Medical Students' Perceptions of the Elements of Effective Inpatient Teaching by Attending Physicians and Housestaff

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BACKGROUND: Most studies of effective inpatient teaching have focused on teaching by attending physicians.

OBJECTIVE: To identify and compare medical students' perceptions of behaviors associated with teaching effectiveness of attending physicians and housestaff (residents and interns).

DESIGN AND PARTICIPANTS: Third-year students who spent 4 weeks on a general internal medicine inpatient service during academic year 2003–2004 completed surveys using a 5-point Likert-type scale. Students evaluated numerous teaching behaviors of attendings and housestaff and then evaluated their overall teaching effectiveness.

MEASUREMENTS: Each behavior was correlated with the perceived teaching effectiveness in univariate and regression analyses.

RESULTS: Seventy-two students were taught by 23 attendings and 73 housestaff. Of 144 possible teaching evaluations, they completed 142 (98.6%) for attendings and 128 (88.9%) for housestaff. The mean rating for perceived teaching effectiveness was 4.48 (SD 0.82) for attendings and 4.39 (SD 0.80) for housestaff. For attending physicians, teaching effectiveness correlated most strongly with enthusiasm for teaching (R^2=63.6%) but was also associated with inspiring confidence in knowledge and skills, providing feedback, and encouraging students to accept increasing responsibility. Housestaff teaching effectiveness correlated most strongly with providing a role model (R^2=61.8%) but was also associated with being available to students, performing effective patient education, inspiring confidence in knowledge and skills, and showing enthusiasm for teaching. Regression models explained 79.7% and 73.6% of the variance in evaluations of attendings and housestaff, respectively.

CONCLUSIONS: Students' perceptions of effective teaching behaviors differ for attending physicians and housestaff, possibly reflecting differences in teaching roles or methods.

KEY WORDS: clinical clerkship; undergraduate education; teaching quality.
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Numerous studies have demonstrated that the quality of teaching that medical students experience on their clinical clerkships is important to their career development. One study found that inpatient attending physician teaching ratings, but not those of housestaff, predicted students' knowledge gain as measured by a National Board of Medical Examiners (NBME) Subject Exam.[1] Another study found that the inpatient teaching ratings of attending physicians, as well as those of housestaff, had an impact on the NBME and United States Medical Licensing Examination (USMLE) scores of students and that this was true for both good and bad teachers.[2] A study at a third medical school demonstrated that teaching behaviors were responsible for improvement in student performance over a clerkship, with house staff teaching accounting for the majority of the variance.[3] Students are more likely to choose internal medicine as a career if their teaching residents or attending physicians are excellent teachers.[4]

Most of the studies that have assessed effective teaching on inpatient services have focused on attending physicians. Elements of attending physician teaching that have been shown to be important for student learning include using active and case-based learning, making thought processes transparent, and providing useful feedback. Excellent teachers demonstrate sound clinical skills, are good role models, and encourage students' professional growth.[5–8] While occasionally quality aspects of resident teaching have been studied,[9] prior studies have not made direct comparisons of resident and attending physician teaching. Although resident teaching is thought to complement, rather than duplicate, teaching by attending physicians,[10] the elements of excellent resident teaching are not well understood.

We sought to clarify the behaviors that third-year medical students associated with effective teaching during their inpatient internal medicine core clerkship and to compare the behaviors considered important for attending physicians with the behaviors they considered important for housestaff.

METHODS

Course Description

The 8-week inpatient adult medicine clerkship is required for all third-year medical students at the University of Pittsburgh. Students rotate for 4-week blocks at the Montefiore University Hospital and either the Veterans Administration Medical Center or Shadyside Hospital, a community-based teaching hospital. This study is limited to those students who rotated through Shadyside Hospital and their experiences on that rotation.

