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Research Report

Does It Cost More to Train Residents or to Replace Them?

A Look at the Costs and Benefits of Operating Graduate Medical Education Programs

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Sponsored by the Medicare Payment Advisory Commission

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Preface

Medicare is the primary vehicle for federal support for physician residency training programs through its graduate medical education payments to teaching hospitals. One important factor influencing the decisions that a teaching hospital makes regarding graduate medical education (GME) program offerings is how the residency programs are likely to affect its financial performance. The Medicare Payment Advisory Commission (MedPAC) is concerned that the increasing trend toward physician specialization is inconsistent with the needs of an efficient, high-quality, high-value health care delivery system for primary care physicians (MedPAC, 2010). MedPAC asked RAND to use available literature and data to summarize how the costs and benefits of operating residency training programs are likely to vary by specialty. The underlying policy question is whether Medicare support for residency training programs should be restructured to differentiate between programs that are less costly or self-sustaining and those that are more costly to the supporting institution. This report should be of interest to policymakers and other parties involved in GME financing issues.

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Abstract

The policy issue underlying this study is whether Medicare support for graduate medical education (GME) should be restructured to differentiate between programs that are less costly or are self-sustaining and those that are more costly to the sponsoring institution and its educational partners. We used available literature, interviews with individuals involved in operating GME programs, and analysis of administrative data to explore how the financial impact of operating residency training programs might differ by specialty. The study does not quantify the variation in financial impact, but it provides a framework for examining both the costs and benefits of operating GME programs to the sponsoring institution and its educational partners. It also identifies the major factors that are likely to affect financial performance and influence program offerings and size.

Marginal financial impacts are more likely to influence sponsor decisions on changes in GME program size and offerings and help explain why GME program expansions are occurring without additional Medicare funding. If the hospital has service needs, there is a marginal benefit to adding a resident, particularly in the more-lucrative specialty and subspecialty programs, before considering the additional benefits of any Medicare GME-related revenues.

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Summary

A number of factors influence the decisions that a sponsoring institution makes regarding which graduate medical education (GME) specialty and subspecialty programs to support, how many positions to support, and the sites where residency training occurs. One important factor is the financial impact of supporting a residency training program. The impact includes both the costs associated with operating the residency program and the benefits that the hospital and its educational partners derive from operating the programs. In determining program size, the incremental or marginal impact of each resident is more likely to affect a hospital's decisions than the average financial impact per resident. Other important considerations affecting decisions on program offerings include accreditation requirements, the interests of the other institutions affiliated with the residency training programs, community workforce needs, and faculty and medical school graduate preferences.

Medicare is the primary vehicle for federal support to teaching hospitals through its direct graduate medical education (DGME) payments for the direct costs of operating residency training programs and additional payments for inpatient services associated with the indirect costs of operating residency training programs. Both types of payments are formula-driven and do not reflect the financial impact of operating different types of residency programs. In 1997, hospital-specific caps were placed on the number of residency positions that Medicare supports. Since then, the number of subspecialty programs has grown while the number of primary care residency programs has declined (Salsberg et al., 2008; Weida et al., 2010). Between 1996 and 2011, the number of primary care residents has increased 8.4 percent, while there has been a 10.3 percent increase in other specialties and a 61.1 percent increase in subspecialty residents (RAND analysis of JAMA, Appendix II, 1996; Brotherton and Etzel, 2012).

In its June 2010 report, the Medicare Payment Advisory Commission (MedPAC) found that the increasing trend toward specialization is inconsistent with the needs of an efficient, high-quality, high value health care delivery system for primary care physicians (MedPAC, 2010). MedPAC expressed concern that the costs and benefits of sponsoring residency programs are likely to vary by specialty, and that some programs may be more financially attractive to sponsoring institutions than others. In particular, the trend toward subspecialization raises the question of whether Medicare funding should be restructured to differentiate between programs that are less costly or self-sustaining and those that are more costly to the supporting institution. Understanding the financial impact would allow Medicare to distribute its GME funds more efficiently (MedPAC, 2010).

