The Cost of Medical Student Instruction in the Practice Setting

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Using an incremental cost approach, the cost of instruction for medical students participating in a variety of ambulatory-care, chiefly family-practice, experiences in several clinical practice sites was examined. The costs ranged from $5 per student per day for a first-year observational experience to $112 per student per day for a second-year preceptorship with direct patient care involvement by the students. Factors such as the previous experience of the student, the baseline productivity of the site, the number of examining rooms, the income source of the preceptor (salary vs fee-for-service), and the clarity of preceptor role definition are discussed in relation to cost. The lack of defined, stable income to offset costs is noted. In view of the substantial costs of instruction in ambulatory family practice clerkships, clearly defined ongoing sources of income must be provided to ensure the continuation or expansion of these vital experiences.

In an attempt to increase the number of students choosing careers in family practice and other primary care areas, health professional schools have increased the use of ambulatory care based experiences in training students for the health care professions.[1] Because of location and financial restraints, many traditional medical center clinics have not been able to meet the need for these additional ambulatory care sites. Furthermore, it can be strongly argued that a significant portion of education in primary care can best be provided in community based practice sites. Thus, physicians in private practice and administrators of large group practices have been asked to increase the number of medical and other health care students in their ambulatory care sites. The cost and income effects of this teaching load are of growing concern, especially with the current emphasis on medical care cost containment.

Ambulatory care teaching sites must have a means to assess the impact of teaching on their clinical operations. The basic cost questions facing clinical teaching sites are: what are the added costs in the practice setting due to students? And how are these costs offset? This study illustrates one approach to answering the first question by developing and applying an incremental cost approach in a variety of ambulatory practice settings and with different types of medical student clerkship experiences.

Methods

The study examined three practice settings: a consumer owned health maintenance organization (HMO), a university administered HMO, and offices of fee-for-service physicians. Elective clerkships in family medicine at the first, second, and

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fourth year levels were studied along with a required third year "primary care" clerkship.

An incremental cost approach to determining educational costs was used, since patient care is the most important "product" in usual practice settings. Using an incremental approach, only changes in expenditures for inputs of labor, materials, space, or in the value of patient care occurring as a result of adding students to a practice were considered to be instructional costs. No attempt was made to include in the dollar cost analysis any imputed value for time spent with students outside the usual working day.

There is no totally valid measure for patient care productivity. The number of patient visits before, during, and after the presence of students in the practice setting is used as a proxy measure of productivity. Where a significant difference in the number of visits with and without students present was found, the difference in mean visit productivity is used as a best estimate of productivity change. The difference is multiplied by the cost per visit to give the costs due to lost patient care productivity. The cost per visit is computed using data supplied by the comptroller in the prepaid practice settings and the average hourly fees generated in the private practice setting.

Semi-structured interviews with administrators determined what materials or space were added as a result of the presence of medical students. A review of accounting records was then used to determine actual expenditures. Similar interviews with physicians, nursing personnel, and the administrators were used to provide subjective assessments of the impact of teaching on the practice. Time logs were kept by participating physicians to record time spent with students outside or beyond the preceptor's usual clinical day.

Where students were present in the practice setting for one or two half-days per week (first-and second-year clerkships), the days before and after the time the student was present were used as controls for determining changes in productivity. For the fourth-year family medicine clerkship (an intermittently filled, four-week block experience), the two weeks before and after the student's presence were used as the control period. The university affiliated HMO has third-year primary care clerkship students in the practice setting present every day for 48 weeks each year. Therefore, two-week periods when the health plan was open but no students were present were used as the control period. The three weeks before and after the week that students were not present were used as the "study" period.

