"Making the Grade:" Noncognitive Predictors of Medical Students' Clinical Clerkship Grades

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Objectives: Because clinical clerkship grades are associated with resident selection and performance and are largely based on residents'/attendings' subjective ratings, it is important to identify variables associated with clinical clerkship grades.

Methods: U.S. medical students who completed ≥1 of the following required clinical clerkships—internal medicine, surgery, obstetrics/gynecology, pediatrics, neurology and psychiatry—were invited to participate in an anonymous online survey, which inquired about demographics, degree program, perceived quality of clerkship experiences, assertiveness, reticence and clerkship grades.

Results: A total of 2,395 medical students (55% women; 57% whites) from 105 schools responded. Multivariable logistic regression models identified factors independently associated with receiving lower clerkship grades (high pass/pass or B/C) compared with the highest grade (honors or A). Students reporting higher quality of clerkship experiences were less likely to report lower grades in all clerkships. Older students more likely reported lower grades in internal medicine (P=0.02) and neurology (P<0.001). Underrepresented minorities more likely reported lower grades in all clerkships (P<0.001); Asians more likely reported lower grades in obstetrics/gynecology (P=0.007), pediatrics (P=0.01) and neurology (P=0.01). Men more likely reported lower grades in obstetrics/gynecology (P<0.001) and psychiatry (P=0.004). Students reporting greater reticence more likely reported lower grades in internal medicine (P=0.02), pediatrics (P=0.02) and psychiatry (P<0.05). Students reporting greater assertiveness less likely reported lower grades in all clerkships (P≤0.03) except IM.

Conclusions: The independent associations between lower clerkship grades and nonwhite race, male gender, older age, lower quality of clerkship experiences, and being less assertive and more reticent are concerning and merit further investigation.

Key words: education ■ race/ethnicity ■ clerkship grades ■ clinical evaluation

INTRODUCTION

Medical school traditionally consists of two preclinical years of classroom learning, followed by two years of clinical clerkship training. During the preclinical years, students are primarily evaluated using objective examination scores.[1] Grading during clinical clerkships consists of a combination of objective measures, including written examinations [e.g., National Board of Medical Examiners (NBME) subject examinations], oral examinations, Objective Structured Clinical Exams (OSCE)/Standardized Patient exams, and more subjective faculty/resident evaluations of students' clinical performance and of papers, projects, and small-group presentations.[1] More subjective evaluations by faculty/residents are nearly universal at U.S. medical schools and account for median contributions of 50–70% of a student's grade across all core clerkships.[1]

Few studies have identified factors specifically associated with clinical clerkship grades. Medical College Admission Test (MCAT) scores and undergraduate grade point averages (uGPAs) have been shown to be associated with first- and second-year grades and USMLE Step-1 scores[2] but have not consistently been shown to be correlated with clinical performance.[2-4] Since clerkship grades have been shown to be associated with resident selection[5] and performance during residency, and are composed of both objective and subjective assessments of medical students' performance,[6-9] it is important to identify noncognitive factors associated with determination of clinical clerkship grades. Very little is known about factors specifically associated with clinical clerkship grades. Previous studies have identified clerkship order[10,11] and preclinical GPA[12] as correlates of clerkship performance. Personal traits of compulsiveness and

aggressiveness have been associated with higher class rank, while Myers-Briggs "extraversion" type was correlated with clinical evaluations in the obstetrics/gynecology (ob/gyn) clerkship.[13,14] In addition, older age was associated with success on the third-year OSCE at one British medical school, while being male and of ethnic minority were associated with poorer performance.[15]

While these studies identified variables associated with clerkship performance, they were limited by inclusion of a small number of institutions, small sample sizes or differential use of performance measures reflecting only portions of students' clinical performance (i.e.,

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Table 1. Percentage of students responding to assertiveness and reticence items

The following statements pertain to your attitudes and behaviors in medical school. Please indicate the extent of your agreement with each statement.

	N	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
Assertiveness						
1. If I don't know an answer, I still act as though I do.	1,803	23.3	47.4	16.4	12.0	0.9
2. I feel comfortable with direct questioning that puts me on the spot.	1,803	11.6	25.5	19.7	35.3	7.8
3. I feel comfortable with my current communication skills.	1,802	0.9	9.8	9.9	47.9	31.4
4. I see a competitive side to medicine, and it drives me to do well.	1,803	7.0	22.4	25.2	35.7	9.7
5. I feel confident in my potential to be a good doctor.	1,800	0.7	3.1	11.1	47.6	37.3
6. I have made sure that important people know who I am.	1,803	9.5	30.8	29.8	23.0	6.8
7. I am a logical, goal-directed speaker when I need to be.	1,801	1.0	6.5	16.1	52.5	23.7
8. I know how to "work a room" or use a meeting to my advantage.	1,803	11.0	33.1	28.5	21.0	6.5
9. "Powerful" is a word I would use to describe myself.	1,802	19.4	42.7	25.0	9.8	3.1
10. I enjoy taking risks, especially those that might advance my career.	1,803	14.6	38.4	29.8	14.0	3.3
11. When I know an answer to a question, I am eager to respond.	1,789	1.4	11.9	23.8	47.3	14.8
12. I am confident when interacting with attendings and residents.	1,785	1.6	11.8	28.2	47.0	10.4
Reticence						
1. I do not readily respond to questions from residents and attendings because I am uncomfortable speaking out.	1,787	26.7	41.6	12.6	15.6	3.4
2. I am uncomfortable responding to questions because I'm not always sure I'm right.	1,787	11.5	24.9	15.5	36.1	11.8
3. I do not always ask questions, because I'm afraid people will think my questions are foolish.	1,788	11.1	33.4	16.6	32.7	6.0
4. I speak and participate as much as other students but am still labeled as being quiet/reserved.	1,785	21.6	40.8	18.2	15.3	3.9
5. I am modest or reserved when interacting with attendings and residents.	1,786	6.2	23.9	24.0	36.3	9.4
6. Out of respect for my superiors, I prefer not to challenge or openly question their decisions.	1,788	2.1	16.9	21.3	42.8	16.9

