



## APM Perspectives

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# Estimating the cost to departments of medicine of training residents and fellows: A collaborative analysis

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With almost 30% of the 106 000 U.S. resident and fellowship slots allocated to internal medicine and its subspecialties,<sup>1</sup> graduate medical education (GME) represents a major mission of departments of internal medicine. However, unlike patient care or, in university-based departments, research, departments of internal medicine have no reliable external source of funding for their GME efforts. Moreover, regulatory bodies continue to emphasize the teaching of residents over the clinical service they provide, a trend that serves only to increase the educational costs to departments. Although teaching hospitals receive substantial payments that total over \$6 billion annually from Medicare,<sup>2</sup> for residency and fellowship training in all specialties the departments and faculty members that provide the education receive little or no direct compensation through this mechanism. Medicare payments cover the salaries and fringe benefits that the physicians-in-training receive (direct medical education [DME]); these costs of

compensating physicians-in-training are not part of the present analysis. Hospitals also receive Medicare payments for indirect medical education (IME). These payments are designed to cover additional costs that the hospital incurs in caring for Medicare patients because participation of physicians-in-training in patient care is thought to reduce the efficiency of the hospital when compared with care provided by attending physicians alone.

To help defray the costs of training, departments of internal medicine must negotiate with their individual teaching hospitals for the fair market value of teaching provided by faculty members. In these negotiations, departments of internal medicine are at a severe disadvantage because there is little information available as to what it should cost them to educate their students. To help define these costs, the Association of Professors of Medicine gathered all available information from its member departments which had performed independent cost estimates. These approaches were presented on two occasions to groups of department chairs who provided advice on how to make these approaches more transparent. This article presents a consensus view of educational costs to departments of internal medicine

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and offers a straightforward approach for estimating them.

## Principles

We seek to define what it actually costs departments to provide an educational program that trains physicians effectively and fulfills the relevant requirements of regulatory bodies. This calculation bears no relation to what the hospital receives from the Medicare program or other payers (DME or IME) or what it saves by not having to pay in other ways for work that physicians-in-training perform. Hospital revenue for GME comes primarily from Medicare, which provides DME payments and IME adjustments to reimbursement rates to hospitals. The formula that determines the amount of this income to the hospital depends on the ratio of physicians-in-training to Medicare beds as well as other historical factors. In addition, the savings to the hospital for having physicians-in-training onsite depend on the costs of physician extenders, the willingness of private practice and full-time faculty physicians to cover patients without extenders or residents, and other local factors. Because hospital revenue and savings related to GME vary widely by region and circumstance, revenue and savings cannot serve as a basis for reimbursing departments for their expenses in providing training. The costs that departments incur in providing training are unrelated to payments hospitals receive for training. To determine whether to have GME programs and how large they should be, hospital executives need to examine true revenues and savings from these programs together with their true costs, including appropriate payments to departments for administering training programs and teaching the residents and fellows as well as the added cost of patient care provided by physicians-in-training.

The method of estimating departmental costs of teaching must be readily understandable to hospital administrators and department faculty, allowing them to identify the rationale behind the calculations and apply them locally with minimal effort and controversy. To achieve this end, wherever possible we seek to tie departmental costs of teaching directly to regulatory requirements. This approach should reduce disagreements between departments and hospital executives because hospital administrators are accustomed to defining expenditures needed to comply with regulatory mandates, such as state hospital certification, Joint Commission for Accreditation of Healthcare Organization inspections, and the like.

Departmental expenses must include all components of cost associated with administration of and teaching in the programs. For example, the cost of faculty time should include not only salary and fringe benefits, but also institutional (university or departmental) overhead

expenses, office space rental, and costs of faculty staff support; these costs are all prorated to the proportion of a faculty member's effort devoted to GME. Additional costs include administrative expenses such as staffing to coordinate recruitment, orientation, schedules, documentation of evaluations, and space rental for the education office. These administrative costs must include direct salaries and fringe benefits as well as all of the appropriate overheads.

Many training programs include a major component based at one or more Department of Veterans Affairs (VA) facilities. The costs of supervising and teaching physicians-in-training at VA medical centers should not be included in negotiations with non-VA hospitals because the VA central office provides funding to individual medical centers to pay for educating the physicians-in-training working there. However, because many GME programs that include VA training positions are administered from non-VA teaching hospitals, the program must expend resources on recruitment of physicians-in-training who will serve at the VA for part of their training as well as on oversight of the VA curriculum and evaluation of physician-in-training performance at VA sites. Thus, some of the administrative costs involved in VA training will need to be supported by non-VA hospitals.

