Early Performance in a Humanistic Medicine Course as a Predictor of Dental Students' Later Clinical Performance

Linda Pollak Nelson, D.M.D., M.Sc.D.; Peter Maramaldi, Ph.D., M.P.H., L.C.S.W.; Taru H. Kinnunen, Ph.D.; Elsbeth Kalenderian, D.D.S., M.P.H.

Abstract: The purpose of this study was to test the hypothesis that dental students' early ability to demonstrate a humanistic approach with patients is associated with later clinical performance. A first-year humanistic medicine course, Patient Doctor I (PDI), at Harvard School of Dental Medicine combines training in conducting the medical interview with human values, placing a high value on strengthening relationships with patients and emphasizing empowerment, respect, and strong communication skills. Retrospective data were collected in the following domains: PDI course evaluations, admissions information, National Board Dental Examination Parts I and II scores, and Promotions Committee and faculty evaluation scores for hand skills and humanistic and interactive patient-student skills. Planned linear contrasts comparisons were performed for each clinical outcome variable. Tests to support the a priori hypothesis of linear relationships between PDI evaluation ratings and clinical performance, defined as hand skills and humanistic and interactive patient-student skills scores, were significant, both at p=0.03. This study demonstrated the feasibility of measuring dental students' humanistic qualities during the first year. Humanistic qualities (PDI performance) during the first year were found to be associated with clinical performance in the third year of dental school.

Dr. Nelson and Dr. Maramaldi contributed equally to this work. Dr. Nelson is Assistant Clinical Professor of Developmental Biology (Pediatric Dentistry), Harvard School of Dental Medicine and Director of Postdoctoral Pediatric Dentistry Residency Program, Children's Hospital, Boston; Dr. Maramaldi is Associate Professor at Simmons School of Social Work, Research Associate Professor at Simmons School of Health Sciences, and Clinical Instructor, Department of Oral Health Policy and Epidemiology, Harvard School of Dental Medicine; Dr. Kinnunen is Assistant Professor, Department of Oral Health Policy and Epidemiology, Harvard School of Dental Medicine; and Dr. Kalenderian is Chair, Oral Health Policy and Epidemiology, and Chief of Quality, Harvard Dental Center, Harvard School of Dental Medicine. Direct correspondence and requests for reprints to Dr. Elsbeth Kalenderian, Harvard School of Dental Medicine, 188 Longwood Avenue, REB 206, Boston, MA 02115; 617-432-0538 phone; 617-432-0047 fax; Elsbeth_kalenderian@hsdm.harvard.edu.

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There is a dearth of empirically supported factors that predict student performance after admission to a dental program.[1-3] Two Canadian studies suggest that student interpersonal skills may be associated with academic and clinical performance.[4,5] We previously published a report on an American Dental Association-funded pilot study that documented the development of an innovative rating system for qualitative narrative assessments of first-year students' interviewing skills.[6] The study described in this article tested the hypothesis that students' early ability to demonstrate a humanistic approach with patients is associated with later clinical performance.

Similar to the practice at some other institutions, first-year students at Harvard School of Dental Medicine (HSDM) conduct patient interviews, creating a rich context for experiencing physical and behavioral issues with actual patients. The pedagogy in the first-year patient-centered course uses problem-based learning (PBL) to teach students the tenets of humanistic medicine, which entails approaching the patient as a person rather than a mere case or a sign or symptom of disease.[7] Humanistic medicine can be taught and learned, and it is central to the curriculum at HSDM where, in addition to dental classes, students complete the entire first two years of required coursework in medicine.[8] The first-year humanistic medicine course at HSDM is called Patient Doctor I (PDI). It combines training in conducting the medical interview with human values such as compassion, caring, sincerity, understanding, and integrity. It places a high value on strengthening relationships with patients and emphasizes empowerment, respect, and strong communication skills.[9] In a humanistic approach to dentistry, active listening is used to emphasize the shared humanity of patient and provider, enabling the dentist to practice with empathy, reflection, professionalism, and trustworthiness.[10]

Methods

Internal Review Board approval was obtained. The sample frame consisted of HSDM students who graduated between 2003 and 2011 and had data available in the following domains: PDI course evaluations, admissions information, National Board Dental Examination (NBDE) Parts I and II scores, and Promotions Committee and faculty evaluation scores for hand skills and humanistic and interactive patient-student skills.