OSCEs) rather than final clerkship grades. Since clerkship grades are more subjective than preclinical grades and may be based, in part, on medical students' interactions with residents/attendings, we conducted an exploratory study to identify noncognitive variables, including student demographics and communication skills that are independently associated with clinical clerkship grades in a demographically diverse national sample of medical students.

METHODS

Sample

The protocol received approval by the institutional review board at Washington University School of Medicine in St. Louis, MO. Between April 26 and July 1, 2006, potential participants were recruited through e-mail communications using the member database of a national medical student association and from the medical school deans of all 125 U.S. allopathic medical schools.

The deans were asked to forward an e-mail to their clinical students to invite them to participate and, if interested, directing them to the survey webpage. Completion of the questionnaire implied consent. U.S. medical students who had completed any of the following clerkships—internal medicine, neurology, psychiatry, ob/gyn, surgery and pediatrics—were eligible to participate.

Survey Design and Administration

Questionnaire items were developed after extensive review of the literature and informal medical student discussions with the first author about students' clerkship experiences and factors that potentially could influence their performance and evaluation of their performance. Based on the literature and anecdotal comments from those informal discussions, the investigators developed a questionnaire, which was subsequently piloted on a convenience sample of resident physicians from a variety of medical institutions nationwide, and 10 residents responded with feedback on item wording and clarity of the questions. The questionnaire included items about students' demographics, assertiveness, reticence, self-reported grades in any and all clerkships they completed, and the quality of their clerkship experiences. Based on the residents' feedback, we eliminated or revised the wording of some items prior to surveying the medical students.

The questionnaire was administered online and anonymously to encourage student response. We did not offer an incentive to complete the questionnaire. While a unique identifier/tracking ID was not used to ensure that students responded only once, we did ask students' to provide a unique code (day of birth, first three initials of mother's maiden name and last four digits of Social Security number) to be used to link data from this survey with follow-up data, if they agreed to be contacted for future studies. If they agreed to be contacted, students also were asked to provide their e-mail address.

Demographics

Students indicated their age, gender, race/ethnicity and country of birth. For data analysis, responses were recoded into four race/ethnicity categories. The underrepresented minority (URM) group included all students who indicated they were of black, Hispanic, native-American or native-Alaskan origin or any combination of these descriptors. Asian race/ethnicity included all non-URM students who identified themselves as Asian or Pacific Islander or any combination of Asian/Pacific-Islander descriptors. White race/ethnicity included all non-URM and non-Asian students who identified themselves as white. We combined all other groups into an "other" race/ethnicity category, which included all students who identified themselves as Middle Eastern, multiracial (e.g., self-identifying as both white and Asian but not as both Japanese and Chinese, who were categorized as Asian), unknown, or "other" without further specification.

We also asked students to select their degree program [MD, MD/PhD, DO (osteopathic), or other] and combined these categories into four groups: 1) MD programs including BS/MD, BA/MD or MD/other non-PhD degree programs; 2) MD/PhD programs; 3) DO programs including DO/other non-PhD degree programs; and 4) foreign medical schools.

Interpersonal-Communication Variables

We were particularly interested in measuring communication skills that have been shown to be associated with patient satisfaction in physician–patient interactions[16] and may contribute to medical students' grades. Few studies have identified how communication skills affect medical student grades. Previous reports of undergraduate students have expressed concerns regarding shyness and reticence among undergraduate students with regard to classroom participation;[17] however, such behaviors have not been shown to negatively affect undergraduate grade attainment.[18] Because the clinical clerkships represent a unique academic environment, where grades are largely determined by subjective evaluations, it is important to understand how communication skills may affect clinical clerkship grades.

Assertiveness

Students were asked to respond to 13 items measuring assertiveness, including 11 previously developed items (Cronbach $\alpha=0.80$).[19] The original 11 statements assessed medical students' comfort with on-the-spot questioning, public speaking, networking, taking risks, making sure important people know who they are, and "working the room" (first 10 items in Table 1 and "People

around me see me as confident"). Two new items (items 11 and 12 in Table 1) measured eagerness to respond to questions and confidence in interacting with attendings/residents. Students reported the extent of their agreement with each statement using a five-point scale ranging from strongly disagree (1) to strongly agree (5).

Reticence

Six questions were designed to measure students' reticence (Table 1). These items were developed from anecdotal reports of students' behaviors that might have influenced their clerkship performance as well as from published reports of medical students' experiences.[20,21] Using the same five-point scale as above, students rated their level of agreement with each of these statements.