A prior study of costs of GME developed sophisticated estimates of administrative costs per physician-in-training, which were found to vary inversely with program size.<sup>3</sup> Although these published estimates may serve as useful guidelines, it appears likely that administrative costs may be difficult to standardize from place to place. Recruitment costs will vary widely among programs. Some programs will need to invest a great deal of time and effort helping international medical graduates with visa issues. Programs with residents located in a single institution may have lower administrative costs than programs that manage resident and fellow rotations across multiple institutions. Oversight of large numbers of residents rotating through many different community-based sites may require more administrative effort than oversight of physicians-in-training at only a few such sites. As discussed above, programs with a large VA component may need to cover central program administrative costs for physicians-in-training while they are at the VA. As a practical matter, if the hospital administration seeks to contest the administrative costs, the budget for this function can be reviewed locally, line by line.

## Approach and results

All costs reported are for fiscal year 2003, which, for the University of Pittsburgh School of Medicine, is July

**Table 1** Calculation of costs to train fellows using Residency Review Committee (RRC) guidelines

	Fellows	Faculty*	Program director†	Effort (%)	Mean base salary‡ (\$)	Training cost (\$)
Cardiology	33	22.00	1.00	20	200 000	920 000
Endocrinology	6	4.00	1.00	20	151 000	151 000
Gastroenterology	14	9.33	1.00	20	194 000	401 000
Geriatric medicine	5	3.33	1.00	20	142 000	123 000
Hematology/oncology	19	12.67	1.00	20	182 000	498 000
Infectious diseases	7	4.67	1.00	20	137 000	155 000
Pulmonary	14	9.33	1.00	20	174 000	359 000
Renal electrolyte	14	9.33	1.00	20	165 000	341 000
Rheumatology	6	4.00	1.00	20	136 000	136 000
Total	118	78.67	9.00			3 084 000
Overhead§						616 800
Grand total						3 700 800

\*RRC requires 1 faculty member at 10 hours per week (20% of FTE) for each 1.5 fellows.

†RRC requires 1 program director at 20 hours per week beyond time spent as a faculty member (40% FTE) for each program. We have shown this as an added 10 hours to a key clinical faculty position.

‡Base salary plus fringe benefit charge. Mean in University of Pittsburgh School of Medicine Department of Medicine—April, 2004. Base salary averages 82% of total compensation.

§Overhead = 20% of salary and fringe benefit charge.

2002 through June 2003. Using these principles, costs are categorized as follows.

### Administrative costs

As noted above, administrative costs consist of the costs of program staff to coordinate recruitment, orientation, schedules, curriculum administration, and documentation of evaluations, as well as recruitment costs, costs of educational materials, and rental of office space. These costs can be readily identified in the departmental budget and are determined by local circumstances.

### Fellowship training

The Residency Review Committee for Internal Medicine (RRC-IM) mandates that fellowship training programs provide 0.2 faculty full-time equivalent (FTE) for each 1.5 fellow FTE within the hospital plus a program director at 20% effort to administer the fellowship (the RRC-IM rules state one faculty member at 10 hours per week for each 1.5 fellow trainee).<sup>4</sup> In addition, the RRC-IM mandates that each fellowship director spend 20 hours per week on the program. Assuming that the program director is one of the faculty FTE included above, we need to add 10 hours per week (an additional 20% of time if we assume a 50-hour work week; this 50 hours does not include time on call) for each fellowship program. On this basis, for example, a fellowship program with 6 fellow FTE at the hospital would require 0.8 FTE of time of a faculty member in the subspecialty of the fellowship as well as an additional 0.2 FTE to provide for the program di-

rector, who must devote at least 20 hours per week total to the program.

The regulations governing fellowships stipulate that fellowship directors have a certain degree of experience beyond their initial training, particularly 5 years prior experience as a fellowship faculty member. Because fellowship directors perform a high proportion of the teaching, it is reasonable to assume that the faculty FTE necessary to teach the fellows will be made up of individuals who have at least the level of experience in the subspecialty that the fellowship directors have. On this basis, the FTE necessary for training will need to be reimbursed to the department using an income level at the median level for the subspecialty of the fellowship, using either national or local guidelines for academic physicians. As noted above, the cost for this faculty time includes salary, fringe benefits, and overheads. Table 1 illustrates these calculations applied to the fellowship training programs at the University of Pittsburgh Medical Center (UPMC, 118 fellows) during a representative recent academic year.