MedPAC asked RAND to use available literature and data to summarize how both the costs and benefits for operating residency programs may differ by such program characteristics as size, specialty, type of sponsor, training venue, and geographic location. We focused on seven

disciplines that play a major role in the care of Medicare patients, use different models for resident training, and have experienced different growth rates in residency positions over 2005–2010: general internal medicine (IM), cardiology, family medicine (FM), dermatology, general surgery, urology, and radiation oncology. We refer to these as *specialty programs* in this report, although cardiology is a fellowship or subspecialty program in internal medicine.

We developed the framework in Figure S.1 to investigate how program characteristics such as size and where training occurs affect the following types of costs:

- direct GME costs—i.e., the educational resources and infrastructure required to operate GME programs
- patient care costs—i.e., the indirect impact of operating GME programs on patient care costs, including the value of resident services and the financial and nonmonetary benefits that hospitals and attending physicians derive from participating in GME activities
- the GME-related patient care revenues and funding that hospitals explicitly receive for participating in GME activities, such as Medicare DGME payments and indirect medical education (IME) payments.

The study was exploratory because it was uncertain at the outset whether sufficient data would be available to measure the financial impact of the factors affecting financial performance. We found data from different sources that could be used to assess whether a particular factor increases or decreases costs and to estimate the relative magnitude of the impact across specialties. However, we were unable to develop a consistent comparison metric—impact per resident—that could be used to quantify the results and generate an overall measure of financial impact for each type of program. Data limitations, particularly with respect to attending physician faculty-to-resident ratios, precluded us from doing so. Although the study does not quantify the variation in financial impact, it provides a framework for doing so and identifies the major factors that are likely to affect the financial performance of the sponsoring institution and influence program offerings and size.

Figure S.1. Framework for Analyzing the Financial Impact of Operating GME Programs

Direct GME program Costs	=	Resident stipends & benefits	+	GME-related physician compensation	+	GME program administration costs (including overhead costs allocated to the program)
PLUS						
Indirect effects on net costs	=	Value of services performed by residents as measured by impact on institutional costs	+	Value of services performed by residents as measured by impact on attending physician productivity and clinical revenues		
	+	Impact on hospital revenues (market share, payer mix, payment-to-cost ratios)	+	Impact on physician recruitment and retention costs		
MINUS						
Direct GME benefits	=	GME-related revenues				
EQUALS						
Financial impact of operating GME programs						

Table S.1 summarizes our overall findings regarding the relative impact that different program characteristics are likely to have on the financial performance of sponsoring institutions and their educational partners. Those program characteristics that are likely to increase costs per resident are shown with upward-pointing arrows, while those that are likely to reduce costs are shown with downward-pointing arrows. The relative magnitude of the direction across programs is reflected in the shading. If the impact across programs is in the same direction, the specialty program that is estimated to be most affected is shown with black arrows, the program likely to be the least affected is shown with white arrows, and those that fall in between are shown with gray arrows. If the impact is a cost for one or more programs and a benefit for others, the shading of the arrow depicts the magnitude of the direction. For example, the IM and FM faculty practice plans are estimated to operate at a loss, whereas the other specialties are estimated to operate at a profit, with the highest profit per resident estimated for urology and the lowest profit estimated for cardiology and general surgery. Sideways arrows indicate no significant impact on specialty program costs.

Table S.1. Relative Impact of Selected Program Characteristics on the Financial Performance of Sponsors and Educational Partners

