

Evaluations of Medical Students' Clinical Experiences in a Family Medicine Clerkship: Differences in Patient Encounters by Disease Severity in Different Clerkship Sites

Fred W. Markham, MD; Susan Rattner, MD; Mohammadreza Hojat, PhD;
Daniel Z. Louis, MS; Carol Rabinowitz; Joseph S. Gonnella, MD

Background and Objectives: *Evaluation of medical students' clinical encounters is an essential component of optimizing their educational experience. In this study, we collected data on the diagnoses and disease severity in student-patient encounters at different family medicine clerkship sites. **Methods:** Participants were 582 third-year medical students who completed a total of 7,515 specially designed patient encounter cards in a 6-week family medicine clerkship at five training sites over 3 years. **Results:** Variation was found in the average number of encounters in different clerkship sites. The findings for three frequently encountered diseases (essential hypertension, diabetes mellitus, and upper respiratory infection) showed significant differences in the proportions of patients at different stages of the disease in different clerkship sites. **Conclusions:** Students at different clerkship sites experience different numbers of encounters with patients and significant variation in the illness severity of patients seen in those encounters.*

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A variety of approaches have been used to document clinical experiences of medical students and physicians.¹⁻⁶ Attempts have also been made to evaluate differences in the experiences gained in different educational programs and different training sites.⁷⁻¹¹ Attention in those evaluations has been directed to the number of encounters with patients who have certain diseases, without taking into consideration the severity of the disease condition.

We believe that in monitoring and evaluating clinical experiences of medical students, documentation of the severity of medical conditions is important. Clinical management, including the management of health care costs, varies not only by clinical diagnosis but also by disease severity. The educational value of disease severity must therefore not be overlooked. While disease "variety" (case mix) has been the focus of atten-

tion in previous studies, the study reported here focuses on both disease variety and severity.

Severity of disease can be operationally determined by employing a system of disease staging developed by Gonnella et al.^{12,13} Disease staging is a clinically based classification system that permits the rational development of treatment protocols by identifying groups of patients at different levels of disease severity.¹⁴ The severity of disease is classified into three stages based on the development of pathophysiological manifestations: Stage 1 defines a disease with no complications (eg, type 1 diabetes mellitus without complications), Stage 2 is a disease with local complications (eg, diabetes mellitus with retinopathy or neuropathy), and Stage 3 is a disease with multiple-site involvement or systemic complications (eg, diabetes mellitus with renal failure).

This study was designed to examine the clinical experiences of medical students, measured by the number of encounters with patients at different stages of diseases in different family medicine clerkship sites. We determined if there are differences among different

clerkship sites in patient encounter opportunities (average encounters per student) and, if there are, whether there were differences in the proportions of patients at different stages of a given disease among different family medicine clerkship sites.

Methods

Participants

Participants were 582 third-year medical students at Jefferson Medical College (representing 89% of all third-year students) who returned a minimum number of encounter cards required by the department. These students were taking their required 6-week family medicine clerkship in three classes during the academic years of 1997–1998, 1998–1999, and 1999–2000. The minimum number of cards in the family medicine clerkship was 30, representing 75% of the completed cards expected to be received from each student based on clerkship directors' judgment after 1 to 2 years of experience with the project.

All students in our medical school are required to take a 6-week clerkship in family medicine. Students completed their family medicine clerkship in five affiliated institutions designated in this study as sites A, B, C, D, and E. Most patients were seen in outpatient family medicine facilities (83%). Some encounters occurred in the emergency room (10%), in nursing homes (2%), during home visits (1%), in hospitals (1%), and in other facilities (3%).

Instrument

We designed computer-readable patient encounter cards (copies are available from the authors) to document students' clinical experiences. One side of the card contained student identification and patient information (age and gender), encounter information (location of encounter and supervising physician), and a list of activities and procedures. The other side provided space for coding the encounter's principal diagnosis and its severity and up to four secondary diagnoses.