### Residency training

Residency training costs fall under 3 categories, including program leadership and key generalist faculty, subspecialty training directors, and costs of providing teaching by other physicians. Although the RRC-IM does not provide an all-encompassing formula for faculty participation in residency training, there are mandates for the number of program leaders and subspecialty training directors within a training program.<sup>4</sup>

The first category, program leadership and key faculty, can be determined using RRC-IM guidelines,

**Table 2** Residency training: RRC required program leadership and key clinical faculty, 141 resident FTE at the academic hospital

	Effort (%)	Mean base salary* (\$)	Training cost (\$)
Program Director, Residency Training	70.0	195 000	136 500
Associate Program Director	50.0	140 000	70 000
Associate Program Director	50.0	140 000	70 000
Associate Program Director	50.0	140 000	70 000
Associate Program Director	50.0	140 000	70 000
Site Coordinator	30.0	140 000	42 000
Key clinical faculty	30.0	140 000	42 000
Key clinical faculty	30.0	140 000	42 000
Key clinical faculty	30.0	140 000	42 000
Key clinical faculty	30.0	140 000	42 000
Key clinical faculty	30.0	140 000	42 000
Key clinical faculty	30.0	140 000	42 000
Key clinical faculty	30.0	140 000	42 000
Key clinical faculty	30.0	140 000	42 000
Key clinical faculty	30.0	140 000	42 000
Total			794 500
Overhead†			158 900
Grand total			953 400

RRC = Residency Review Committee; FTE = full-time equivalent.

\*Base salary plus fringe benefit charge. Mean in Department of Medicine, Division of General Internal Medicine—April, 2004. Base salary averages 87% of total compensation.

†Overhead = 20% of salary and fringe benefit charge.

which specify numbers of individuals in each category, depending on the number of physicians-in-training within the program. Table 2 describes this calculation for the University of Pittsburgh program and lists defined RRC-IM roles for program directors, associate program directors, and key clinical faculty members using the numbers RRC-IM requires for the complement of physicians-in-training. At our academic hospital we have 141 FTE-based interns and residents. The RRC-IM requires one program director giving at least 50% effort (Pittsburgh uses 70% effort because of the size and complexity of the program), one associate program director for every 40 residents, and 8 key clinical faculty. The University of Pittsburgh program designated a site coordinator at 30% FTE because the program is based at two sites in addition to the VA. The number of residents refers to FTE within the hospital itself. The VA provides for faculty training at the VA.

The second category includes additional clinical faculty members in specific disciplines mandated by the RRC-IM (subspecialty education coordinators). Key clinical faculty may also serve as subspecialty education coordinators, but the job is distinct from key clinical faculty members and associate program directors because they coordinate training in their subspecialties and assist in career planning for physicians-in-training who seek fellowships. We have shown these as additional cost over key clinical faculty for 6 disciplines and utilized key clinical faculty for the remainder. This calculation may use the compensation of the division chief or the designated faculty member to determine the cost. Another alternative is to use the Association of American Medical Colleges (AAMC) median for a

typical associate professor level faculty member. We have chosen to use the mean level of compensation for each subspecialty in the University of Pittsburgh School of Medicine Department of Medicine. This calculation is illustrated in Table 3.

The third category, additional teaching cost, covers the cost of providing teaching by individuals not included in the first two categories. This component is the most difficult to define, because it is not guided by any mandates from the RRC-IM. Different groups who have estimated this cost have used different approaches. Nasca et al. assigned no cost to the depart-

**Table 3** Additional faculty members in specific disciplines—subspecialty education coordinators for residency training

Division	Effort (%)	Mean base salary*	Training cost (\$)
Cardiology	0.20	200 000	40 000
Gastroenterology	0.20	194 000	39 000
Geriatric medicine	0.20	142 000	28 000
Hematology/ oncology	0.20	182 000	36 000
Pulmonary	0.20	174 000	35 000
Renal	0.20	165 000	33 000
Total			211 000
Overhead†			42 200
Grand total			253 200

RRC = Residency Review Committee; FTE = full-time equivalent.

\*Base salary plus fringe benefit charge. Mean in Department of Medicine—April, 2004.

†Overhead = 20% of salary and fringe benefit charge.