During their rotation at Shadyside Hospital, students participate in several teaching sessions. Teaching Attending physicians conduct Walk Rounds for 1 hour on Tuesday and Thursday mornings. During these rounds, students and interns present their patients emphasizing patients' daily management, often involving bedside interactions. For many of the patients, the Teaching Attending is also the patient's attending of record. Formal attending rounds are conducted with the Teaching Attending and 2 teams of residents, interns, and medical students on Monday, Wednesday, and Friday for 90 minutes. They focus on cases presented by students and interns, are conducted in a conference room, emphasize the pathophysiology of presented cases, and may involve bedside interactions.

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The Student Teaching Attending conducts sessions for medical students only. Each group of 4 to 5 third-year medical students meets for an hour, four times weekly. These sessions focus on students' case presentation skills, physical examination skills and written histories and physicals. Each Student Teaching Attending is encouraged to cover topics adapted from the Clerkship Directors in Internal Medicine/Society of General Internal Medicine (CDIM/SGIM) Curriculum Guide.[11]

Student Teaching Attendings and Teaching Attendings are chosen from the full-time and the part-time volunteer faculty based on interest in teaching and previous teaching evaluations. With few exceptions, they are generalists (general internists or geriatricians). Both Teaching Attendings and Student Teaching Attendings rotate in 4-week blocks. The interns and residents are participants in the categorical, medicine–pediatrics, and transitional programs at the University of Pittsburgh rotating through Shadyside Hospital.

Study Instruments and Study Population

At the end of each 4-week block, each student completes an evaluation of the intern, resident, Teaching Attending, and Student Teaching Attending with whom he/she worked. The form to evaluate the two types of attending physicians consists of 16 items, and the housestaff form consists of 20 items. All items on each form use a 1–5 Likert style scale where 1 = "hardly at all" and 5 = "to a high degree." The forms are similar to previously described, validated surveys.[12,13] The forms are completed anonymously, and attending physicians and house staff see only pooled results at the end of the academic year. None of the students, house staff, or attending physicians knew the teaching evaluations were to be studied.

We retrospectively obtained data from student evaluations for the academic year 2003–2004 (July 2003 to June 2004). Six students rotate through our hospital during each of 12 blocks, for a total of 72 students. The teaching of 23 attending physicians and 73 house staff members was evaluated by students during the study interval. Since each student evaluates an intern, a resident, a Teaching Attending, and a Student Teaching Attending, our potential sample size was 144 evaluation forms for house staff and 144 for attending physicians. The unit of analysis was an individual evaluation form. Forms for interns and residents and those for Teaching Attendings and Student Teaching Attendings were identical, so all house staff and both groups of attending physician evaluations were combined for analysis. However, since no attending physician could simultaneously fill both teaching positions, it was possible to separate Teaching Attending and Student Teaching Attending evaluations for subset analysis.

We decided a priori to limit to items that we thought were related to teaching quality and, with one exception, were on both the house staff and attending physician forms. This strategy left 13 items on the attending physician form and 14 items on the house staff forms. The items eliminated were related to process issues, such as accessing consultants or aspects of the medical informatics system. The retained items were correlated with a final, structurally identical item, which was overall teaching effectiveness.

Statistical Analysis

All statistical analyses were performed using JMP software (SAS Institute; Cary, NC). Comparisons of question means were made using the t tests and Kruskal–Wallis test. Correlations were performed using Pearson's r and Spearman's ρ. The multivariate analysis was performed using forward, stepwise linear regression with overall teaching effectiveness as the dependent variable.

This research was conducted with the approval of the University of Pittsburgh's Institutional Review Board. No extramural funding was used to support the study.

RESULTS

We obtained 142 medical student evaluations of attending physicians and 128 evaluations of housestaff, for response rates of 98.6% and 88.9%, respectively.