Clinical Clerkships

Quality of clinical clerkship experience. Students responded to the following item for each clerkship they had completed: "Rate the quality of your educational experience in each of the following clinical clerkships" using four response choices: poor (1), fair (2), good (3), excellent (4). Higher scores indicated more favorable evaluations of the student's clerkship experience in a single clerkship. This item is included on the national Association of American Medical Colleges Graduation Questionnaire (AAMC GQ) and has been found to be a significant predictor of medical graduates' specialty choice.[22,23] Although this item may be a valid measure of a student's subjective experience during a clerkship, it does not measure the multiple facets of clerkship experiences that inform this evaluation. To further assess the construct validity of this item, we analyzed a national sample of U.S. graduates' responses to the 2001–2004 GQ (N=53,103) and found this item to correlate significantly (rs ranged from 0.587–0.670) with a multi-item scale (the mean of four clerkship-specific items on the GQ) measuring specific domains of the quality of clerkship experience, including sufficiency of feedback and quality of faculty and resident teaching in each of the concordant clerkships (Cronbach's alpha for the multi-item scale for each clerkship ranged from 0.78–0.86). Moreover, each of the single-item quality-of-clerkship measures were distinguished by smaller-magnitude correlations with each of the other (nonconcordant) multi-item quality-of-clerkship measures (rs ranged from 0.078–0.199). Single-item measures have been found to be valid and reliable (as well as practical) for measuring a variety of constructs.[24-27] In paired t tests using data from 106 graduates from one institution who completed these single items (for each clerkship) on both the 2001–2003 GQ and a first-year postgraduate (PGY-1) survey administered in the spring of students' PGY-1 year of training (2002–2004), we found that the two measures (for each clerkship) were not significantly different from each other overall. This finding provides some evidence

that the single-item measure of the quality of students' clerkship experience in a clerkship is reliable.

Grades

The dependent variable of interest was clerkship grade. Students indicated the grading system used in clinical clerkships at their schools by selecting from a list of commonly used grading systems, including honors (H)/high pass (HP)/pass (P)/fail (F), A/B/C/D/F, H/P/F, and P/F. Students also reported their grades for any of the clerkships that they had completed.

Analysis

To explore the underlying constructs among the assertiveness and reticence items, we used principal-components analysis with varimax rotation for data reduction and measured the internal consistency of items on the resulting factors using Cronbach's alpha.

Pearson product-moment correlations were used to measure associations among continuous variables (age, assertiveness, reticence, quality of clerkship experience) and Chi-squared tests were used to measure associations among categorical variables (gender, race, country of birth, degree program). Between-group differences in the continuous variables by gender, race/ethnicity, type of medical school program and grades were assessed using analysis of variance.

For each clerkship, we used a multivariable logistic regression model to identify independent predictors of lower grades (i.e., HP/P or B/C) in that clerkship compared with the highest grade (i.e., H or A) as the reference category. For each clerkship, all predictor variables were entered as a block in the model. We report descriptive statistics and adjusted odds ratios (ORs) and 95% confidence intervals (CIs) of results of the multivariable models. All p values are two sided. We used SPSS® 14.0 (SPSS Inc., Chicago, IL, 2005) for all statistical tests.

RESULTS

Respondent Characteristics

We received 2,395 responses from students in 105 medical schools (94 of 125 U.S. allopathic medical schools, seven U.S. osteopathic and four foreign). Table 2 shows the demographics of survey respondents. Our sample was representative of all third- and fourth-year medical students matriculating in U.S. allopathic medical schools in 2003 in terms of age[29] (mean age for all 2003 matriculants = 24 versus mean age at matriculation of sample = 24.2), race,[30,31] and gender.[32] The racial/ethnic composition of our sample—white (57.1%), Asian (22.5%), URM (11.1%), other (3.9%), missing (5.4%)—was not significantly different from that reported for all 2003 matriculants—white (61.2%), Asian (18.6%), URM (14.2%), other (4.6%).[30,31] Women were overrepresented in our sample compared with all 2003

matriculants (55.4% vs. 44.1%, respectively); however, this difference was not significantly different from the AAMC data.[32]

Of the 2,395 respondents, 1,385 (57.8%) provided unique codes and contact information. Of these 1,385 students, only five duplicate surveys were identified. Upon inspection of the data, the first of each of the duplicate surveys entered into the online system were incomplete and therefore excluded from analysis. Since surveys were completed anonymously, we cannot discern the number of duplicate questionnaires (if any) that were submitted by students who did not provide unique codes and contact information, but we would expect this number to be small based on the rate of duplicate submissions by students providing unique codes (5/1,385 or 0.36%) and the fact that there was no incentive offered to students to complete the survey.

Since the P/F grading system has no "highest" passing grade, the 50 students using this system were excluded. Due to insufficient numbers, we excluded students who reported a grade of D or F (no more than three students in any one clerkship) or who were from osteopathic (22 students) or foreign (four students) schools.

Principal-Components Analysis of Assertiveness and Reticence Items

Principal-components analysis of the assertiveness items resulted in three factors. One item ("People around me see me as confident") loaded on two factors and was dropped from the measure, resulting in a 12-item measure of assertiveness (Table 1). Since the Cronbach's alpha coefficient (α=0.82) for the 12-item measure of assertiveness was higher than the coefficients for any of the three subscales (ranging 0.50–0.79), we used the 12-item scale in our analysis. Mean scores were computed only for students who responded to more than half of the 12 items (i.e., $\geq$7 assertiveness items). Higher scores indicated greater assertiveness.