Deductions from the literature and empirical observations were used to develop three concepts related to our hypothesis that students' early ability to demonstrate a humanistic approach with patients is associated with later clinical performance: 1) humanistic qualities (student's individual PDI performance ratings), 2) NBDE and year three promotion scores, and 3) two faculty evaluation scores related to clinical performance—hand skills (3a) and humanistic and interactive patient-student skills (3b). Student information was deidentified by the registrar, who extracted data from the admission information, including students' year of admission, year of undergraduate matriculation, GPAs and Dental Admission Test scores, and demographic information.

Definitions of Concepts and Study Variables

We defined "humanistic qualities" as attitudes and behaviors that reflect empathy and understanding of the patient's perceptions (operationally defined by the ratings of assessments of students' performance in the Patient Doctor I course). Faculty-rated student performance utilizing qualitative evaluations was quantified and assessed for reliability. Focus groups and individual interviews were used to develop a quantitative coding strategy. Faculty members used superlatives to identify high performance (1=best) and the absences of superlatives combined with negative comments to identify low performance (5=worst).[6] Previously published empirical findings used to generate the coding strategy are shown in Table 1.

We defined "NBDE and promotion scores" as students' command of the didactic curriculum (operationally defined by scores on the NBDE Parts I and II and year three Promotions Committee data). At HSDM, students take the NBDE I just prior to starting their third year. Most students take the NBDE II during their fourth year. We used the composite score in our analysis.

The minutes of the Promotions Committee reflect each student's performance and the decision to promote or hold the student back for remediation. Promotions Committee data were used to score the students as follows: students receiving Honors=1; students without concerns=2/3; students held back and not allowed to go on rotation immediately after completing their third year=4; and students with serious promotion concerns=5. This rating runs parallel to PDI narrative assessment quantitative ratings with 1 being the best and 5 being the worst.

We defined "hand skills" as dexterity and mastery of manual skills associated with direct patient care (operationally defined by hand skills scores, taken from dental faculty evaluations). "Humanistic and interactive patient-student skills" were defined as the clinical management of patient care, including infection control, treatment planning, and time management (operationally defined as humanistic and interactive patient-student skills scores, taken from faculty evaluations). The faculty used numerical thresholds to evaluate clinical performance for the third-year dental students with specific procedural requirements for the following disciplines: Operative Dentistry, Prosthodontics, Periodontics, Oral Surgery, Endodontics, and Pediatric Dentistry. For each completed procedure, students received a grade for treatment planning, professionalism, and infection control (humanistic and interactive patient-student skills) and a grade for the actual clinical dental procedure (hand skills). For the study reported here, we considered all graded completed procedures during the third clinical year. These were the only available clinical grade data for the study population. We combined the grades in all disciplines in order to average the clinical procedures scores. This enabled us to generate one mean hand skills score (1=best, 5=worst) and one mean humanistic and interactive patient-student skills score (1=best, 5=worst).

Statistical Methods

Given that our research questions were new and innovative, it was hard to estimate an exact effect size. However, as the initial population that we were drawing from was over 300, we allowed for missing data or non-availability and hence used n=200 as an estimate, because even a small effect size can be detected with 0.80 power (0.1 to 0.3=small effect; 0.3 to 0.5=moderate effect; and >0.5=large difference

Table 1. PDI evaluation ratings compared to demographic data, pre-admissions data, clinical performance, national board scores, and promotion scores

