Student Attendance and Academic Performance in Undergraduate Obstetrics/Gynecology Clinical Rotations

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**IMPORTANCE**  Student attendance is thought to be an important factor in the academic performance of medical students, in addition to having important regulatory, policy, and financial implications for medical educators. However, this relationship has not been well evaluated within clinical learning environments.

**OBJECTIVE**  To evaluate the relationship between student attendance and academic performance in a medical student obstetrics/gynecology clinical rotation.

**DESIGN, SETTING, AND PARTICIPANTS**  A prospective cohort study of student attendance at clinical and tutorial-based activities during a full academic year (September 2011 to June 2012) within a publicly funded university teaching hospital in Dublin, Ireland. Students were expected to attend 64 activities (26 clinical activities and 38 tutorial-based activities) but attendance was not mandatory. All 147 fourth-year medical students who completed an 8-week obstetrics/gynecology rotation were included.

**EXPOSURES**  Student attendance at clinical and tutorial-based activities, recorded using a paper-based logbook.

**MAIN OUTCOMES AND MEASURES**  The overall examination score (out of a possible 200 points) was obtained using an 11-station objective structured clinical examination (40 points), an end-of-year written examination comprising 50 multiple-choice questions (40 points) and 6 short-answer questions (40 points), and an end-of-year long-case clinical/oral examination (80 points). Students were required to have an overall score of 100 points (50%) and a minimum of 40 points in the long-case clinical/oral examination (50%) to pass.

**RESULTS**  The mean attendance rate was 89% (range, 39%-100% [SD, 11%], n = 57/64 activities). Male students (84% attendance, \( P = .001 \)) and students who failed an end-of-year examination previously (84% attendance, \( P = .04 \)) had significantly lower rates. There was a positive correlation between attendance and overall examination score (\( r = 0.59 \) [95% CI, 0.44-0.70]; \( P < .001 \)). Both clinical attendance (\( r = 0.50 \) [95% CI, 0.32-0.64]; \( P < .001 \)) and tutorial-based attendance (\( r = 0.57 \) [95% CI, 0.40-0.70]; \( P < .001 \)) were positively correlated with overall examination score. The associations persisted after controlling for confounding factors of student sex, age, country of origin, previous failure in an end-of-year examination, and the timing of the rotation during the academic year. Distinction grades (overall score of \( \geq 60\% \)) were present only among students with attendance rates of 80% or higher. The odds of a distinction grade increased with each 10% increase in attendance (adjusted odds ratio, 5.52; 95% CI, 2.17-14.00). The majority of failure grades (6/10 students; 60%) occurred in students with attendance rates lower than 80%. The adjusted odds ratio for failure with attendance rates of 80% or higher was 0.11 (95% CI, 0.02-0.72).

**CONCLUSIONS AND RELEVANCE**  Among fourth-year medical students completing an 8-week obstetrics/gynecology clinical rotation, attendance at clinical and tutorial-based activities was positively correlated with overall examination scores. Further research is needed to understand whether the relationship is causal, and whether improving attendance rates can improve academic performance.
Student attendance is thought to be an important factor in the academic performance of medical students on the basis that clinical contact and teaching are necessary to develop competence. Student attendance also has wider implications for institutions providing medical education. The educational value of clinical teaching is resource dependent and expensive. Medical schools are increasingly challenged in providing clinical teaching in the face of increasing student numbers. In this context, medical schools must appraise the educational value of attendance at their clinical teaching programs. Medical schools also are accountable by regulatory bodies for the professional performance of their graduates. Student attendance is an integral part of professional development and, from a regulatory perspective, considered evidence of professionalism. These issues present an important challenge for medical schools in terms of defining and implementing attendance policies.

Previous studies evaluating the relationship between attendance and academic performance among medical students have been limited and related to classroom-based lectures only rather than clinical activities. The aim of this study was to evaluate the relationship between student attendance at both clinical and tutorial-based activities and academic performance in a medical student rotation in obstetrics/gynecology (ob/gyn). The hypothesis was that students who attended more activities during the clinical rotation would perform better at the end-of-year examinations.