Procedures

In addition to instructions for completing the encounter cards, the students were given a booklet containing a diagnostic list using a small subset of codes from the *International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM)*¹⁵ These codes are used by students to translate the diagnoses that they write down on the card into numerical codes for the purpose of data analyses. The booklet also contains examples of the logic and application of disease staging for classifying illness severity.¹²⁻¹⁴

The students were instructed to fill out an encounter card each time they participated in the care of a patient. Completed cards were returned to the course coordinators and then scanned into computer-readable files for evaluation.

Three disease conditions (essential hypertension, diabetes mellitus, and upper respiratory infection) representing the largest number of encounters in the family medicine clerkship sites were selected for this study. Percentages of recorded encounters with patients at different stages of disease in each clerkship site were compared with those in other clerkship sites.

Statistical Analyses

Chi-square and z test for proportions were used to detect significant differences for the three selected diagnoses. Each encounter was considered as a unit of observation in statistical analyses. To examine the practical (clinical) importance of the differences, the effect size estimates (d), for pair wise comparisons of the proportions were calculated by arcsin transformation.^{16, pp179-213} The effect size estimates below .20 are considered trivial, around .50 are moderate, and above .80 are large.¹⁶ In statistical analyses of the present study, we took a conservative approach by considering any effect size estimate less than .35 (midway between .20 and .50) as a trivial difference with no practical (clinical) significance.

To study the validity of the encounter card information, 112 encounter cards completed by 15 students during their family medicine clerkship were examined.¹⁷ A comparison was made between the attending faculty's principal diagnosis recorded on the chart and the student's diagnosis submitted on the encounter cards.

To study the reliability of our patient encounter model, we compared the pattern of diagnostic categories for different clerkships (family medicine, internal medicine, and pediatrics) in three different academic years.

Results

A total of 7,515 patient encounters were reported by students in the five clerkship sites with the three diagnoses (3,906 essential hypertension, 1,819 diabetes mellitus, and 1,790 upper respiratory infection). Severity of disease was coded for 74% of these diagnoses. Total numbers of encounters by disease and clerkship sites are shown in Table 1. The percentage of patients at different stages of disease (as recorded by students) in each site are also shown in Table 1, as is the number of students at each site who completed the encounter cards for each of the disease conditions.

Comparisons Among Clerkship Sites by Disease Severity

Significant associations ($P < .01$) were observed between stages of diseases and clerkship sites for essential hypertension ($\chi^2_{(8)} = 37.5$) and for upper respiratory infection ($\chi^2_{(8)} = 56.8$) but not for diabetes mellitus ($\chi^2_{(8)} = 8.8$, $P = .35$).

Table 1

Percentages of Patient Encounters by Medical Students in a Third-year Family Medicine Clerkship, by Clerkship Sites and Stages of Disease

Clerkship sites(#)*	DISEASES AND SEVERITY			Total Encounters	Mean Encounter**
	Stage 1 %	Stage 2 %	Stage 3 %		
Essential hypertension					
A (52)	60	32	8	163	3
B (28)	68	32	0	60	2
C (244)	73	21	6	1,726	7
D (124)	79	16	5	395	3
E (99)	78	16	5	506	5
Diabetes mellitus					
A (43)	56	23	21	80	2
B (22)	48	30	22	46	2
C (231)	52	33	15	686	3
D (91)	56	27	17	152	2
E (92)	52	29	19	303	3
Upper respiratory infection					
A (35)	65	24	10	98	3
B (18)	89	11	0	38	2
C (134)	90	9	1	281	2
D (103)	86	13	1	387	4
E (76)	90	8	2	430	6

* Number of students who completed the encounter cards

** Total number of encounters reported by students divided by total number of students in a given site, rounded off to the nearest whole number.