	PDI Evaluation Ratings (1=best, 5=worst)					
	1 N=22	2 N=42	3 N=76	4 and 5 N=26	ANOVA p-value	Linear Contrast p-value
Demographics						
Gender: women	50%	51%	57%	61%	NS	NS
White	73%	58%	48%	54%	NS	NS
Black	5%	5%	4%	0	NS	NS
Asian	22%	33%	39%	29%	NS	NS
Pre-admission data	Mean (95% CI)	Mean (95% CI)	Mean (95% CI)	Mean (95% CI)		
Age at entrance	24 (22.9-25.1)	23.5 (23.0-24.0)	24.0 (23.3-24.6)	23.9 (23.0-24.9)	NS	NS
DAT Acad Ave	22 (21.4-22.8)	21.9 (21.4-22.4)	22.2 (21.8-22.6)	22.3 (21.7-22.9)	NS	NS
DAT PAT	20.1 (19.1-21.2)	19.4 (18.7-20.2)	19.5 (18.9-20.1)	19.4 (18.4-20.3)	NS	NS
DAT Quant Reas	21.3 (19.7-22.9)	20.6 (19.4-21.8)	21.9 (21-22.7)	21.3 (19.9-22.8)	NS	NS
DAT Reading Comp	22.3 (21.2-23.4)	22.4 (21.6-23.2)	21.7 (21.2-22.3)	21.6 (20.7-22.6)	NS	NS
DAT Biology	21.2 (20.2-22.1)	21.5 (20.8-22.2)	21.2 (20.7-21.7)	21.3 (20.4-22.1)	NS	NS
DAT Inorganic Chem	23 (21.9-24.1)	22 (21.2-22.8)	22.9 (22.3-23.5)	23.3 (22.3-24.2)	NS	NS
DAT Organic Chem	22.9 (21.5-24.4)	22.6 (21.5-23.6)	22.8 (22-23.6)	23.5 (22.2-24.8)	NS	NS
DAT Total Sci	21.8 (21-22.6)	21.9 (21.4-22.5)	22 (21.6-22.4)	22.3 (21.6-23)	NS	NS
Clinical performance	Mean 95% CI	Mean 95% CI	Mean 95% CI	Mean 95% CI		
Humanistic and interactive patient-student skills	1.5 (1.5-1.6)	1.6 (1.5-1.6)	1.6 (1.5-1.6)	1.6 (1.5-1.7)	0.16	0.03
Clinical hand skills	1.7 (1.6-1.8)	1.8 (1.7-1.8)	1.8 (1.7-1.8)	1.9 (1.8-1.9)	0.16	0.03
National board scores	Mean 95% CI	Mean 95% CI	Mean 95% CI	Mean 95% CI		
NBDE I	91.6 (89.6-93.6)	91.1 (89.7-92.5)	92.3 (91.2-93.3)	91.4 (89.6-93.1)	NS	NS
NBDE II	82.7 (80.9-84.6)	83.2 (81.9-84.6)	83.5 (82.5-84.5)	82.7 (81-84.3)	NS	NS
Promotion scores						
One	18%	29%	39%	14%	NS	NS
Two/three (n=110)	14%	21%	48%	17%	NS	NS
Four/five	6%	38%	41%	16%	NS	NS

effect).[11] While the suggested Recommended Minimum Effect Size is 0.20 in social sciences,[12] we wanted to report even smaller effects to illustrate findings of this pilot study by using 0.15 as a cut-off point for minimum effect size. Our final sample size of 170 is sufficient to detect an effect size of 0.14 and larger.[12]

Descriptive statistics were computed for all variables. Pearson and Spearman (promotions scores) were calculated among these variables: PDI evaluation ratings, demographics, pre-admission data, clinical performance, NBDE scores, and promotions scores. The relationship between PDI evaluation ratings (classified as 1, 2, 3, and 4/5) and other variables were assessed by one-way ANOVAs for continuous variables and chi-square (Pearson and Fisher exact) for categorical variables. In addition, we had hypothesized a linear relationship between PDI evaluation ratings and clinical performance (hand skills and humanistic and interactive patient-student skills). Therefore, while calculating the overall significance of the F in the two one-way ANOVAs, planned linear contrasts comparisons were performed for each clinical outcome variable. In each planned contrast comparison, weights (in parentheses) were assigned to the means for each of the four PDI groups, according to the conventions stated by Rosenthal and Rosnow[13]: Group 1 (-2), Group 2 (-1), Group 3 (1), and Group 4/5 (2).

Results

Data were available for 170 students who had records for all the study variables. They included students who graduated in 2003, 2005, and between 2007 and 2011. By gender, the group was 55 percent women and 45 percent men. The majority were white/non-Hispanic (55 percent). One-third (34 percent) identified themselves as Asian/Pacific Islanders. Small percentages were black non-Hispanic (4 percent) or Hispanic (5 percent). The mean age at entrance was twenty-four (CI 23.5-24.4).

Correlations among the study variables tended to be weak. Strong correlations were found between humanistic and interactive patient-student skills and hand skills ($r=0.89$, $p<0.001$) and between NBDE I and NBDE II ($r=0.67$, $p<0.001$). This correlation indicated a strong relationship between the two parts of the grading system: humanistic and interactive patient-student skills and hand skills.

The relationships between PDI evaluation ratings and other variables are shown in Table 1. None of the one-way ANOVAs or chi-square tests yielded significant results. However, tests to support the a priori hypothesis of linear relationships between PDI evaluation ratings and hand skills and humanistic and interactive patient-student skills scores were significant, both at $p=0.03$. The results are shown in Table 2 and Figures 1 and 2.

