.90)</td>
<td>25.33 (24.32-25.05)</td>
<td>24.92 (24.59-25.27)</td>
<td>24.61</td>
<td>24.61</td>
<td>24.97</td>
</tr>
<tr>
<td>USMLE Step 2 score</td>
<td>214.73 (211.61-218.70)</td>
<td>219.93 (218.02-221.86)</td>
<td>217.67 (214.86-221.66)</td>
<td>218.90</td>
<td>217.34</td>
<td>218.12</td>
</tr>
</tbody>
</table>

Abbreviations: CI, confidence interval; USMLE, United States Medical Licensing Examination.
\textsuperscript{a}For the students included in the final analysis of covariance analyses. Step 1 scores were not available for 20 students, whose data were excluded.
\textsuperscript{b}Possible range, 0 to 100.
\textsuperscript{c}Possible range of points, 12 to 30.

Table 4. Analysis of Covariance Models for Prediction of Mean Subject Examination Scores, Total Clinical Grades, Total Overall Grades, and USMLE Step 2 Scores (n = 2216)

<table>
<thead>
<tr>
<th>Predictors</th>
<th>Outcome</th>
<th>Mean (95% CI), by First Clerkship</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>First Clerkship, SS (F\textsuperscript{1})</td>
<td>Sex, SS (F\textsuperscript{1})</td>
</tr>
<tr>
<td></td>
<td>F value</td>
<td>P value</td>
</tr>
<tr>
<td>Mean subject examination score</td>
<td>0.63</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Total clinical grade</td>
<td>29.6 (1.5)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Total overall grade</td>
<td>86.9 (3.2)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>USMLE step 2 score</td>
<td>2317.2 (1.77)</td>
<td>&lt;.001</td>
</tr>
</tbody>
</table>

Abbreviations: SS, type III sum of squares; USMLE, United States Medical Licensing Examination.
CLERKSHIP ORDER AND EXAMINATION SCORES

Table 5. Paired Comparisons Between First Clerkship Groups for Differences in Mean Subject Examination Scores and Total Overall Grades (n = 2216)

<table>
<thead>
<tr>
<th>First Clerkships Compared</th>
<th>No. of Students</th>
<th>Difference in Subject Scores, Mean (95% CI)</th>
<th>Difference in Overall Grades, Mean (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>IM-Pediatrics</td>
<td>965</td>
<td>0.75 (−0.04 to 1.54)</td>
<td>0.41 (−0.05 to 0.86)</td>
</tr>
<tr>
<td>IM-Surgery</td>
<td>980</td>
<td>1.49 (0.71 to 2.27)</td>
<td>0.36 (−0.09 to 0.81)</td>
</tr>
<tr>
<td>IM-Ob/Gyn</td>
<td>935</td>
<td>1.52 (0.71 to 2.34)</td>
<td>0.65 (0.18 to 1.12)</td>
</tr>
<tr>
<td>IM-Psychiatry</td>
<td>951</td>
<td>1.69 (0.89 to 2.49)</td>
<td>0.66 (0.20 to 1.12)</td>
</tr>
<tr>
<td>IM-FM</td>
<td>797</td>
<td>1.90 (0.92 to 2.88)</td>
<td>0.93 (0.37 to 1.50)</td>
</tr>
<tr>
<td>Pediatrics-Surgery</td>
<td>739</td>
<td>0.74 (−0.13 to 1.62)</td>
<td>−0.04 (−0.55 to 0.46)</td>
</tr>
<tr>
<td>Pediatrics-Ob/Gyn</td>
<td>694</td>
<td>0.78 (−0.13 to 1.68)</td>
<td>0.24 (−0.27 to 0.77)</td>
</tr>
<tr>
<td>Pediatrics-Psychiatry</td>
<td>710</td>
<td>0.95 (0.05 to 1.84)</td>
<td>0.26 (−0.26 to 0.76)</td>
</tr>
<tr>
<td>Pediatrics-FM</td>
<td>556</td>
<td>1.16 (0.10 to 2.21)</td>
<td>0.53 (−0.08 to 1.13)</td>
</tr>
<tr>
<td>Surgery-Ob/Gyn</td>
<td>709</td>
<td>0.03 (−0.86 to 0.93)</td>
<td>0.29 (−0.23 to 0.80)</td>
</tr>
<tr>
<td>Surgery-Psychiatry</td>
<td>685</td>
<td>0.21 (−0.68 to 1.09)</td>
<td>0.30 (−0.21 to 0.81)</td>
</tr>
<tr>
<td>Surgery-FM</td>
<td>531</td>
<td>0.41 (−0.64 to 1.46)</td>
<td>0.57 (−0.03 to 1.17)</td>
</tr>
<tr>
<td>Ob/Gyn-Psychiatry</td>
<td>680</td>
<td>0.17 (−0.74 to 1.08)</td>
<td>0.01 (−0.51 to 0.54)</td>
</tr>
<tr>
<td>Ob/Gyn-FM</td>
<td>526</td>
<td>0.38 (−0.69 to 1.45)</td>
<td>0.28 (−0.34 to 0.90)</td>
</tr>
<tr>
<td>Psychiatry-FM</td>
<td>542</td>
<td>0.21 (−0.86 to 1.27)</td>
<td>0.27 (−0.34 to 0.88)</td>
</tr>
</tbody>
</table>