Principal-components analysis of the reticence items resulted in one six-item factor (Cronbach's α=0.74). Mean scores were computed only for students who responded to more than half of the six items (i.e., $\geq$4 reticence items). Higher scores indicated greater reticence.

Unadjusted Tests

Tables 3 and 4 show the descriptive statistics for each predictor variable by clerkship grade (i.e., highest versus lower grades). Table 3, displaying the unadjusted tests for continuous variables, indicates that higher assertiveness and lower reticence scores were associated with the highest grade (each P<0.001) in each clerkship. Younger age was associated with receiving the highest grade in internal medicine (P=0.004) and neurology (P=0.008). Higher quality of clerkship experience was associated with receiving the highest grade (P<0.001) in all clerkships.

Table 4 shows the distribution of grades (number and percentage of students) for each of the categorical variables—race, gender, country of birth and degree program. In each clerkship, a significantly higher percentage of white students reported receiving the highest grade (P<0.001). A greater proportion of women received the highest grade in ob/gyn (P<0.001) and psychiatry (P=0.01), whereas a greater proportion of men received the highest grade in surgery (P=0.03). A higher percentage of U.S.-born students received the highest grade in surgery (P=0.01), ob/gyn (P<0.05), and psychiatry (P=0.009).

Table 2. Characteristics of respondents [number (%)]	
	N=2,395(%)
Gender	
Male	949 (39.6)
Female	1,328 (55.4)
No response	118 (4.9)
Race/Ethnicity	
White	1,368 (57.1)
Asian	538 (22.5)
URM	265 (11.1)
Other	94 (3.9)
No response	130 (5.4)
Born in United States	
Yes	1,831 (76.5)
No	305 (12.7)
No response	259 (10.8)
Completed Clerkships	
Internal Medicine	1,912 (79.8)
Surgery	1,883 (78.6)
Ob/Gyn	1,830 (76.4)
Pediatrics	1,843 (77.0)
Neurology*	1,348 (56.2)
Psychiatry	1,789 (74.7)
Grading Systems	
H/HP/P/F	1,315 (54.9)
H/P/F	219 (9.1)
A/B/C/D/F	337 (14.1)
P/F	50 (2.1)
Other	90 (3.8)
No response	384 (16.0)
Year in Medical School	
2nd year	26 (1.1)
3rd year	997 (41.6)
4th year (or recently graduated)	1010 (42.2)
Other year in medical school (e.g., in research)	45 (1.9)
No response	317 (13.2)
Degree Program	
MD or MD/other	1,956 (81.7)
MD/PhD	97 (4.1)
DO	22 (0.9)
Foreign	4 (0.2)
No response	316 (13.2)

* The N is lower for students in neurology because fewer schools require this clerkship.[28]

We also measured correlations among assertiveness, reticence and age as well as differences in these variables by gender, race, degree program and year in medical school. Assertiveness was negatively correlated with reticence (r=-0.567, P<0.001). Age was not significantly associated with either assertiveness (r=-0.037) or reticence (r=0.019). White students reported higher levels of assertiveness than URM [mean (SD) assertiveness 3.22 (0.55) vs. 3.10 (0.58), respectively; P=0.03], and white students reported lower levels of reticence than Asian and URM students [mean (SD) reticence 2.79 (0.69) vs. 3.13 (0.78), 3.04 (0.75), respectively; P<0.001]. Male students reported higher levels of assertiveness than female students [mean (SD) assertiveness 3.32 (0.56) vs. 3.09 (0.57), P<0.001]. Female students reported higher levels of reticence than male students (mean [SD] reticence 2.96 (0.74) vs. 2.81 (0.74), P<0.001]. Assertiveness and reticence did not differ significantly by year in medical school or degree program. MD/PhD students were older than MD or MD/other-degree students [mean (SD) age 28.48 (2.83) vs. 26.62 (3.09) years, respectively; P<0.001]; and second-year students were younger than students in third, fourth and other year of medical school [24.38 (2.02) vs. 26.28 (3.12), 27.19 (3.08),

Table 3. Unadjusted means (SD) of age, assertiveness, reticence, and quality of clerkship experience by clerkship grade

Internal Medicine (N=1,278)	Highest Grade (n=482)	Lower Grades (n=796)	P
Age in years	26.53 (2.68)	27.04 (3.23)	0.004
Assertiveness	3.28 (0.56)	3.15 (0.58)	<0.001
Reticence	2.75 (0.70)	2.96 (0.73)	<0.001
Quality of clerkship experience	3.74 (0.51)	3.28 (0.77)	<0.001

Surgery (N=1,265)	Highest Grade (n=467)	Lower Grades (n=798)	P
Age in years	26.68 (2.79)	27.01 (3.29)	0.07
Assertiveness	3.33 (0.55)	3.10 (0.57)	<0.001
Reticence	2.77 (0.72)	2.99 (0.73)	<0.001
Quality of clerkship experience	3.39 (0.75)	2.78 (0.93)	<0.001