In Stage 1 of essential hypertension, fewer encounters were recorded in sites A and B than sites D and E ($d > .35$). In Stage 2 of essential hypertension, proportions of encounters were smaller in sites D and E than sites A and B ($d > .35$). No patient in Stage 3 of essential hypertension was encountered in site B. The differences between this and other sites were of practical importance ($d < .35$).

Consistent with the chi-square results, none of the between-site differences in all three stages of diabetes mellitus were of practical importance ($d < .35$). In upper respiratory infection, the proportion of encounters at Stage 1 was significantly lower in site A than all other sites ($d > .35$). No other between-site differences were observed. In Stage 2 of this disease, the proportion of encounters was significantly larger in site A than sites C and E. Also, the proportion of encounters with patients at Stage 3 of upper respiratory infection was significantly higher for site A (10%) than all other sites.

Site Comparisons by Number of Encounters

The mean of the number of encounters per student can give an estimate of the opportunities for gaining clinical experiences in different clerkship sites. As shown in Table 1, these means for essential hypertension vary from a low of two (in site B) to a high of

seven (in site C), indicating that on average, a student at site C is provided with 3.5 times more opportunity to evaluate patients with essential hypertension than his/her counterpart in site B. Similarly, the opportunity for encounters with patients with essential hypertension is less than half in sites A and D, compared with site C.

The mean number of patient encounters per student for patients with diabetes mellitus is somewhat higher in sites C and E than in the other sites (three versus two). The opportunity for encountering a patient with upper respiratory infection is three times more in site E than in sites B and C. Also, the mean of encounters in site A is one half of that in site E.

The relative magnitudes of the average encounters for different stages of a disease in different sites follow a pattern similar to those of the percentages reported in Table 1. These results confirm the second research question: substantial differences exist in providing opportunities to students in gain-

ing disease-specific experiences in different clerkship sites.

Validity and Reliability of Students' Diagnoses

A 77% concordance rate was found between the students' recorded principal diagnosis and the faculty's confirmation of diagnosis. When either principal or secondary was taken into consideration, the concordance rate increased to 97%. These concordance rates are higher than those reported in a psychiatry clerkship (range=33%–49%)¹⁸ but comparable with those reported in a primary care clerkship (88% and 87%).¹⁹

Reliability testing showed similar patterns of diagnostic encounters for each clerkship across the 3 academic years. These findings suggest that the pattern of patient encounters remained stable over different academic years, providing evidence in support of the reproducibility of the results. For example, in the family medicine clerkship, all of the five frequently reported diagnostic problems were listed among the top diagnostic categories in all 3 years.

Discussion

These findings provide a partial affirmative answer to the first research question: proportions of encounters, in some diagnostic categories, with patients with different severity of diseases vary in different clerk-

ship sites (particularly in Stages 1 and 3). These findings suggest that medical students' clinical experiences in different clerkship sites may not be comparable in some of the diseases.

Information about the clinical encounters of each medical student has important educational implications in the planning of curriculum and for maintaining an optimal balance of clinical experiences among medical students. Also, the information should be used in the assessment of clerkship sites, as well as in counseling individual students to obtain complementary clinical experiences if such is needed.

Information concerning students' clinical experiences identifies possible deficiencies in educational programs by identifying the type of patient problems not encountered and procedures not performed by the student.¹⁷

For example, in a previous study, we observed that in a family medicine clerkship, female students were not performing male genital examinations as frequently as their male classmates.²⁰ Attention was paid to this deficiency, and significant improvement was made by close monitoring of clinical encounters—a checklist is now in place at all training sites to remind students and faculty to include specific procedures in students' clinical experiences.

Our model provides data that give educators the means to determine if the learning experiences meet the required standards. The model used in this study can help us understand the strengths and weaknesses in each clerkship site. Such understanding can in turn help optimize the clinical experiences of medical students.

Corresponding Author: Address correspondence to Dr Markham, Jefferson Medical College, Department of Family Medicine, 1015 Walnut Street, Suite 401, Philadelphia, PA 19107. 215-955-2350. fred.markham@mail.tju.edu.

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