	General Internal Medicine	Cardiology	Family Medicine	Dermatology	General Surgery	Urology	Radiation Oncology
Direct GME Cost Impacts							
Resident compensation increases by postgraduate year of training.[1]	⇧	⬆	⇧	⇧	⇧	⇧	⇧
Attending physician compensation							
Compensation levels vary across specialties.[2]	⇧	⇧	⇧	⇧	⇧	⬆	⬆
Attending physician time spent in administrative and teaching activities does not generate patient care revenues.[3]	⇧	⇧	⬆	⇧	⇧	⇧	⇧
RRC minimum requirements have economies of scale.[4]	⇧	⇧	⇧	⇧	⇧	⬆	⬆
Other direct costs							
Malpractice insurance varies across specialties.[5]	⇧	⇧	⇧	⇧	⬆	⬆	⇧
Single-program sponsors lack economies of scale.[6]	⬆	⇧	⬆	⇧	⇧	⇧	⇧
Multiple training sites require additional coordination.[7]	⇧	⇧	⬆	⇧	⬆	⬆	⇧
Outpatient hospital and other ambulatory training is less efficient than inpatient training.[8]	⇧	⇧	⬆	⬆	⇧	⇧	⬆
Nonhospital training sites require more coordination and oversight.[9]	⇧	⇧	⬆	⬆	⇧	⇧	⇧
Difficulty in filling slots increases recruitment and orientation costs for foreign medical school graduates.[10]	⬆	⇧	⬆	⇧	⇧	⇧	⇧
Indirect Financial Impacts							
Residents provide on-call services that benefit both the hospital and attending physicians.[11]	⇩	⇩	⇩	⇩	⬇	⇩	⇩
Residents teach more junior residents and medical students.[12]	⇩	⇩	⇩	⇩	⬇	⬇	⇩
Some specialty programs have a larger cost impact on inpatient costs than others after controlling for hospital-level teaching effect.[13]	⇔	⇔	⇔	N/A	⬆	⬆	N/A

	General Internal Medicine	Cardiology	Family Medicine	Dermatology	General Surgery	Urology	Radiation Oncology
Resident training increases the cost of ambulatory care.[14]	⇧	⇧	⬆	⬆	⇧	⇧	⬆
Teaching affects attending physician productivity and revenues.[15]	⇧	⇧	⇧	⇧	⬇	⬇	⇩
Faculty practice plan collections and practice expenses differ.[16]	⇧	⇩	⇧	⇩	⇩	⬇	⇩
Resident research reduces time spent in patient care activities; pure research is not eligible for Medicare GME payments.[17]	⇧	⇧	⇧	⇧	⬆	⇧	⬆
Physicians in academic practices have lower compensation than physicians in academic practices.[18]	⇩	⇩	⇩	⬇	⇩	⬇	⬇
Direct GME Benefit Impacts							
Medicare DGME payments are higher for primary care programs and lowest for subspecialty programs.[19]	⬇	⇩	⬇	⇩	⇩	⇩	⇩
Medicare IME payments do not differ by specialty.[19]	⇩	⇩	⇩	⇩	⇩	⇩	⇩

NOTES: Program characteristics that are likely to increase costs per resident are shown with upward-pointing arrows (⇧), while those that are likely to reduce costs are shown with downward-pointing arrows (⇩). The relative magnitude of the direction is reflected in the shading. If the impact across programs is in the same direction, the specialty program that is estimated to be most affected is shown with black arrows, the program likely to be the least affected is shown with white arrows, and those that fall in between are shown with gray arrows. If the impact is a cost for one or more programs and a benefit for the remaining programs, the shading of the arrow depicts the magnitude of the direction. IME = indirect medical education, RRC = residency review committee.

Basis and sources for estimates:

[1] RAND-calculated national weighted average stipend by year of residency training derived from the Association of American Medical Colleges (AAMC) *Survey of Resident/Fellow Stipends and Benefits*, Autumn 2010 Report, and the number of years each training program requires determined from the *ACGME Data Resource Book 2010–2011.*

[2] Median faculty compensation levels reported in MGMA *Academic Practice Compensation and Production Survey for Faculty and Management: 2011 Report Based on 2010 Data*. Compensation for FM is based on non-obstetric faculty compensation; compensation for cardiology is based on compensation for noninvasive cardiology faculty.

[3] Percentage of time spent in teaching and "other" activities reported in MGMA (2011). The percentages of all activities were scaled so that the sum equaled 100 percent.