Ob/Gyn (N=1,260)	Highest Grade (n=452)	Lower Grades (n=808)	P
Age in years	26.68 (2.89)	26.83 (3.07)	0.38
Assertiveness	3.30 (0.53)	3.12 (0.59)	<0.001
Reticence	2.75 (0.72)	2.98 (0.75)	<0.001
Quality of clerkship experience	3.25 (0.87)	2.68 (0.93)	<0.001

Pediatrics (N=1,269)	Highest Grade (n=475)	Lower Grades (n=794)	P
Age in years	26.72 (2.74)	26.87 (3.06)	0.39
Assertiveness	3.32 (0.53)	3.10 (0.58)	<0.001
Reticence	2.73 (0.70)	3.01 (0.75)	<0.001
Quality of clerkship experience	3.48 (0.69)	3.02 (0.86)	<0.001

Neurology (N=890*)	Highest Grade (n=349)	Lower Grades (n=541)	P
Age in years	26.58 (2.54)	27.13 (3.32)	0.008
Assertiveness	3.30 (0.56)	3.11 (0.58)	<0.001
Reticence	2.78 (0.75)	2.99 (0.75)	<0.001
Quality of clerkship experience	3.22 (0.85)	2.64 (0.94)	<0.001

Psychiatry (N=1,230)	Highest Grade (n=550)	Lower Grades (n=680)	P
Age in years	26.85 (3.27)	26.76 (2.82)	0.60
Assertiveness	3.26 (0.56)	3.12 (0.57)	<0.001
Reticence	2.80 (0.72)	3.00 (0.73)	<0.001
Quality of clerkship experience	3.28 (0.80)	2.89 (0.86)	<0.001

Tests of significance were one-way analyses of variance. Highest grades=H/A; lower grades=HP/P or B/C; * The N is lower for students in neurology because fewer schools require this clerkship.[28]

and 27.20 (2.79), respectively; P<0.001]. A greater proportion of MD/PhD students reported being in their research years than MD or MD/other-degree program students (18.6% vs. 1.4%, respectively; P<0.001). Since year in medical school was associated with both age and degree program, we excluded year in medical school from further analysis.

Multivariable Logistic Regression Models

Table 5 shows the results of the multivariable logistic regression analyses identifying independent predictors of receiving lower grades (HP/P or B/C) compared with receiving the highest grade (H/A).

For each clerkship, students reporting more positive clerkship experiences were less likely to receive lower grades in that specific clerkship (each P<0.001). Students reporting greater assertiveness were less likely to receive lower grades in each clerkship (each P≤0.03) except for internal medicine.

In internal medicine, students reporting older age (P=0.02), greater reticence (P=0.02) or being URM (P<0.001) were more likely to receive lower grades. In surgery, URM students were more likely (P<0.001) to receive lower grades. In ob/gyn, male (P<0.001), Asian (P=0.007) or URM (P<0.001) students were more likely to receive lower grades. In pediatrics, students reporting greater reticence (P=0.02) or being Asian (P=0.01) or URM (P<0.001) were more likely to receive lower grades. In neurology, students reporting older age (P<0.001), being other race (P=0.004), Asian (P=0.01) or URM (P=0.001) were more likely to receive lower grades. In psychiatry, students reporting greater reticence (P<0.05), being male (P=0.004) or URM (P<0.001) were more likely to receive lower grades.

DISCUSSION

This study of a national sample of U.S. medical students describes several noncognitive factors that independently predicted clerkship grades. Several factors such as poorer evaluations of the quality of students' clerkship experience, male gender, older age and non-white race/ethnicity were associated with lower clerkship grades. Poorer evaluations of the quality of students' clerkship experiences were consistently associated with receiving lower grades. This association between students' grades and their subjective experience during the clerkship cannot be construed as causal. Students might have rated the quality of their clerkship experience lower because they received poorer grades, or they might have received lower grades because of negative clerkship experiences or lack of interest in the specialty. Regardless, these findings have implications for residency recruitment, as clerkship experiences influence students' specialty-choice decision-making process,[22,23,33,34] and clerkship grades are important criteria in the resident-

selection process.[5,35,36] Our finding that male gender was associated with lower grades in ob/gyn mirrors other recent reports of lower grades in ob/gyn received by men,[37-39] which may be due in part to gender discrimination, which was reported by some men in a multi-institutional study.[40] It also may be possible that the lower grades in ob/gyn and psychiatry reflect the increasing presence of women faculty in ob/gyn and psychiatry[41] and potential gender differences in students' interest in these specialties. The observed relationship between older age and lower grades in internal medicine and neurology may be due to older students having greater family/social obligations or having taken leave from medical school, resulting in a potential loss of preclinical knowledge. Notably, while MD/PhD students were older, they were not more likely to report lower clerkship grades (Table 4).

The single most striking finding in our study was that race/ethnicity consistently predicted grades across all clerkships. URM students more likely reported lower grades in all clerkships. Asian students more likely reported lower grades in pediatrics, ob/gyn, and neurology; students classified as other race/ethnicity more likely reported lower grades in neurology. These associations are notable, because the model also controlled for communication-related variables, assertiveness and reticence, which were also related to grades. Further, being born in a foreign country did not independently predict grades. The apparent independent association between race/ethnicity and clerkship grades is of concern and merits further investigation.