Methods

Setting

The study was conducted within the Department of Obstetrics and Gynecology, Trinity College, University of Dublin. The undergraduate program in ob/gyn is completed during an 8-week period in the penultimate year of the 5-year degree course in medicine. Students must successfully complete each year before progressing to the next year. Therefore, students completing their ob/gyn rotations have already successfully completed the first 3 years of the curriculum, including 2 years of basic science subjects in an integrated systems approach and 1 clinically based year (which includes 8 clinical rotations in medicine and surgery, each lasting 4 weeks). The ob/gyn program is based at the Coombe Women and Infants University Hospital, with 2 weeks in externally based gynecology placements. The study received institutional research ethics board approval from the Coombe Women and Infants University Hospital. The requirement for individual consent was waived by the research ethics board.

There are 4 rotations during the academic year, with up to 40 students in each rotation. The program comprises a combination of clinical activities and tutorial-based learning activities. The clinical activities consist of a concentrated program of 1-on-1 teaching with medical staff at the gynecology and antenatal outpatient clinics, observing and assisting at obstetrical and gynecological procedures in the operating theater, spending a dedicated week as an integral team member on the delivery suite (including night shifts), ward-based historical taking supported by bedside teaching with academic staff, and self-directed learning activities. The tutorial-based activities involve all the students undertaking the rotation and consist of interactive lectures and small group work, including case-based discussions. Students complete their individual clinical activities in the mornings and their tutorial-based activities as a group in the afternoons. The tutorials are scheduled daily for the 8-week rotation. To encourage attendance at large group tutorials, a hard copy of lecture slides is usually provided only during the lecture; the lectures are not recorded and are not available online. Distance learning activities (eg, web-based tutorials, recorded lectures) are not used as part of the program.

The college regulations advise students that they “must attend lectures and clinical rotations during the year according to the timetable provided” and that they must “have satisfied the attendance requirements at recognized general, specialist and maternity hospitals in accordance with the study guide” to be eligible for the final examination. However, there are no specific criteria that define satisfactory attendance or outline the consequences of poor attendance. Although students are strongly encouraged to attend, and attendance during the ob/gyn rotation is routinely recorded in logbooks, attendance is not mandatory.

Study Design

This was a prospective cohort study. Student attendance was defined as attendance at clinical and tutorial-based activities. The attendance rate (as a total percentage) for each student was calculated by comparing the number of activities the student attended with the number of activities the student was expected to attend. All activities were given equal weighting. In addition, the attendance rates for clinical and tutorial-based activities for each student were calculated separately. The outcome of interest was the overall examination score obtained by each student (out of a possible 200 points). The assessment modalities used to determine the examination score were an end-of-rotation objective structured clinical examination (OSCE), computed as the sum of the scores awarded at each station (40 points, 20% of the overall score); an end-of-year written examination consisting of multiple-choice questions (40 points, 20% of the overall score) and short-answer questions (40 points, 20% of the overall score), and an end-of-year long-case clinical/oral examination (80 points, 40% of the overall score). The OSCE consisted of 11 stations, including 2 interactive stations with simulated patients to assess communication skills. The written examination consisted of 50 multiple-choice questions (single best-answer format) and 6 short-answer questions based on clinical scenarios. The long-case clinical/oral examination consisted of a 30-minute consultation with a real patient, followed by a 20-minute discussion of the patient with 2 senior faculty members. All of the questions used in the OSCE, multiple-choice examination, and short-answer examination were validated by use in previous examinations during the preceding 5 years. Students required a weighted overall score of at least 100 points (50%) to pass the examination. The other require-
ment for passing was to achieve a passing score (≥40 points, 50%) on the individual component of the long-case clinical/oral examination.

Scores for each section of the examination were awarded using a close marking system in line with the University's marking scheme.5 Under this marking scheme, scores below 30% or above 75% are rare (although may be awarded for exceptional performance). Students who met the expected basic standard (ie, demonstrated the essential items for the competency tested) were awarded a pass score between 50% and 59%. Students who were above the expected basic standard (ie, demonstrated additional items for the competency tested) were awarded a distinction grade score between 60% and 75%. Students who were below the expected basic standard (ie, did not demonstrate the essential items for the competency tested) were awarded a fail score between 30% and 49%. Standard setting therefore ensured that students awarded a score of 50% had demonstrated an adequate level of competency and students awarded a score of 60% had demonstrated a high level of competency.