**Table 4** Additional teaching by divisions

	Allocated 36-Month Training Schedule			Training cost (\$)
	Session 1* (months)	Session 2† (months)	Total (months)	
Cardiology	4.00	1.77	5.77	378 656
Endocrinology		1.78	1.78	116 813
Gastroenterology		1.78	1.78	116 813
General internal medicine	10.00		10.00	656 250
Geriatric medicine	1.00	1.78	2.78	182 438
Hematology/oncology	2.00	1.78	3.78	248 063
Infectious diseases		1.78	1.78	116 813
Pulmonary	3.00	1.77	4.77	313 031
Renal electrolyte		1.78	1.78	116 813
Rheumatology		1.78	1.78	116 813
Total	20.00	16.00	36.00	2 362 500§
Overhead‡				472 500
Grand total				2 835 000

\*Inpatient months on service.

†Ambulatory and sub-specialty months on service.

‡Overhead = 20% of salary and fringe benefit charge.

§13.5 full-time equivalent (FTE) were required to teach 141 residents at \$175 000. \$175 000 is mean base salary and fringe benefit charge in the Department of Medicine—April 2004.

ment of medicine for bedside teaching in the hospital, arguing that the help residents provide to faculty members in performing bedside rounds compensates for time spent teaching.<sup>3</sup> The Departments of Medicine at Creighton University and the University of Pittsburgh performed time studies that revealed significant costs for bedside inpatient teaching and somewhat lower costs for outpatient teaching than the estimates of the Nasca study. Such time studies can be onerous and distracting for program faculty and staff and because these studies cannot be compared readily with national benchmarks, they may be less than persuasive to hospital administrators. As shown at the bottom of Table 4, the University of Pittsburgh time studies revealed that it takes 13.5 faculty FTE to provide teaching not covered by the first two categories to 141 FTE of interns and residents based at the non-VA hospitals in the program. Table 4 divides this cost into the different divisions of the department based on the amount of time physicians-in-training spend working with the faculty of each division. Table 5 sums up the total costs of teaching in the University of Pittsburgh program, including all of the categories just described.

As an alternative, the Hunter Group, which has consulted extensively at a number of academic hospitals including Wayne State University School of Medicine, Mount Sinai School of Medicine, and the David Geffen School of Medicine at the University of California, Los Angeles, developed a blended approach that takes the resident training schedule and divides it up into primary care time and specialty care time for both inpatient and outpatient experiences. In their estimates, primary care supervision requires one FTE for each 6 physicians-in-training (based in part on family medicine RRC guide-

lines and Hunter Group estimates from independent time studies). Specialty supervision is set at one FTE for each 10 physicians-in-training. Table 6 provides an estimate, based on time studies, of these additional teaching costs at the University of Pittsburgh. Table 7 totals these costs, and then develops a cost per resident and a cost per fellow.

Our estimates for training costs have several potential limitations. First, we have created a separate category for additional teaching cost because in large programs the institutional roles can cover only a fraction of the teaching and precepting. To the extent that a program can accomplish its entire teaching mission using only program directors, associate program directors, key clinical faculty, subspecialty co-

**Table 5** Total costs of education at the University of Pittsburgh School of Medicine

	Cost (\$)
Administrative office expense	1 300 000
Fellowship training expense	3 700 800
Residency training expense	
Program leaders	953 400
RRC subspecialty coordinators	253 200
Additional teaching cost	2 835 000
Total	9 042 400
Cost per resident	35 164*
Cost per fellow	31 363†

\*Administrative office expense is divided over all 200 residents, including resident FTE, at the VA. Residency Training Expense is divided over 141 resident FTE present at non-VA teaching hospitals.

†118 fellows at non-VA teaching hospitals.

**Table 6** Assumptions, Hunter Group

Faculty supervision	
10 Residents/FTE faculty = Specialty	10:1
6 Residents/FTE Faculty = Primary Care	6:1
Median AAMC Associate Professor salary plus benefits (Primary Care)	\$164 585
Median AAMC Associate Professor salary plus benefits (Specialty)	\$209 383
Median AAMC Department Chair salary plus benefits (Primary Care)	\$260 268
Mean AAMC Department Chair salary plus benefits (Specialty)	\$378 701
Service Chief	\$75 000
Average secretary salary plus benefits	\$43 050
GME office support per resident	\$600
Program Director salary = Median AAMC Associate Professor salary plus benefits	
Benefit factor	23%

ordinators, and site directors, our cost accounting could be reduced by up to 30%. Second, we have shown faculty costs based on FTE. However, the cost of a gastroenterologist or interventional cardiologist losing procedure time is more than the percent FTE shown, and our model does not account for this additional cost to the Department. Similarly, the loss of time for inefficiencies of teaching (interrupted patient schedules, travel time, etc) is not included in our additional teaching costs.