Previous studies in single institutions have documented associations between URM and Asian race/ethnicity with lower clinical grades and licensing exam scores;[42-45] however, no national studies have examined the effect of race/ethnicity on clinical clerkship grades. The existence of racial and ethnic disparities among medical school faculty in previous reports demonstrated that minority faculty, including URM and Asian Pacific Islanders, were less likely to be promoted than white faculty.[46,47] Reasons for these racial and ethnic disparities among faculty promotion are likely multifactorial, but it is important also to consider that potential institutionalized biases affecting medical school faculty promotion also might contribute to evaluation of minority students.

Furthermore, the NBME has reported that nonwhite minority students received lower scores on licensing exams compared with white students,[48] but associations between students' race/ethnicity and scores on NBME subject examinations have not been published. Since scores on NBME subject examinations and other objective measures may contribute to clinical clerkship grades, the associations that we observed between race/ethnicity and grades could reflect, to some extent, poorer performance on objective examinations by nonwhite students in our study. Future research including both ob-

jective and subjective measures of clinical clerkship performance in addition to students' personal characteristics should be informative.

Our findings also should be considered in the context of the need for cultural competency training, which is increasingly being recognized as a mechanism for addressing health disparities by improving intercultural patient–physician interactions.[49,50] Our results suggest that cultural competency training may be relevant as well to student–teacher interactions in the medical education environment. One study demonstrated that minority medical students had a lower sense of personal accomplishment and self-reported quality of life than nonminority medical students.[51] In the diverse environment of medical school, racial/ethnic disparities in academic achievement and educational experiences also might reflect deficits in cultural awareness between students and teachers. The medical education community at large

Table 4. Number (%) of students receiving clerkship grades by gender, race/ethnicity, country of birth and degree program

Internal Medicine (N=1,278)	N	Highest Grade (%)	Lower Grades (%)	P
Gender				
Male	493	188 (38.1)	305 (61.9)	0.81
Female	785	294 (37.5)	491 (62.5)	
Race/Ethnicity				
White	805	331 (41.1)	474 (58.9)	<0.001
Asian	283	105 (37.1)	178 (62.9)	
URM	137	27 (19.7)	110 (80.3)	
Other	53	19 (35.8)	34 (64.2)	
Country of Birth				
United States	1,115	423 (37.9)	692 (62.1)	0.67
Not in United States	163	59 (36.2)	104 (63.8)	
Degree Program				
MD or MD/other	1,224	460 (37.6)	764 (62.4)	0.64
MD/PhD	54	22 (40.7)	32 (59.3)	
Surgery (N=1,265)				
Gender				
Male	492	200 (40.7)	292 (59.3)	0.03
Female	773	267 (34.5)	506 (65.5)	
Race/Ethnicity				
White	792	328 (41.4)	464 (58.6)	<0.001
Asian	293	99 (33.8)	194 (66.2)	
URM	128	25 (19.5)	103 (80.5)	
Other	52	15 (28.8)	37 (71.2)	
Country of Birth				
United States	1,101	421 (38.2)	680 (61.8)	0.01
Not in United States	164	46 (28.0)	118 (72.0)	
Degree Program				
MD or MD/other	1,221	453 (37.1)	768 (62.9)	0.48
MD/PhD	44	14 (31.8)	30 (68.2)	
Ob/Gyn (N=1,260)				
Gender				
Male	484	142 (29.3)	342 (70.7)	<0.001
Female	776	310 (39.9)	466 (60.1)	
Race/Ethnicity				
White	797	334 (41.9)	463 (58.1)	<0.001
Asian	278	74 (26.6)	204 (73.4)	
URM	127	28 (22.0)	99 (78.0)	
Other	58	16 (27.6)	42 (72.4)	
Country of Birth				
United States	1,097	405 (36.9)	692 (63.1)	<0.05
Not in United States	163	47 (28.8)	116 (71.2)	
Degree Program				
MD or MD/other	1,220	439 (36.0)	781 (64.0)	0.65
MD/PhD	40	13 (32.5)	27 (67.5)	

might benefit from a greater understanding of cultural differences through cultural competency training.

In addition, striking among our findings were the relationships between grades and communications variables, which also may be culturally determined. White students reported higher levels of assertiveness than URM students and lower levels of reticence than Asian and URM students. These racial/ethnic differences in communication variables may have contributed to the racial/ethnic disparities in clerkship grades—students reporting greater assertiveness were less likely to report lower grades in all clerkships except internal medicine, and students reporting greater reticence were more likely to report lower grades in internal medicine, pediatrics and psychiatry. Since the