Preceptors in the HMOs were all general internists or family physicians, and counts of the number of patients seen per day described a normal distribution. The Welch test for unpaired samples with unequal variances was used as the test of significance. The fee-for-service physicians included some subspecialists as well as family physicians, general internists, and pediatricians. The counts of their patient visits were not normally distributed. A nonparametric test (Sign test) was used to test for group differences in this case. In those instances where a difference was found, the difference in the group means was used as a best estimate of the actual change in productivity. These differences multiplied by the cost per visit represent the cost of patient visit productivity changes. To allow comparison between clerkships, costs are reported on a per student per day basis.

Results

First-Year Family Medicine Course (Consumer HMO)

The students were present for a single half-day per week for a maximum of 30 weeks per year in 6 out of 85 family practice offices within the consumer-run HMO. There was no significant change in patient care productivity measured as the difference in the number of patients seen in the presence or absence of first year medical students (Table 1). The preceptors felt that since the basic purpose of the clerkship was to allow the students to observe an ongoing family practice, no reduction in the schedule was necessary or desirable. However, the preceptors reported that they spent an average of one half hour per day longer in the clinical setting during those sessions in which students were present. Since productivity was maintained, the extra time was considered to be donated by the physicians out of their personal time. The nurses involved in the practice setting did, however, generate a small cost due to excess overtime claimed on those days during which students were present. Since this cost is borne by the

Table 1. Productivity Changes and Total Costs Due to Presence of Medical Student

Clerkship	1st Year	2nd Year	3rd Year		4th Year
Site	A	A	B	C	A
Number of preceptors	6	3	8	10	3
Number of observations per preceptor (minimum)	20	40	15	10	40
Number of patient visits without students present mean ± SE (if normally distributed)	23.3 ± 2.5	23.6 ± 2.0*	17.7 ± 2.5	22.9**	23.5 ± 2.1*
Number of patient visits with students present mean ± SE (if normally distributed)	23.8 ± 2.6	15.3 ± 2.*	17.2 ± 2.9	21.7**	18.8 ± 2.4*
Total cost/student/day (lost productivity cost plus incremental cost of space, materials, and labor) rounded to nearest dollar	$5	$112	$84***	$30	$64
Principle patient care activity of medical student	Observation	Participation	Participation	Mixed observation and participation	Participation

Site A—Consumer owned prepaid group
Site B—University administered prepaid group
Site C—Offices, practices of private physicians
*Difference significant ($P<0.05$) using Welch test for unpaired samples with unequal variances
**Difference significant ($P<0.05$) using Sign test (number of visits were not normally distributed)
***See text for discussion
SE=Standard Error

practice site, it is included in the present analysis and results in a total cost of $4.50 per student per day. No increases in space required or materials used directly by the first year students were noted.

Second-Year Family Medicine Clerkship (Consumer HMO)

One to two students were present for a half-day per week for 30 weeks in 3 of 85 family practice offices within the HMO. This was an elective experience in which students were expected to follow a group of patients under the supervision of a family physician. There was a significant difference in the mean number of patients seen in the presence (15.3) and absence (23.6) of students (Table 1). The cost of replacing the 8.3 visits "lost" when students were present is $112/student/day. The preceptors' interviews revealed that they felt they could not meet the objectives of the

experience and maintain a full schedule of patients. There was no excessive overtime claimed by nurses during the time students were present. No additional space or material was required for the student clerkship.

Third-Year Primary Care Clerkship (University HMO)

The primary care clerkship is required of third year medical students. Medical students are present in all of the practices within the HMO in nearly every session for 48 of 52 weeks of the year. The students are encouraged to take an active role in patient care under a physician preceptor's supervision. No change in productivity was noted during the 2 one-week periods when the students were not present. However, since students were present in nearly all practices, the baseline productivity may have been at a level which "assumed" the presence of students. This hypothesis is strengthened by the observation that the baseline productivity in the university HMO is significantly less than that in the consumer owned HMO where students were in fewer than ten percent of the practices and for relatively short periods of time (Table 1). If the differences in productivity between the two HMOs were due to the almost constant presence of students in the university HMO, a loss of approximately five visits per day at a cost of $82/student/day would be attributed to the third year clerkship in the university HMO. The confounding variable of a difference in case mix between the two sites was examined and eliminated. One variable that could not be ignored was that the physicians in the university HMO were general internists rather than family physicians as in the consumer HMO. Given a similar patient population, family physicians may see more patients than do internists. The estimated cost of $82/student/day may thus be a maximum estimate of the productivity loss.