Participants
All students completing their ob/gyn rotation during the full academic year (September 2011 to June 2012) were included in the study. The class was evenly divided into 4 groups by the medical school (based on sex and nationality) and each group completed 1 of 4 separate 2-month rotations during the year. Student demographic information was obtained from departmental records, including sex, age, country of origin, previous end-of-year failure during medical school, and the rotation during the academic year in which they completed the ob/gyn rotation. Previous annual examination failure refers to failure of the end-of-year examinations (usually held in June) at any stage during the first 3 years. Each student must successfully complete a number of modules each year before progressing to the next academic year. Each module is examined separately and includes a summative examination at the end of the academic year. Students who are unsuccessful at these annual examinations are required to successfully complete a supplemental examination and, if unsuccessful, are required to repeat the academic year or may be excluded from the course. Year 1 contains 3 modules (human form and function, evolution and life and human development, and behavioral sciences and ethics); year 2 contains 7 modules (molecular and translational medicine, clinical biochemistry, principles of pharmacology and practical scientific research, head and neck anatomy, neuroscience, etiology and mechanisms of disease, and fundamentals of clinical and professional practice); and year 3 contains 6 modules (therapeutic management of disease, laboratory medicine, principles of surgical and medical practice, otolaryngology and ophthalmology, advanced clinical and professional practice, principles and practice of evidence-based medicine, and elective practice). In year 3, the principles of surgical and medical practice module contains 7 clinical rotations in 4-week durations; and a second module contains a separate clinical rotation in otolaryngology (lasting 2 weeks) and ophthalmology (2 weeks).

Data Collection
Student attendance was calculated from a paper-based logbook that the students were required to complete during the rotation. The logbook identified every clinical and tutorial-based activity that the student was expected to attend during each day of the rotation. Students were expected to attend 64 activities: 26 clinical activities (equating to ≥60 hours of direct teaching in the clinical learning environment) and 38 tutorial-based activities (equating to ≥60 hours of direct teaching in tutorials). Each student was required to document his or her attendance at a particular activity by obtaining a signature from the supervisor for that activity in the logbook. The students were given instructions on the first day of the rotation on how to complete the logbook. Students then submitted their logbooks at the end of the rotation. The logbook did not contribute to the student’s score. The lecturer examined each logbook for attendance at both the required clinical and tutorial-based activities. The same lecturer (R.P.D.) examined each logbook. If the supervisor’s signature was present, it was taken that the student attended that particular activity; however, if a supervisor’s signature was absent without an explanatory note, it was taken that the student did not attend that particular activity. The examination scores were obtained from the departmental records following the end-of-year assessments.

Data Analysis
Descriptive statistics (mean, median, standard deviation, interquartile range, and range) were used to describe the student population, student attendance, and academic performance. The attendance rates in relation to student demographics were compared using an unpaired samples t test and 1-way analysis of variance. The attendance rates by attendance type (clinical or tutorial-based activities) were compared using a paired samples t test. The relationship between attendance and examination performance was evaluated using the Pearson (r) and Spearman (r) correlation coefficients and simple linear regression. Correlations between attendance and examination performance were obtained separately for clinical activities and tutorial-based activities and also for the different assessment methods. Adjusted correlation coefficients were calculated using multivariable linear regression analyses to adjust for the potential confounding effects of student age, sex, country of origin, previous failure in an end-of-year examination, and the timing of the rotation during the academic year (to account for time from end-of-year examination). Total attendance and overall examination score were represented graphically on a simple scatterplot and a line of best fit was placed using the method of least squares.