Abbreviations: CI, confidence interval; FM, family medicine; IM, internal medicine; Ob/Gyn, obstetrics/gynecology.

Possible range, 0 to 100.

Possible range, 12 to 30 (2-5 points for each of 6 clerkships).

Significant at P < .003.

0.66; 95% CI, 0.20–1.12), or family medicine (mean difference, 0.93; 95% CI, 0.37–1.50). No other significant differences were observed when any 2 first clerkship groups' performances were compared.

COMMENT

This study provides evidence that third-year medical student performance as assessed by subject examination and overall grade is associated with the first clinical clerkship. In particular, the strongest associations appear to be with internal medicine as the initial clerkship, followed by pediatrics. Issues to be considered in interpreting these findings include their plausibility, the magnitude of identified differences, the generalizability of the findings, and the potential implications for curriculum and student assessment.

The positive association between initial internal medicine clerkship experience and subject examination performance throughout the clerkship sequence may reflect general understanding of internal medicine concepts, providing a fundamental basis for medical knowledge in all clinical disciplines. Having taken the internal medicine clerkship, students may have the basic understanding of these concepts and an advantage in standardized examination performance thereafter. The smaller association of pediatrics as first clerkship with subject examination scores vs psychiatry and family medicine may be due to the overlap of core medicine attributes found within the pediatrics clerkship. The lack of association of first clerkship specialty with overall clinical performance may indicate that these skills are learned similarly, whatever the first clerkship.

Students completing the training program graduated with an equivalent clinical knowledge base, as measured by USMLE Step 2 scores and clinical skills evaluation, regardless of first clerkship specialty. Although the result may be the same, intermediate measurements of progress (clerkship grades) may nevertheless be affected by clerkship sequence. A difference of 1.5 to 2 points in mean subject examination scores may appear small, but because it occurs near the 73-point cutoff, it can make the difference between a grade of “advanced” or “outstanding” (Table 1), which is supported by comparing the difference of nearly 1 clerkship grade in a single clerkship during the year between internal medicine and obstetrics/gynecology, internal medicine and psychiatry, and internal medicine and family medicine (Table 5). We hypothesize that the association may be more concentrated in subject examinations early in the academic year in the absence of internal medicine experience than in later clerkships, in which basic knowledge of internal medicine has been accumulated throughout the year through other clerkships. If so, the individual clerkship grades may be more affected than shown in a mean summary score.

Concerns about clerkship sequence and the effect of the internal medicine clerkship on subsequent clerkships is not unique to our institution. Other medical schools have also discussed the relationship in written communications, including the Medical College of Wisconsin (James Sebastian, MD, Dean’s Educational Innovation Advisory Committee, May 2010), the University of Missouri School of Medicine (Michael Hosokawa, EdD, Department of Family and Community Medicine, May 2010), the University of Nebraska Medical School (Gary Beck, MA, Undergraduate Medical Education coordinator, Department of Pediatrics, May 2010), Creighton University School of Medicine (Bruce Houghton, MD, Inpatient Internal Medicine Clerkship director, June 2010), Wright State Boonshoft School of Medicine (Karen Kirkham, MD, Undergraduate Medical Education vice-chair, June 2010), and Michigan State University (Brian Mavis, PhD, Medical Education Research and Development director, June 2010). Nevertheless, the generalizability of these findings to other institutions should be considered.