Clinical space in the university affiliated HMO was designed to include the presence of students. An examining room and small conference room were added to each practice. This extra space results in a cost of $1.50/student/day.

Third-Year Primary Care Clerkship (Private Office Setting)

During the third-year primary care clerkship, each medical student spends one day per week for eight weeks in a private physician's office. No office was used more than 24 weeks per year. The student role was limited to observation in some offices. A significant reduction in productivity was noted when students were present. The cost per visit used to compute the income lost to the practice was the current "usual and customary fee" of $25 for an intermediate office visit (20 minutes). The difference of 1.2 visits per day when students were present generated a cost of $30/student/day. No added space or material costs were identified.

Fourth-Year Elective Family Medicine Clerkship (Consumer HMO)

The students were supervised in block rotations of two to six weeks duration in 3 of 86 family practice offices in the consumer owned HMO. A significant decrease in the number of patients seen occurred when students were present. The replacement cost of the lost visits was $64/student/day. Again, the preceptors felt they could not maintain their full schedule and also direct the medical students. No incremental cost for space was involved but the preceptors felt that additional space would be needed if the students were present for a greater part of the year.

Discussion

This study was designed to estimate costs of practice based ambulatory care experience. The major costs resulted from reduced patient care visits "produced" when students were present. Total costs ranged from $4.50 per day for an observational first-year experience to $112 per day for the second-year experience in which students had an active role in the practice.

Clerkship experiences in which the students observed the clinical process generated fewer costs. First-year students felt the observational experiences were worthwhile. However, evaluations completed by third-year students revealed that merely observing was felt by the majority of these students to be of limited value.

As the student became more experienced, cost decreased. This reduction was presumably due to less instructional time required and increased patient care service provided by the students themselves. In the case of even more advanced

"students," a number of studies[2-4] show that at the third-year resident level there is sufficient trainee-provided productivity to cover a substantial share of instructional costs in addition to the resident's salary.

There are relatively few studies with which to directly compare the present results. Lindenmuth et al[5] studied two preceptors in the same third year primary care clerkship (university HMO) used in the present study. Their results indicated an actual increase in productivity (therefore a net benefit) by the physician who supervised the students. However, the Lindenmuth study did not control for changes in patient mix (the preceptoring physician tended to see walk-ins), nor for the effect of the student on supervision or productivity of the nurse practitioners who were present. Furthermore, as noted previously, in the present study the physicians in the university practice appeared to be working at a baseline productivity which assumed the presence of medical students. With no income incentives, it is unlikely that they would try to see more patients during relatively brief periods when they were not supervising medical students.

The authors have previously reported, using the same university HMO site,[6] a study in which the instructional costs were determined by allocation of the total cost of the medical school department to the various programs of the department. In that study, patient care, research, the third-year primary care clerkship, and other educational programs were considered to be of equal importance. Costs were allocated to those programs using a system of self-reported logs and direct observation. A cost of $50/student/day was attributed to the third-year primary care clerkship. One would expect the cost in that study, which included clerkship administration and indirect costs, would have been greater than the cost determined in the present study using an incremental approach. However, the prior total cost study relied largely on the preceptors to estimate proportion of joint activities (eg, examining a patient with a medical student present) that should be attributed to instruction. It may be that preceptors tend to underestimate the impact of students on their practices. Finally, the cost determination in the university HMO in the present study is, as noted previously, a maximum estimate of instructional costs.

Despite the methodologic differences, the studies seem to indicate a cost of about $50 per student per day for a typical third-year or fourth-year clerkship. Viewed another way, the cost would be roughly equivalent to the dollar cost of adding or switching from patient care to instruction about 40 minutes of preceptor time (or two to three visits) per student per day. Studies in other settings would be helpful in confirming these data.