The mean for attending physicians' teaching effectiveness was 4.48 (SD 0.82) and ranged by individual attending physicians from 3.5 to 5.0. The number of evaluations per attending physician varied from 1 to 15, since specific attending physicians interacted with 1 to 4 groups of students. There were no significant differences between the teaching effectiveness evaluations of full-time and volunteer faculty. The mean for house staff teaching effectiveness was 4.39 (SD 0.80) and ranged

Table 1. Student Ratings for Teaching Behaviors of Attending Physicians and Housestaff*

Teaching Behavior	Mean (SD) Rating of Attending Physicians	Mean (SD) Rating of Housestaff
Showed enthusiasm and interest in teaching	4.69 (0.55)	4.62 (0.60)
Was available to me	4.49 (0.84)	4.59 (0.67)
Treated me with trust and respect	4.66 (0.61)	4.77 (0.49)
Encouraged me to accept increasing responsibility	4.54 (0.79)	4.69 (0.56)
Provided opportunity for learning technical skills	4.30 (0.90)	4.45 (0.90)
Explained approaches to problems and reasons for decisions	4.59 (0.75)	4.45 (0.95)
Was aware of clerkship expectations and goals	4.69 (0.59)	4.44 (0.78)
Provided useful feedback	4.13 (1.09)	4.20 (1.04)
Encouraged evidence-based medicine	4.72 (0.52)	4.44 (0.81)
Inspired confidence in their knowledge and skills	4.71 (0.62)	4.65 (0.58)
Considered cost-effectiveness and quality issues	4.28 (0.93)	4.12 (1.03)
Practiced ethical medicine	4.85 (0.42)	4.80 (0.44)
Provided a role model	4.41 (0.93)	4.45 (0.77)
Performed effective patient education†	–	4.54 (0.74)

*Students rated each behavior on a 5-point Likert-type scale in which 1 indicated "hardly at all" and 5 indicated "to a high degree."
†This item was evaluated only for housestaff.

Table 2. Results of Multivariate Analyses: Predictors of Medical Students' Perceptions About the Teaching Effectiveness of Attending Physicians and Housestaff*

Variable	Attending Physicians		Housestaff	
	P Value	R^2 Value (%)	*P* Value	R^2 Value (%)
Showed enthusiasm and interest in teaching	<.001	63.6	.05	1.0
Inspired confidence in their knowledge and skills	<.001	9.9	.02	1.6
Provided useful feedback	<.001	5.0	.86	–
Encouraged me to accept increasing responsibility	.03	1.2	.07	–
Provided a role model	.87	–	<.001	61.8
Was available to me	.34	–	<.001	6.4
Performed effective patient education†	–	–	.003	2.8
Total		79.7		73.6

Results shown are from analyses using forward stepwise linear regression methods in which all assessed teaching behaviors were independent variables, and the overall teaching effectiveness was the dependent variable.
†*This item was evaluated only for housestaff.*

from 2.0 to 5.0. The number of evaluations per housestaff member varied from 1 to 6.

The mean ratings for teaching behaviors are shown in Table 1. Attending physician ratings ranged from 4.13 to 4.85, with the lowest mean for providing feedback and the highest for practicing ethical medicine. The housestaff ratings ranged from 4.12 to 4.80, with the lowest mean for considering cost-effectiveness and quality issues, while the highest was again for practicing ethical medicine. The ratings of teaching behaviors were all significantly correlated ($P<.001$) with teaching effectiveness, with correlation coefficients ranging from .34 to .66 for attending physicians and from .38 to .75 for housestaff. Since all of the teaching behaviors were correlated with teaching effectiveness, they were all entered into the regression models.

The results of the multivariate analysis are shown in Table 2. The analyses explained 79.7% and 73.6% of the variance in attending physician and housestaff teaching effectiveness evaluations, respectively. Enthusiasm was the most powerful variable in the attending physician analysis, explaining nearly two-thirds of the variance in teaching effectiveness. Although enthusiasm remained significant in the housestaff model, it explained only 1% of the variance. The most powerful variable in the housestaff analysis was role modeling, explaining over 60% of the variance in teaching effectiveness. Role modeling did not reach significance in the attending physician model. Inspiring confidence in knowledge and skills appeared in both models, but it explained more variance in the attending physician teaching effectiveness model than in the house staff model (9.9% vs 1.6%). Providing feedback and encouraging students to take increasing responsibility explained significant variability in the attending physician teaching effectiveness model but not in the housestaff analysis. Availability to students explained variance in the housestaff model but not in the attending physician analysis. Providing patient education, the single item not included on both evaluation instruments, explained variance in the teaching effectiveness of housestaff.