Examination failure was defined as an overall grade score of less than 50% and a distinction as an overall grade score of 60% or higher. The a priori hypothesis was that an attendance rate threshold could be identified that minimized failure rates and maximized distinction rates. It was assumed that a threshold of at least 50% would be required and a mathematical model calculating attendance rates in 10% increments above and below the minimum 50% attendance rate was used. Logistic regression analyses were performed to deter-
Table 1. Attendance Rates by Student Demographics and Attendance Type

<table>
<thead>
<tr>
<th>Attendance Rate by Type of Activities</th>
<th>All Activities (n = 64)</th>
<th>Clinical Activities (n = 26)</th>
<th>Tutorial-Based Activities (n = 30)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean No.:</td>
<td>Mean %:</td>
<td>Median No.:</td>
</tr>
<tr>
<td>All students</td>
<td>147 (100)</td>
<td>57; 89</td>
<td>(39-100) [11]</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>51 (35)</td>
<td>54; 84</td>
<td>(39-100) [15]</td>
</tr>
<tr>
<td>Female</td>
<td>96 (65)</td>
<td>59; 92</td>
<td>(55-100) [7]</td>
</tr>
<tr>
<td>Age, y</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20-24</td>
<td>111 (76)</td>
<td>58; 91</td>
<td>(51-100) [9]</td>
</tr>
<tr>
<td>25-29</td>
<td>26 (18)</td>
<td>53; 81</td>
<td>(39-100) [17]</td>
</tr>
<tr>
<td>≥30</td>
<td>10 (7)</td>
<td>57; 90</td>
<td>(75-96) [8]</td>
</tr>
<tr>
<td>Geographic area of origin</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>European Union</td>
<td>103 (70)</td>
<td>57; 91</td>
<td>(45-100) [11]</td>
</tr>
<tr>
<td>North America</td>
<td>19 (13)</td>
<td>57; 88</td>
<td>(63-98) [9]</td>
</tr>
<tr>
<td>Asia and Africa</td>
<td>25 (17)</td>
<td>57; 91</td>
<td>(39-100) [14]</td>
</tr>
<tr>
<td>Previous end-of-year failure</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>112 (76)</td>
<td>59; 91</td>
<td>(61-100) [8]</td>
</tr>
<tr>
<td>Yes</td>
<td>35 (24)</td>
<td>53; 84</td>
<td>(39-100) [17]</td>
</tr>
<tr>
<td>Rotation during the academic year</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 (Sep-Oct)</td>
<td>32 (22)</td>
<td>55; 86</td>
<td>(55-100) [12]</td>
</tr>
<tr>
<td>2 (Nov-Jan)</td>
<td>34 (23)</td>
<td>56; 88</td>
<td>(39-100) [15]</td>
</tr>
<tr>
<td>3 (Feb-Mar)</td>
<td>39 (27)</td>
<td>58; 91</td>
<td>(45-100) [9]</td>
</tr>
<tr>
<td>4 (Apr-May)</td>
<td>42 (29)</td>
<td>59; 92</td>
<td>(63-100) [7]</td>
</tr>
</tbody>
</table>

Abbreviation: IQR, interquartile range.
* Comparison of clinical activities vs tutorial-based activities.

mine the odds ratio (OR) for failure or a distinction grade in terms of 10% increasing increments of attendance (as a continuous variable) or at the defined threshold for recommended minimum attendance (as a binary variable). Multivariable logistic regression analyses were performed to adjust for the same potential confounding factors of student age, sex, country of origin, previous examination failure, and the timing of the rotation during the academic year. SPSS version 20 (SPSS Inc) was used for statistical analysis. A 2-sided significance level of .05 was used.

Results

There were 147 students who completed the ob/gyn program during the 2011-2012 academic year and all students submitted a logbook. The mean total attendance rate was 89% (range, 39%-100% [SD, 11%]). A profile of students and attendance rates is provided in Table 1. Male students (84% attendance, P = .001) and students who failed an end-of-year examination previously (84% attendance, P = .04) had significantly lower attendance rates. Only 145 students completed the end-of-year assessment because 2 were absent due to illness. The mean total score was 57% (range, 34%-72% [SD, 6%]). Of the 145 students who completed the assessments, 59% (n = 85) passed, 34% (n = 50) passed with a distinction grade, and 7% (n = 10) failed.