[4] Average program size derived from the total number of residents and programs in ACGME (2011) and analysis of RRC program-specific requirements (ACGME, 2007b–2007d; ACGME, 2009a–2009e).

[5] National normalized premium rates in 2008 (O'Brien-Strain et al., 2010).

[6] RAND analysis of single-program sponsors in ACMGE (2011).

[7] Average number of participating institutions in ACGME (2011) and technical expert panel input on FM rotations.

[8] Average percentage of first-year training in hospital outpatient clinics (AMA, 2011).
[9] Average percentage of first-year training in nonhospital ambulatory care settings (AMA, 2011).
[10] Average percentage of international medical graduates (AMA, 2011).
[11] RAND-derived estimate based on analysis of a convenience sample of on-call schedules and the difference between what the resident is paid for on-call coverage and what the hospital would otherwise need to pay. Nonsurgical rate based on an estimated average hourly rate for academic hospitalists derived from MGMA (2011) and surgical rates based on 2010 MGMA on-call compensation survey.
[12] RAND-derived estimate based on estimated percentage of time spent in teaching medical students and junior residents, the difference between the hourly rates for residents and attending physicians, and the estimated impact of teaching on attending physician productivity and revenues.
[13] RAND analysis of California Office of Statewide Health Planning and Development inpatient discharge data and hospital financial data.
[14] Percentage of first-year training in ambulatory settings (AMA, 2011).
[15] RAND-derived ratio of academic physician bills at 100 percent clinical activity to private practice physician billings using MGMA (2011).
[16] RAND estimate constructed from MGMA (2011) based on percentage of time spent in billable clinical activities, estimated collections for time spent in clinical activity, and estimated compensation for clinical activity. Practice expenses estimated using CMS (2012) practice expense per hour data and median number of ambulatory encounters (MGMA, 2011). Billable hours derived by multiplying 40 hours per week by 48 weeks and the percentage of time in billable clinical activities.
[17] RAND analysis of RRC requirements (ACGME, 2007b–d; ACGME, 2009a–e) and Robertson (2009).
[18] Difference between compensation for academic and private practices in MGMA (2011).
[19] Based on average differences in payment by specialty. There would be no payment for some residents if the hospital were over its cap, but the limit is applied proportionately across all programs at the hospital and does not apply to individual residents or specialties.

Key factors affecting variation in the direct costs of GME programs include program size, attending physician compensation levels, and malpractice insurance. Economies of scale affect both variation across specialty programs and between large GME programs at academic health centers (AHCs) and smaller community-based programs. Smaller specialty programs with relatively high faculty compensation levels and malpractice insurance costs are likely to have higher direct GME costs per resident than other programs. However, residency programs also have a number of indirect effects on hospitals and attending physicians. These indirect effects are important from the perspective of the overall economics of operating GME programs and the marginal impact of changing program offerings, but they are problematic to measure. Despite the duty hour limitations and the growing emphasis of the accreditation requirements on education over service, our interviewees indicated that residents continue to serve as a relatively inexpensive source of labor. They identified attending physician patient care revenues and the share of outpatient clinic costs and other practice expenses covered by the faculty practice plan as key differences in the financial impact of training programs in different specialties. Attending physicians in specialties with relatively high compensation levels that also provide most services in hospital-operated facilities are more able to support resident clinical supervision activities through their patient care revenues. Primary care residency programs are disadvantaged relative to other specialties because of lower physician revenues and a higher proportion of training in ambulatory clinics. These programs are often subsidized by the hospital or cross-subsidized by faculty practice plan revenues from other departments. While funding disparities can be addressed in AHCs through cross-subsidization, this opportunity does not exist in community hospitals with a single primary care program.