While the dollar costs are valid only for the specific sites and clerkships studies, this experience suggests certain factors are of importance in affecting costs of medical student instruction in most ambulatory settings. If the baseline productivity of a site is quite high and the physicians busy, the presence of students may result in high costs as a result of reduction in productivity. Preceptors are unable to maintain a rapid pace with students present as more than observers. This is especially true early in clinical education when students need close supervision. The preceptors' understanding of their own role in medical education is also a major factor in determining costs. Even though the clerkships in this study had defined goals and objectives, the preceptors differed greatly in their role perception and in the amount of time they felt was necessary for teaching. Some of the preceptors gave short lectures on nearly every subject mentioned by the student. Others used more direct questioning and/or attempted to teach by example. The degree of independence given to students also varied widely with preceptors. All of these decisions affect the physician's use of time and thus the instructional cost.

Space in terms of examining rooms and offices available for students appears to be important especially in the later stages of clinical education. When the preceptor/student team has enough room to allow the student to complete work-ups while the preceptor continues to see patients, productivity is enhanced. Space costs, although substantial, are minor compared to costs resulting from reduced preceptor productivity. Administrative or financial pressures directed at maintaining productivity also affect costs. Since there is usually little direct effect of reduced productivity on their income, salaried physicians (such as those in HMOs and medical centers) may tend to reduce their patient visits more when students are present than comparable fee-for-service physicians.

Whether decreased productivity and increased time spent in teaching results in better student

education is an important and, as yet, unanswered question. Furthermore, what level of responsibility is appropriate for medical students at any given point in their training is another unanswered question. In some medical schools, fourth-year students function as interns in the inpatient environment. Likewise, it may be appropriate for students in the ambulatory care setting to provide patient service, under supervision, consistent with their level of experience. Fourth-year, and even third-year, students have the knowledge and skills to provide basic physical examinations and care for minor illnesses. Services provided by students may, if reimbursable, offset a portion of educational costs.

The level of student supervision and the preceptor's attitude towards ordering laboratory tests, x-rays, and consultations may also be important in controlling educational costs. If students are not closely monitored, increases in ancillary services and costs occur. While it may be argued that certain educational value may be derived from these tests, the costs must then be charged to education.

The means used to offset costs attributed to medical education are of major importance and interest. A variety of overt and hidden sources appear to have been utilized in the sites included in the present study. The teaching physician may accept a lower salary or income and, thus, directly bear the cost of reduced productivity attributed to education. Satisfaction from teaching and/or failure to realize the extent of income reduction may be factors in the preceptor's acceptance of a lower salary. In other situations, the patient bears the teaching cost by being charged more for the same service or for unnecessary ancillary services. For salaried physicians in HMOs or medical schools, decreased productivity results in fewer visits with a fixed salary level. Hiring extra physicians and nurses to replace the lost visits, or simply having fewer services available for the same premium cost, result in the cost burden falling on the patient. Government and private foundation support of clinical preceptors is relatively unusual. Despite the often modest amount involved, this type of support is viewed as important in starting programs and as one means of providing preceptors with recognition for their efforts in educating students.

Tuition income is occasionally used to pay for the education provided by faculty whose chief clinical activity occurs in ambulatory care settings. Whether these physicians can derive the remainder of their income from practice sources and compete successfully for promotions and tenure is a major problem facing most medical centers.

Current standards for medical education require that a significant amount of teaching take place in clinical ambulatory care practices. This activity generates costs due to added labor, space, and/or lost patient visit productivity. With significant costs attributable to education in the office practice setting, medical schools, the practice community, and government agencies should formulate policies that clearly define resources for offsetting ambulatory educational costs.[7] Otherwise, ambulatory care experiences will either continue to be underrepresented in medical education or be reduced to even lower levels than presently available.

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