Relationship Between Attendance and Examination Performance

There was a positive correlation between total attendance and overall examination score (r = 0.59 [95% CI, 0.44-0.70]; P < .001 and r² = 0.50 [95% CI, 0.36-0.62]; P < .001) (Figure). The association persisted after adjusting for student age, sex, country of origin, previous examination failure, and the timing of the
rotation during the academic year (adjusted \( r = 0.48 \) [95% CI, 0.41-0.55]; \( P < .001 \)). Both clinical attendance (\( r = 0.50 \) [95% CI, 0.32-0.64], \( P < .001 \)) and tutorial-based attendance (\( r = 0.42 \) [95% CI, 0.37-0.52], \( P < .001 \)) were positively correlated with the overall examination score (Table 2). The mean scores across the different assessment components were similar. The coefficient of determination \( (r^2) \) was 0.35.

Conversely, the failure rate was greater in each decreasing category of attendance: 2% (2/92) among students with a 90% to 100% rate, 5% (2/40) among students with an 80% to 89% rate, 20% (1/5) among students with a 70% to 79% rate, 25% (4/16) among students with a 60% to 69% rate, and 100% (4/4) among students with a rate of 59% or lower. The majority of failure grades (6/10, 60%) occurred in students with attendance rates lower than 80%. The crude OR for failure with attendance rates of 80% or higher was 0.05 (95% CI, 0.01-0.20) and the adjusted OR was 0.11 (95% CI, 0.02-0.72).

### Discussion

We found a positive association between student attendance and academic performance within the clinical learning environment that persisted after controlling for the potential confounding effects of student age, sex, country of origin, previous examination failure, and time between rotation and end-of-year examination. The study showed that attendance at both clinical activities and tutorial-based activities was similarly correlated with academic performance. An attendance rate threshold of 80% provided reasonable discrimination for both failure and distinction grades.

### Attendance and Academic Performance

Previous studies of medical and other health professional students have shown a positive but weak correlation between student attendance and academic performance. \(^6\)–\(^22\) Studies of the effect of mandatory attendance policies within medical schools are sparse, although a study found that a mandatory attendance policy increased attendance but did not increase academic performance within basic science lectures. \(^23\) However, attendance at both clinical and classroom-based teaching activities and its association with academic performance within clinical rotations has not been examined previously. The positive correlation between attendance and academic performance in this study was higher than that reported in the existing literature and raises the possibility that attendance may be an important factor in academic achievement during clinical rotations. Despite the lack of a mandatory attendance policy, we found a high total attendance rate (89%), suggesting that medical students regard attendance during clinically orien-

### Table 2. Correlation Between Attendance Types and Assessment Methods*<sup>a</sup>

<table>
<thead>
<tr>
<th>Student Scores</th>
<th>Attendance Type, ( r ) (95% CI)&lt;sup&gt;b&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall examination</td>
<td>Overall (Mean (range) [SD])</td>
</tr>
<tr>
<td>Objective structured clinical examination (OSCE)</td>
<td>58 (38-73) [7]</td>
</tr>
<tr>
<td>OSCE with communication skills stations</td>
<td>61 (38-80) [8]</td>
</tr>
<tr>
<td>Multiple-choice questions</td>
<td>58 (40-73) [7]</td>
</tr>
<tr>
<td>Short-answer questions</td>
<td>53 (23-73) [7]</td>
</tr>
<tr>
<td>Long-case clinical/oral examination</td>
<td>57 (34-70) [7]</td>
</tr>
</tbody>
</table>

Abbreviation: IQR, interquartile range.

* \( P < .001 \) for all correlation coefficient comparisons.

*\( \text{Pearson product-moment correlation coefficient.} \)
tated rotations as educationally valuable. Male students were significantly less likely to attend compared with female students. The influence of sex on the relationship between attendance and academic performance is conflicting within the literature.20,22 The lower attendance rate among students who previously failed an end-of-year examination suggests that previous poor academic performance may be associated with subsequent poor attendance. Although not reaching statistical significance, there was an increase in attendance rates as the academic year progressed (and as the high-stakes end-of-year examinations approached), suggesting that medical educators may need to emphasize attendance at times remote from examinations.