The public policy debate over GME financing often focuses on only one component of the cost and benefit equation and, by doing so, leads to the perplexing but commonly heard adage that "it costs to train residents and it costs to replace them." This seeming contradiction arises from looking at the average cost of residency training to determine that "it costs to train residents" and at the loss of benefits derived from having residents to determine that "it costs money to replace them." It is best resolved by examining the marginal financial impact of adding or subtracting residents to existing teaching programs. The marginal impacts are more likely to influence sponsor decisions on changes in GME program size and offerings and help explain why GME programs are expanding above the Medicare full-time equivalent (FTE) limit on funded positions. For existing programs, minor changes in residency program size are unlikely to have an impact on the either GME infrastructure costs or IME costs, so the major cost of adding a slot is the resident's stipend and fringe benefits and resident-specific allowances. Marginal costs may be higher if adding the resident requires additional capacity or attending physicians. If the hospital has service needs that would otherwise need to be met by hiring alternative providers, there is a marginal benefit to adding a resident, particularly in a subspecialty program, before considering the additional benefits of any GME-related revenues.

One national GME expert who we interviewed suggested that the limits on the number of positions that Medicare will fund provide a natural experiment that demonstrates the overall economics of operating residency programs. Since 1996, there has been a steady increase in the number of subspecialty programs and residents. While some subspecialty expansions, such as in hospice and palliative care, are consistent with physician workforce priorities, others have low priority relative to increasing the supply of primary care physicians. Unless workforce priorities are reinforced by the hospital's internal service needs, program expansions are more likely to occur in the more-lucrative specialty and subspecialty programs rather than primary care. Medicare's GME-related payments should be realigned to be more consistent with the differences in financial impact of various specialty programs and to focus support on primary care residency programs. However, the difficulties that many primary care residency programs are experiencing in filling their slots with qualified candidates suggest that simply increasing payments for primary care programs relative to other specialty and subspecialty programs will not be sufficient. Significant investments are needed not only to enhance primary care training programs but also to attract future physicians into primary care.

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Abbreviations

AAMC	American Association of Medical Colleges
ACGME	Accreditation Council for Graduate Medical Education
AD	assistant director
AHC	academic health center
AMA	American Medical Association
AY	academic year
CMI	case-mix-index (used to measure patient severity and average resource usage)
CMS	Centers for Medicare & Medicaid Services
COTH	Council of Teaching Hospitals and Health Systems
CPI-U	Consumer Price Index—All Urban
DGME	direct graduate medical education (payments that Medicare makes for the direct costs of graduate medical education)
DO	doctor of osteopathy
FM	family medicine
FTE	full-time equivalent
FY	[federal] fiscal year
GME	graduate medical education
HCRIS	Healthcare Cost Report Information System
HI	Herfindahl Index
HRSA	Health Resources and Services Administration
HSA	health service area
IM	internal medicine
IME	indirect medical education (payments that Medicare pays for higher patient care costs associated with teaching activities)
IRB	intern and resident-to-bed (ratio used in the Medicare payment formula for indirect medical education)
MD	medical doctor [allopathic]
MedPAC	Medicare Payment Advisory Commission
MGMA	Medical Group Management Association
MMA	Medicare Modernization Act
OSHPD	[California] Office of Statewide Health Planning and Development
PD	program director
PED	pediatric
PGY	postgraduate year (of residency training)
PPS	prospective payment system

PRA	per resident amount (Medicare's direct graduate medical education payments are based on its share of the per resident amount)
RRC	residency review committee (committee for a given specialty or subspecialty that establishes program-specific accreditation requirements)
RVU	relative value units (used to measure physician work effort)
VA	U.S. Department of Veterans Affairs

1. Introduction

Graduate medical education (GME) is clinical training provided to graduates from schools of medicine, osteopathy, dentistry, and podiatry. GME is provided in residency programs approved by nongovernmental accrediting organizations for the various disciplines and specialties. Residency programs are typically sponsored by a teaching hospital, a medical school, or an educational consortium. Clinical training occurs primarily in teaching hospitals, where residents provide patient care under the supervision of an attending physician and may instruct medical and allied health students or conduct clinical research as part of their training program.