When the evaluations of teaching attending and student teaching attending physicians were analyzed separately, clear differences appeared. The mean teaching effectiveness rating of Teaching Attendings was higher than that of Student Teaching Attendings (4.65 vs 4.35, $P=.04$). As shown in Table 3, both models contained enthusiasm as independently associated with teaching effectiveness. However, the Teaching Attending analysis resembled that of housestaff, containing role modeling and availability to the student. The final item in this model was providing opportunities for learning technical skills. However, none of these three items were retained in the Student Teaching Attending model. The Student Teaching Attending analysis resembled the combined attending

Table 3. Results of Multivariate Analyses: Predictors of Medical Students' Perceptions About the Teaching Effectiveness of Teaching Attending Physicians and Student Teaching Attending Physicians*

Variable	Teaching Attendings		Student Teaching Attendings	
	P Value	R^2 Value (%)	*P* Value	R^2 Value (%)
Provided a role model	<.001	74.8	.82	–
Showed enthusiasm and interest in teaching	<.001	7.3	.001	11.2
Was available to me	.01	2.4	.25	–
Provided opportunity for learning technical skills	<.04	1.7	.30	–
Encouraged me to accept increasing responsibility	.96	–	<.001	61.3
Inspired confidence in their knowledge and skills	.14	–	.01	5.6
Treated me with trust and respect	.63	–	<.001	4.5
Practiced ethical medicine	.48	–	.02	2.7
Total		86.2		85.3

Results shown are from analyses using forward stepwise linear regression methods in which all assessed teaching behaviors were independent variables and the overall teaching effectiveness was the dependent variable. Teaching Attendings conduct bedside walk rounds and formal teaching rounds with the entire ward team. Student Teaching Attendings conduct case presentation-based sessions with medical students only.

physician model with the exception of the item relating to practicing ethical medicine.

DISCUSSION

Our study investigated what medical students perceive as effective inpatient teaching behaviors by attending physicians and housestaff. From a medical student's perspective, behaviors associated with teaching effectiveness vary among housestaff and different types of attending physicians. Of the variables we studied, two were most strongly associated with perceived teaching effectiveness and accounted for over half the variance in their respective analyses: showing enthusiasm in teaching for the combined attending physicians and the Student Teaching Attendings and providing a role model for housestaff and Teaching Attendings. Inspiring confidence in knowledge and skills accounted for variance in the combined attending physician, housestaff, and Teaching Attending analyses, indicating the importance of perceived clinical competence. Other important teaching behaviors identified for housestaff included availability to the students and the provision of effective patient education. In contrast, other behaviors associated with the combined attending physician teaching effectiveness were giving feedback and encouraging increasing responsibility.

Previous studies have investigated the characteristics of attending physicians considered to be excellent teachers by housestaff and students. Irby illustrated that excellent teachers enjoy teaching, possess general medical knowledge, knowledge of the team, and of general teaching concepts.[6] Although excellent teachers may have very different styles of teaching, they share common characteristics that help facilitate learning, including case-based learning, active participation by learners, role modeling, and providing feedback and direction.[5] Many of these principles were evident in our students' evaluations. The importance of our "enthusiasm" variable probably captured Irby's concept of enjoying teaching. Torre et al.[7] addressed associations between learning activities and student perceptions of teaching quality. This study found that high-quality feedback and the opportunity to propose a plan were strongly associated with student perceptions of teaching effectiveness. Our study also demonstrated the importance of an attending physician's knowledge, skills, and feedback to the learners. Torre's "proposing a plan" may reflect the same concept as our "increasing responsibility," since both relate to effective teachers' allowing meaningful student participation and growth. A survey of medical students at the University of Michigan found that satisfaction with the learning environment was associated with feedback, promotion of critical thinking, and the faculty's placing a high priority on teaching.[14] These themes again parallel our findings of feedback, student growth, and enthusiasm.