The strengths of this study include its consideration of student attendance in terms of both clinical and tutorial-based activities. Previous studies have addressed only student attendance at lectures without any consideration of attendance at other tutorial-based or clinical activities and predominantly in basic science subjects.6–11,14–17,19–22 Both clinical activities and tutorial-based activities separately correlated positively with academic achievement, suggesting the possible importance of both for academic achievement. This finding is important because some medical students struggle in adapting to the challenges of learning within the clinical environment, which is possibly more challenging than the more familiar tutorial-based learning environment.24 Absenteeism within the clinical learning environment may go unnoticed without attendance monitoring systems and may be detrimental to students who are poorly equipped to adapting to the pace of the clinical learning environment. The validity of the study was enhanced by the use of an instrument to record the attendance rate for all students, including poor attenders, unlike previous studies that used more subjective student questionnaires7,8,10,16–18,21,22 or sign-in sheets.6,9,11–15

A variety of assessment formats may be used to examine the main learning domains of knowledge, skills, and attitudes. Previous studies demonstrating the positive relationship between attendance and academic performance have focused exclusively on knowledge-based assessments only (multiple-choice and short-answer examinations).6–22 In contrast, this study used knowledge-based assessments and skills-based assessments (OSCE and long-case clinical examinations) to determine academic performance. There was a positive correlation between total attendance and the assessment of each of the main learning domains. The use of a range of assessment modalities to include skills-based assessments in addition to knowledge-based assessments helped ensure a more complete picture of the association with attendance. The analysis that addressed individual elements of the program may facilitate comparison with teaching programs in other institutions.

A number of limitations need to be considered when interpreting this study. First, the relationship between attendance and academic performance is complex, with many influencing factors that may not have been fully addressed in this study, such as the student’s ability to learn, motivation to learn, opportunities to learn (of which attendance is an important element), ability to perform (on the assessments), and the student’s personality. Therefore, a critical limitation is the inability to discern whether these findings are causal, or whether limited attendance is just a marker of poor academic skills, poor professionalism, or intercurrent psychosocial problems such as depression. The findings may also be a result of reverse causality (that the students with greater intellectual ability are inherently more motivated to attend), and the lack of a robust measure of this underlying ability is a limitation.

Second, the findings are based on research at a single institution, and require replication in other centers to allow generalizability. Third, the fact that only a small number of students failed to achieve competency (even though it is a desirable academic outcome) limited the statistical evaluation of the association between attendance and academic performance. The high admission standards for medical students at our institution limited variability in usual measures of premedical academic skill as well as in-school performance, making it difficult to discern differences. Another limitation of the small number of failures is the potential for overfitting of the multivariable modeling for this outcome. Fourth, although the assessment measures were common academic metrics, some of the skills learned through attending activities may not have been assessed, particularly in the area of professionalism. It is therefore possible that this study may have underestimated the full value of attendance. Fifth, the use of the logbook may have positively influenced attendance. Conversely, recording signatures at the end of each session may not have captured timekeeping at scheduled activities, or students who had forgotten their logbooks. Students may not have recorded attendance at activities beyond those required in the logbook, although given the very structured nature of the rotation, this was likely to have been minimal.

**Attendance Thresholds**

In general, medical schools encourage and expect full attendance, although what this means is rarely specified. A challenge for medical educators formulating attendance policies is specifying a minimum attendance rate threshold for satisfactory attendance. By using the number of distinction and failure grades in different attendance rate categories, we found that an attendance rate threshold of 80% provided reasonable discrimination for both failure and distinction grades in our program. This approach may be an example of how other medical schools might explore whether a threshold exists in their programs.

**Future Research**

There are a number of areas that merit further research based on this study. An exploration of the factors influencing attendance should be undertaken. If a causal relationship can be identified, interventions to preemptively target potential poor attenders should be investigated to avoid the cycle of persistent failure and remedial education among a subset of students from year to year. The effect of rapidly evolving electronic learning resources on attendance patterns should also be evaluated.
Conclusions

Among fourth-year medical students completing an 8-week ob/gyn clinical rotation, attendance at clinical and tutorial-based activities was positively correlated with overall examination scores. A threshold attendance of 80% was discriminatory for both failure and distinction grades. Further research is needed to understand whether the relationship is causal, and whether improving attendance rates can improve academic performance.

REFERENCES