Discussion

Our findings supported the a priori hypothesis that students' early ability to demonstrate a humanistic approach with patients is associated with later clinical performance. The required PDI course is akin to humanistic medicine, which may be included in the curriculum at other schools.

This study showed an association between PDI evaluation ratings (humanistic skills) and third-year clinical performance (hand skill and humanistic and interactive patient-student skills). Similar to Buyse and Lievens's findings with Situational Judgment Tests (SJTs),[14] we found that humanistic skills are a predictor for clinical performance in later years. SJTs measure interpersonal skills and noncognitive

Table 2. Key words or phrases used to obtain the PDI evaluation ratings

Key Words and/or Phrases in Narrative Evaluations in Form of Direct Quotes Taken from Faculty Interviews

With POSITIVE connotations	With NEGATIVE connotations
• From the beginning she seemed to exhibit an innate sense of . . .	• Although . . .
• I have no doubt that she will be a fine [something positive]	• However . . .
• Was a leader in group discussion	• I would hope that . . .
• Outstanding	• With more training . . .
• Delightful	• With more experience . . .
• It was a pleasure to have [name] . . .	• I am looking forward to [some area of improvement]
• [Student's] contributions were valuable	• Should continue working on . . .
• Exceptional	• Any mention of language or cultural issues affecting performance
• Superb	• It would be good if . . .
• Responded well to feedback	• It might be to her benefit if . . .
• Star	• Might benefit from . . .
• Mature	• [Name] had some difficulty with . . .
• Leader	• Had problem with [describe issue], but as the year progressed [something positive about performance]
• Excellent	• In the end, [name] was able to do the skills required . . .
• It was a pleasure to work with [name]	
• A natural . . .	
• Came in with . . .	
• Has innate people skills . . .	
• Openness to experience	
• Highly motivated self-learner	
• Go the extra mile	
• Natural gifts	

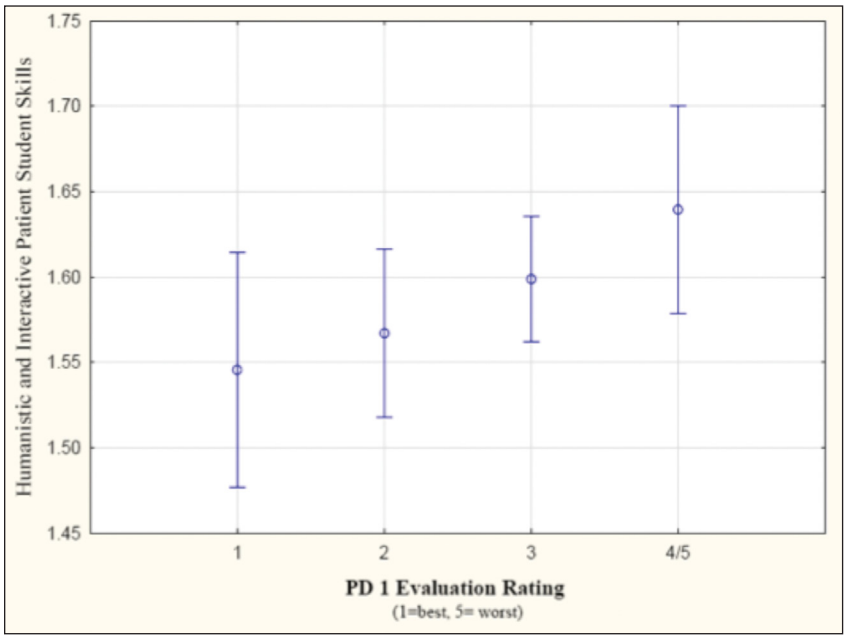

Figure 1. Linear relationship between PDI evaluation ratings and clinical performance: humanistic and interactive patient-student skills

ANOVA F(3, 166)=1.75, p=0.16; linear contrast F(1, 166)=4.76, p=0.03
Vertical bars denote 0.95 confidence intervals.

characteristics. We liken characteristics captured in SJTs to what we defined as humanistic qualities, which we used to predict student performance during the clinical years of training. Our findings support Buyse and Lievens's suggestion that dental educators might include selection criteria assessing both noncognitive skills and cognitive skills during the admission process.