## Conclusions

Although different approaches have been used at different medical centers, there is remarkable unanimity in the cost estimates. Nasca et al estimate that it costs departments of medicine \$34 000 per year to train a resident, with costs rising to higher levels in smaller programs because of reduced efficiency in spreading administrative costs over many residents. The Nasca group does not provide an estimate for fellows. The Hunter Group, in conjunction with the places it has consulted, estimates about \$34 000 per resident and \$17 500 per fellow. In these analyses, the estimates for costs of training fellows were heavily influenced by the reduced level of DME and IME revenue provided by Medicare for subspecialty fellows as opposed to residents. These estimates are outlined in Tables 6 and 7. Interestingly, if the Hunter Group analysis were applied to the University of Pittsburgh training program (141 FTE at the non-VA hospitals multiplied by \$34 000 per resident plus 118 FTE multiplied by

\$17 500 per fellow) together with the administrative office costs, the cost for teaching would total \$8 134 000, a value that differs from the estimates from time studies by 11%. The difference in the calculated results comes from a lower estimate of the costs of fellowship training by the Hunter Group, which, as stated above, was based on estimates of GME funding as well as on actual costs of teaching. Time estimates at Creighton University came up with about \$34 000 per resident and \$24 000 per fellow. At Creighton, the costs for educating residents and fellows may be increased because the programs are small and there are high fixed costs. The University of Pittsburgh time studies led to an estimated cost of \$35 000 per resident. The annual cost of training a fellow is also approximately \$30 000, using the RRC-IM mandates as the basis for the calculation. It is interesting, in this regard, that the VA allocates \$43 000 per year to its hospitals above and beyond the salary and fringe of each physician-in-training to train each resident.<sup>5</sup> (The figure quoted varies by region. For VISN 4 [Pennsylvania, Delaware and parts of West Virginia] it was \$42 911 this year.) In the VA system, payments for resident and for fellow education are identical.

In summary, the consensus approach for estimating the costs of providing GME developed here sums up local administrative costs, costs of fellowship training driven by RRC-IM mandates, and the 3 components of residency training costs including program leadership and key faculty, subspecialty faculty, and an estimate of the cost of providing teaching by the rest of the faculty. Because time studies at two institutions agree with those of the Hunter Group, it seems entirely reasonable to use the Hunter Group approach to estimating this component of residency training, which has the advantage of being formula-driven.

Although it is very difficult to determine exact costs to departments of internal medicine for providing GME, the values developed using several different methodologies at multiple academic medical centers agree, to a reasonable extent. Of course, the costs of some of these components will vary at different institutions. The approach outlined here is simple and related as directly as possible to regulations governing training programs and appears likely to be applicable to any U.S. academic medical center. Similar approaches along these lines can also be developed for training programs in other disciplines, with modifications that relate directly to the circumstances of and regulations governing training in these disciplines.

**Table 7** Hunter Group analysis of teaching costs

Department of Medicine	ACGME positions (GME office)	XXX Residents	XXX Faculty	Dept. Chair	Admin Asst.	Service Chief	Program Director	Admin Asst.
Allergy/clinical immunology	2	2.0	0.3			1.0		
Cardiology	35	16.6	1.7			1.0		
Endocrinology	8	5.6	0.9			1.0		
Gastroenterology	12	5.6	0.6			1.0		
Geriatric medicine	13	7.9	1.3			1.0		
Hematology/oncology	12	10.1	1.7			1.0		
Infectious disease	5	2.5	0.4			1.0		
Liver disease		3.0	0.5			1.0		
Internal medicine	130	103.7	17.3			1.0	0.5	0.5
Medicine-pediatrics	8	7.0	1.2			1.0		
Pulmonary and critical care	28	9.4	0.9			1.0		
Nephrology	13	10.4	1.7			1.0		
Rheumatology	2	1.8	0.3			1.0		
Sub-specialty programs							0.5	0.5
Subtotal	268	185.7	28.8	0.5	1.0	13.0	1.0	1.0
Total	\$160 800		\$4 746 469	\$189 351	\$43 050	\$975 000	\$164 585	\$43 050
Cost/resident	\$600		\$25 561	\$1 020	\$232	\$5 251	\$886	\$232
Teaching cost total		\$6 322 304						
Cost/resident		\$34 048						

ACGME= Accreditation Council for Graduate Medical Education.

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