Table 4. continued

Pediatrics (N=1,269)	N	Highest Grade (%)	Lower Grades (%)	P
Gender				
Male	493	181 (36.7)	312 (63.3)	0.67
Female	776	294 (37.9)	482 (62.1)	
Race/Ethnicity				
White	798	344 (43.1)	454 (56.9)	<0.001
Asian	282	85 (30.1)	197 (69.9)	
URM	137	29 (21.2)	108 (78.8)	
Other	52	17 (32.7)	35 (67.3)	
Country of Birth				
United States	1,106	423 (38.2)	683 (61.8)	0.12
Not in United States	163	52 (31.9)	111 (68.1)	
Degree Program				
MD or MD/other	1,224	453 (37.0)	771 (63.0)	0.11
MD/PhD	45	22 (48.9)	23 (51.1)	
Neurology (N=890*)				
Gender				
Male	339	140 (41.3)	199 (58.7)	0.32
Female	551	209 (37.9)	342 (62.1)	
Race/Ethnicity				
White	542	240 (44.3)	302 (55.7)	<0.001
Asian	207	75 (36.2)	132 (63.8)	
URM	104	29 (27.9)	75 (72.1)	
Other	37	5 (13.5)	32 (86.5)	
Country of Birth				
United States	764	301 (39.4)	463 (60.6)	0.78
Not in United States	126	48 (38.1)	78 (61.9)	
Degree Program				
MD or MD/other	863	337 (39.0)	526 (61.0)	0.57
MD/PhD	27	12 (44.4)	15 (55.6)	
Psychiatry (N=1,230)				
Gender				
Male	475	191 (40.2)	284 (59.8)	0.01
Female	755	359 (47.5)	396 (52.5)	
Race/Ethnicity				
White	772	384 (49.7)	388 (50.3)	<0.001
Asian	273	105 (38.5)	168 (61.5)	
URM	132	41 (31.1)	91 (68.9)	
Other	53	20 (37.7)	33 (62.3)	
Country of Birth				
United States	1,068	493 (46.2)	575 (53.8)	0.009
Not in United States	162	57 (35.2)	105 (64.8)	
Degree Program				
MD or MD/other	1,194	531 (44.5)	663 (55.5)	0.32
MD/PhD	36	19 (52.8)	17 (47.2)	

Percentages are for the row totals. Levels of significance shown are for two-tailed Chi-squared tests of associations between clerkship grades and each predictor variable. Highest grades=H/A; lower grades= HP/P or B/C; * The N is lower for students in neurology because fewer schools require this clerkship.[28]

Table 5. Multivariable logistic regression models predicting lower grades (HP/P or B/C) in each clerkship compared with the highest grade (H or A)

Internal Medicine (N=1,278)	OR (95% CI)	P
Age	1.053 (1.008–1.101)	0.02
Assertiveness	0.990 (0.758–1.292)	0.94
Reticence	1.273 (1.034–1.567)	0.02
Quality of Clerkship Experience	0.332 (0.266–0.414)	<0.001
Gender		
Male	0.930 (0.719–1.202)	0.58
Female	1.000	
Race/Ethnicity		
Other	1.192 (0.638–2.228)	0.58
Asian	1.243 (0.901–1.713)	0.18
URM	2.428 (1.520–3.879)	<0.001
White	1.000	
Country of Birth		
Non-United States	0.897 (0.608–1.321)	0.58
United States	1.000	
Degree Program		
MD or MD/other	1.137 (0.627–2.064)	0.67
MD/PhD	1.000	

Surgery (N=1,265)	OR (95% CI)	P
Age	1.041 (0.997–1.087)	0.07
Assertiveness	0.704 (0.532–0.932)	0.01
Reticence	1.104 (0.896–1.361)	0.35
Quality of Clerkship Experience	0.450 (0.383–0.527)	<0.001
Gender		
Male	0.794 (0.612–1.030)	0.08
Female	1.000	
Race/Ethnicity		
Other	1.370 (0.708–2.650)	0.35
Asian	1.221 (0.885–1.685)	0.22
URM	2.679 (1.650–4.349)	<0.001
White	1.000	
Country of Birth		
Non-United States	1.355 (0.905–2.030)	0.14
United States	1.000	
Degree Program		
MD or MD/other	0.894 (0.448–1.787)	0.75
MD/PhD	1.000	

Ob/Gyn (N=1,260)	OR (95% CI)	P
Age	1.032 (0.989–1.077)	0.15
Assertiveness	0.625 (0.474–0.825)	0.001
Reticence	1.139 (0.925–1.404)	0.22
Quality of Clerkship Experience	0.520 (0.449–0.601)	<0.001
Gender		
Male	1.746 (1.335–2.285)	<0.001
Female	1.000	
Race/Ethnicity		
Other	1.355 (0.720–2.549)	0.35
Asian	1.599 (1.136–2.249)	0.007
URM	2.432 (1.522–3.886)	<0.001
White	1.000	
Country of Birth		
Non-United States	1.140 (0.761–1.708)	0.52
United States	1.000	
Degree Program		
MD or MD/other	1.063 (0.519–2.181)	0.87
MD/PhD	1.000	

communication variables may be related to students' cultural values and norms, minority students might benefit from mentoring or training in communications skills that are valued during clinical clerkships. It is important to note that, while assertiveness and reticence may be correlated, they do not measure the same construct. In addition to cultural competency training, these results have implications for communication skills training, as one study indicated that students who participated in a directed communications curriculum significantly outperformed students in the comparison group in overall clinical examination scores and patient assessment.[52] Our findings suggest that medical students who excel in asserting their knowledge may be rewarded by receiving better grades, although some communication attributes measured here may not necessarily be attributes that an "ideal" physician should have [such as, "If I don't know an answer, I still act as though I do" (item from assertiveness scale)]. We also cannot infer a causal relationship between grades and these communication attributes because students who receive the highest grades may become more assertive or less reticent as a result of their grades.