Park et al. evaluated predictors of dental student clinical performance within a predoctoral dental program.[15] Proficiency was evaluated within their Clinical Evaluation System in four areas: operative, major restorative, and removable and fixed prosthodontics. They found that none of the predental and preclinical benchmarks (such as undergraduate GPA, Dental Admission Test scores, and NBDE I results) significantly predicted clinical performance. Admissions criteria and preclinical didactic performance also did not appear to be associated with clinical performance among their sample of eighty-four dental students. Similar to Park et al.'s findings, our study found that preadmissions data were not associated with clinical performance at HSDM. However, in our study, humanistic skills were associated with clinical performance.

The findings from our study suggest that research is needed to develop measures of the *potential* to learn the tenets of humanistic medicine. This is especially important because humanistic skills can be learned. Dental schools might consider integrating courses that teach humanistic qualities into their first-year curricula and student evaluations.

While we as dental educators seek clinical excellence, we should also strive to produce humanistic practitioners. The advent of the medical home and accountable care organizations underscore the importance of clinical practice that goes beyond traditional perspectives limited to merely the mastering of clinical skills. The mouth must be viewed as a window to assessing overall health, as oral health is a part of general health. Dentistry should align with medicine in ensuring that humanistic qualities are instilled in its graduates. The "dental home" should be fully integrated with the medical home, including the application of humanistic skills by health care providers.

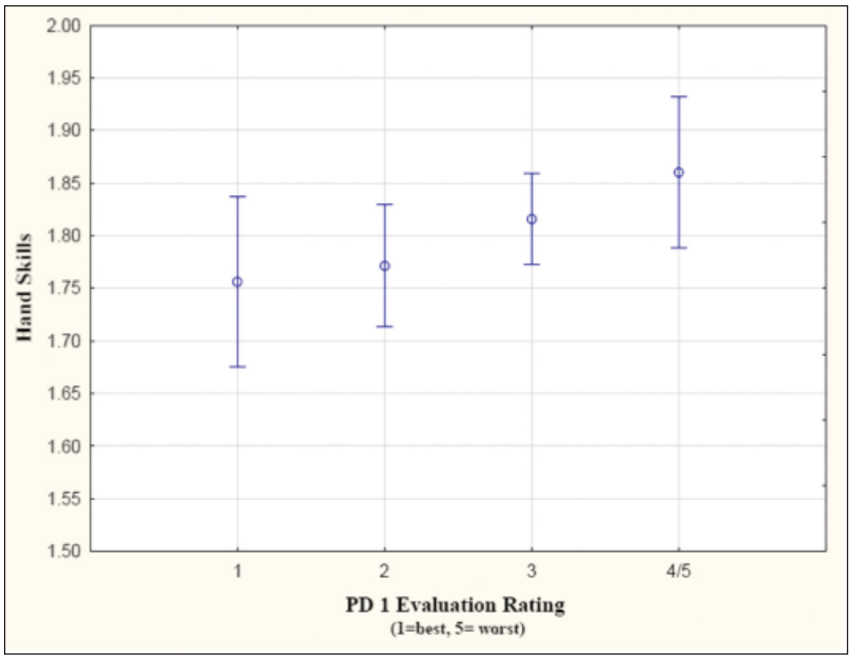

Figure 2. Linear relationship between PDI evaluation ratings and clinical performance: hand skills

ANOVA F(3, 166)=1.75, p=0.16; linear contrast F(1, 166)=4.76, p=0.03
Vertical bars denote 0.95 confidence intervals.

Conclusion

This study demonstrated the feasibility of measuring dental students' humanistic qualities during the first year. Humanistic qualities (PDI performance) during the first year were associated with clinical performance in the third year of dental school.

There are several caveats to consider about this study. The evaluations conducted by the faculty may be flawed due to subjectivity. However, students are evaluated by faculty members from multiple disciplines and specialties, which serves as a form of checks and balances. Although clinical faculty members in each department calibrate student performance standards at the beginning of the clinic year, there may be intra- and interevaluator variation. This is true both in PDI and in the dental clinic. In addition, given that this was a pilot investigation, the study was conducted in a single institution, and there were limitations with the size and scope of the study sample. Future investigations will benefit from larger samples and a sample frame including more than one institution. These issues limit the generalizability of these findings beyond our institution. However, we hope that these limitations will not discourage future investigations from using these findings as formative data for future research. Forthcoming directions may also include more direct or prospective measurements of humanistic/interactive behaviors in clinic settings in an effort to further corroborate these findings.

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