Because of the combination of diverse campuses, the University of Illinois may not represent a typical medical school. However, medical schools are expanding to meet societal needs; many are doing so by opening 4-year branch campuses. It is also possible that the findings represent an
assessments.12-17,19 The study would benefit from replication at other schools with a more traditional student population base and different grading systems.

This study has potential implications for the student evaluation process and for optimizing the curriculum. Previous studies acknowledge students’ interest in selecting third-year clinical training experiences that provide active learning opportunities20 and transitions from classroom to clinic.21 From a pragmatic perspective, students commonly seek an advantage in pursuing their studies to ensure they achieve their personal performance goals. These goals may include securing a highly competitive residency position, induction in Alpha Omega Alpha honor society, or graduation with honors. This study suggests that student lore indicating that the most desirable clerkship order involves taking internal medicine first may indeed be substantiated with available data, student performance in the clinical setting and in other institutions may help provide optimal experiences for students.

Regarding curriculum structure, it is not feasible to place all students in the internal medicine clerkship first. However, the primary finding of this study suggests that specific components found within the internal medicine clerkship provide a foundation of knowledge necessary to the understanding of all medical disciplines. It may be of value for medical schools to explore such components, which may include bedside learning, exposure to a variety of cultural and socioeconomic issues, more intense continuity of care, modeling of clinical decision making, understanding the complex clinical picture and its underlying pathology, more didactic clinical sessions, more responsibility in managing patients, and exposure to management and treatment for common medical problems encountered throughout all medical disciplines. These attributes might be leveraged by increasing inpatient medicine–like experiences early in the third year or possibly second year or by providing an introductory course before initiation of clerkships addressing common medical problems, including their management and treatment.

Strengths of this study include that the mechanism for clerkship grading at the University of Illinois is formulaic and consistent across clerkships, as well as across campuses, to ensure that all clerkship training sites within the system use the same criteria and process. Faculty members from each clinical discipline determine a single instrument with criterion-referenced behaviors essential to the discipline. Such uniformity may make it possible to detect effects that also occur in other institutions but would be difficult to assess because of internal variability in grading approaches. The large number of students per year also helped to make the study feasible, and the diversity of student types allowed us to investigate this phenomenon across a broad range of students, a situation that may not exist in a single medical school of similar size.

In addition to issues about generalizability to other institutions, study limitations include the retrospective design and the incomplete randomization of the assignment of clerkship. Student preference may play a role in this process, and, although this effect cannot be quantified with available data, student selection and personal characteristics may preferentially influence their clerkship order selections. The potential direction and influence of these selections is unknown, but we believe that it was minimized by the large degree of randomness in the clerkship order process.

In addition, there was variation in clerkship experience among campuses, despite strong curricular efforts to provide equal experiences across the campuses. Although there are bound to be differences across campuses in the study population, hospital and clinic systems, faculty training, and general experiences, the analysis controlled for these variables by adjusting for campus site and Step 1 score. Finally, as with all observational designs, this study can establish associations but not causality.

CONCLUSION

Among students at 4 campuses of a US medical school, clerkship order was significantly associated with performance on clerkship subject examinations and overall grades, but not with clerkship clinical performance or USMLE Step 2 scores. The success of student clinical performance may be related to factors other than those included within the scope of this study. Additional analyses of student performance in the clinical setting and in other institutions may help provide optimal experiences for students.

Author Contributions: Dr Kies had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

Study concept and design: Kies, Roth, Rowland.

Acquisition of data: Kies, Rowland.

Analysis and interpretation of data: Kies, Roth, Rowland.

Drafting of the manuscript: Kies, Roth, Rowland.

Critical revision of the manuscript for important intellectual content: Kies, Roth, Rowland.

Statistical analysis: Kies, Rowland.

Administrative, technical, or material support: Kies, Roth.

Study supervision: Kies.

Financial Disclosures: None reported.

REFERENCES