This study has a number of limitations. Although we included a large national sample of medical students, only three deans provided the number of students who were contacted at their school. Therefore, we cannot calculate a response rate to our survey, which limits the generalizability of our results. However, the purpose of this cross-sectional study was exploratory, and we did not intend to test hypotheses and generalize our findings or to make causal inferences. Thus, our sample was sufficiently large to explore associations between grades and noncognitive variables. Although our sample was not randomly selected, it was representative of third- and fourth-year U.S. medical students in terms of age, gender and race/ethnicity.[30-32] However, our sample may not be representative of the medical student population in terms of some unmeasured characteristics. For example, nearly all survey respondents passed their clerkships, and most received H/HP or A/B grades. Few medical students, however, fail their clinical clerkships, and there is a trend towards possible grade inflation in clerkship evaluations.[53,54] Thus, respondents to our survey are not likely to have differed significantly from nonrespondents in terms of clerkship grades.

Table 5. continued

Pediatrics (N=1,269)	OR (95% CI)	P
Age	1.036 (0.992–1.081)	0.11
Assertiveness	0.637 (0.486–0.834)	0.001
Reticence	1.277 (1.042–1.565)	0.02
Quality of Clerkship Experience	0.495 (0.420–0.585)	<0.001
Gender		
Male	1.169 (0.903–1.514)	0.24
Female	1.000	
Race/Ethnicity		
Other	1.385 (0.735–2.613)	0.31
Asian	1.513 (1.087–2.104)	0.01
URM	2.368 (1.501–3.734)	<0.001
White	1.000	
Country of Birth		
Non-United States	0.921 (0.621–1.366)	0.68
United States	1.000	
Degree Program		
MD or MD/other	1.614 (0.857–3.040)	0.14
MD/PhD	1.000	

Neurology (N=890*)	OR (95% CI)	P
Age	1.113 (1.054–1.175)	<0.001
Assertiveness	0.675 (0.488–0.934)	0.02
Reticence	1.151 (0.901–1.471)	0.26
Quality of Clerkship Experience	0.484 (0.408–0.573)	<0.001
Gender		
Male	0.989 (0.728–1.344)	0.95
Female	1.000	
Race/Ethnicity		
Other	4.299 (1.585–11.658)	0.004
Asian	1.627 (1.112–2.383)	0.01
URM	2.281 (1.382–3.764)	<0.001
White	1.000	
Country of Birth		
Non-United States	0.862 (0.552–1.346)	0.51
United States	1.000	
Degree Program		
MD or MD/other	1.551 (0.655–3.672)	0.32
MD/PhD	1.000	

Psychiatry (N=1,230)	OR (95% CI)	P
Age	1.007 (0.968–1.048)	0.71
Assertiveness	0.747 (0.577–0.968)	0.03
Reticence	1.226 (1.002–1.500)	<0.05
Quality of Clerkship Experience	0.559 (0.482–0.648)	<0.001
Gender		
Male	1.439 (1.121–1.847)	0.004
Female	1.000	
Race/Ethnicity		
Other	1.508 (0.831–2.738)	0.18
Asian	1.314 (0.959–1.799)	0.09
URM	2.124 (1.401–3.218)	<0.001
White	1.000	
Country of Birth		
Non-United States	1.427 (0.980–2.077)	0.06
United States	1.000	
Degree Program		
MD or MD/other	1.545 (0.767–3.113)	0.22
MD/PhD	1.000	

Lower grades (HP/P or B/C) are compared with reference category of Highest grades (H or A). Number of students included in the analysis for each clerkship is shown. OR: odds ratio; 95% CI: confidence interval. The reference category for each categorical predictor variable is denoted by OR=1.000; * The N is lower for students in Neurology because fewer schools require this clerkship.[28]

Our findings are consistent with the thesis that race/ethnicity, gender and interpersonal-communication variables are associated with clerkship grades. While these are important medical education issues, they also are of very practical importance for medical students, as receipt of H or A grades on required clinical clerkships are considered to be very important (if not the most important) consideration in the resident selection process, especially for highly competitive residencies. [5,35,36] However, we cannot infer causation (that the noncognitive variables we included in the model were causal predictors of clerkship grades) since all the data were collected at one time. A longitudinal study would be required to test this hypothesis.

Recent studies have questioned the utility of clerkship grades in the resident selection process because significant variability exists among medical schools in the likelihood of receiving the highest grades.[55] Furthermore, supervising clinicians' assessments of medical students' may not accurately reflect clinical competence because evaluations often are not based on direct observation of student–patient interactions.[56,57] Our results suggest a need for further research to evaluate the associations among noncognitive variables and clinical clerkship grades and for cultural competency training of both medical students and medical faculty to address racial/ethnic disparities in the education and evaluation of our future physicians. Most importantly, the question of whether or not our clinical clerkship evaluation systems truly reward important attributes of our future physicians needs to be critically evaluated.

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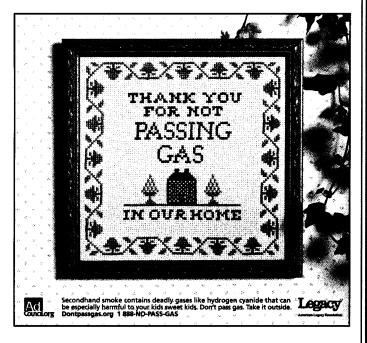
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