An earlier study at our institution investigated overall teaching effectiveness from the medical student's perspective in the ambulatory setting.[8] This study involved many of the same attending physicians, but a different cohort of medical students. In our outpatient settings, students did not work with housestaff. The study identified four behaviors as independently correlated with students' perceptions of effective teaching behaviors: inspiring confidence in knowledge and skills, explaining decisions, respect for students, providing a role model. In our inpatient study, inspiring confidence in clinical skills, showing respect for students and role modeling remained correlated with perceived teaching effectiveness, but explaining decisions was not. Many of the findings are similar, and the differences in the results of these similarly designed studies may be due to the differences between teaching in the inpatient versus the outpatient settings. Some relevant factors might include the more rapid pace of precepting in the ambulatory setting, differences in case mix, and the one-on-one interactions versus team dynamics.[15,16]

A few previous studies have examined teaching behaviors of housestaff. Role modeling, respect for the student, and providing valuable experiences correlated with student satisfaction in one study that addressed high-quality intern teaching behaviors.[9] Studies have shown that a teaching skills course can improve medical student evaluations of resident teaching.[17] However, the instructional methods used vary from teaching specific skill sets to more theoretical approaches.[10] By helping to define the variability in teaching behaviors as perceived by medical students, our study may aid in planning housestaff teaching workshops.

Although it was the lowest rated behavior on our Likert scales, feedback remained associated with effective teaching by attending physicians. The important aspects of feedback have been clearly delineated,[18] and the importance of feedback from residents has been described.[19] Attending physicians, as more experienced teachers, may be more comfortable with this difficult aspect of clinical teaching. Given the low evaluations that feedback received for both residents and attending physicians, both would likely benefit from improvement in this area.

Our medical students valued role modeling from both residents and Teaching Attending physicians. Studies have shown that learners prefer role models similar to themselves.[20] Housestaff are closer to students in level of expertise and training, and students spend more time with them, observing their behavior and thought processes. Furthermore, students gain many of their skills at interacting with patients and their families by observing housestaff,[10] which may explain why availability and patient education were perceived as important housestaff teaching behaviors. Teaching Attending physicians interact with students, housestaff, and patients, at the bedside and on rounds, where they make frequent interventions into care plans. They are often among the most skillful clinicians in our institution, and the students see them as positive role models while acting in this capacity. Characteristics of good role models include emphasizing the doctor–patient relationship and teaching the psychosocial aspects of medicine.[21] The linkage between the important teaching variables in the housestaff and Teaching Attending analyses may also involve these key aspects of role modeling.

The Student Teaching Attending has a more academic role than the Teaching Attending. Through case discussions, the Student Teaching Attending covers much of the core content of the clerkship. During these sessions, students present case summaries and management plans without the presence of housestaff. If viewed along the path of student growth described by Pangaro, students need to progress from the "reporter" stage to the "interpreter" and "manager" stages.[22] In this context, it is understandable that the Student Teaching Attending who encourages increasing student responsibility will be seen as an effective teacher.

This study has a number of limitations. First, it was conducted at a single medical center and may need to be gener-

alized with care. Second, we were relying on students' recollection of teaching behaviors, so the study is subject to recall bias. Third, the number of questions that we asked limits our study. However, our instrument was similar to those used by prior, validated studies. In an earlier study, we found that gender and academic rank did not contribute to teaching effectiveness,[8] so we chose not to examine demographic variables. Finally, we assessed only students' perceptions of effective teaching and have no objective outcomes to validate their opinions.

Although students learn a significant amount from both house staff and attending physicians, how and what they learn is different. By focusing on specific teaching skills, the different types of teachers can complement each other and improve overall medical student learning. All need to work on providing adequate feedback. Faculty and housestaff development efforts could highlight those skills that are considered most important by medical students.

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