A number of factors influence the decisions that a sponsoring institution makes regarding which specialty and subspecialty programs to support, how many positions to support, and the venues in which training occurs. The financial impact of supporting a residency training program on a hospital's bottom line affects decisions on program offerings and training venues. The impact includes both the costs associated with operating the residency program and the benefits that the hospital and its educational partners derive from operating the programs. In determining program size, the incremental or marginal impact is more likely to affect a hospital's decisions. Other important considerations affecting decisions on program offerings include accreditation requirements, the interests of the other institutions affiliated with the residency training programs, community workforce needs, and faculty and medical school graduate and resident preferences.

Medicare is the primary vehicle for federal support to teaching hospitals through its direct graduate medical education (DGME) payments for the direct costs of operating residency training programs and additional payments for inpatient services associated with the indirect costs of operating residency training programs. Both types of payments are formula-driven and do not reflect the actual costs or benefits of operating different types of residency programs. In 1997, hospital-specific caps were placed on the number of residency positions that Medicare supports. Since then, the number of subspecialty programs has grown, while the number of primary care residency programs has declined (Salsberg et al., 2008; Weida et al., 2010). Between 1996 and 2011, the number of primary care residents has increased 8.4 percent, compared to a 10.3 percent increase in other specialties and a 61.1 percent increase in subspecialty residents (Table 1.1).

Table 1.1. Comparison of the Number of Residents in Academic Years 1996 and 2011

Type of Program	AY 1996	AY 2011	Percentage Increase
All primary care	38,753	41,998	8.4%
FM	9,261	9,764*	5.4%
IM	21,071	22,500	6.8%
PED	7,354	8,318	13.1%
IM/PED	1,067	1,416	32.7%
Other specialty	47,567	52,488	10.3%
Subspecialty	11,756	18,941	61.1%
Total, all residents	98,076	113,427	15.7%

* Includes 21 residents in two combined IM/FM programs.
SOURCES: RAND analysis of JAMA, Appendix II (1996), and Brotherton and Etzel (2012).
NOTES: AY = academic year, FM = family medicine, IM = internal medicine, PED = pediatric.

In its June 2010 report, the Medicare Payment Advisory Commission (MedPAC) found that the increasing trend toward specialization is inconsistent with the needs of an efficient, high-quality, high-value health care delivery system for primary care physicians. MedPAC made several recommendations related to addressing weaknesses in Medicare's GME funding and strengthening accountability for using Medicare funds to produce the mix of specialties with the skills and competencies needed in a well-functioning health care delivery system. One recommendation was for the Secretary of the Department of Health and Human Services to report to Congress on how residency programs affect the financial performance of teaching hospitals and whether all residency programs should be supported equally. An underlying premise of the recommendation was that the costs and benefits of sponsoring residency programs are likely to vary by specialty and that some programs may be more financially attractive to sponsoring institutions than others. In particular, the trend toward subspecialization raises the question of whether Medicare funding should be restructured to differentiate between programs that are less costly or self-sustaining and those that are more costly to the supporting institution. Understanding the financial impact would allow Medicare to distribute its GME funds more efficiently (MedPAC, 2010).

Subsequent to making its recommendation that the secretary report on how residency programs affect the financial performance of sponsoring institutions, MedPAC asked RAND to use available literature and data to explore how the financial impact of operating a residency program differs by such program characteristics as size; specialty; and type of sponsor, training venue, and geographic location. This study had three objectives:

1. Establish a framework for considering the various factors that affect how residency training programs affect the financial performance of sponsoring institutions and educational partners.

2. Summarize how each factor affects the costs and benefits of residency training programs.
3. Compare, to the extent feasible, how the financial impact is affected by specialty program characteristics.

Conceptual Framework

Determining the net cost of GME programs is a complex undertaking for several reasons. Various educational partners—primary and affiliated teaching hospitals, community-based training sites, faculty practice plans and medical schools—incur GME costs. Complicated and idiosyncratic financial arrangements between these partners make it difficult to determine the actual costs and benefits of operating a GME program and to make comparisons across programs. Further, there is no direct relationship between most funds supporting GME and the costs of GME activities. This is because GME is largely supported through patient care funds, which are not restricted to being used to support GME even when explicitly attributable to GME activities (as is the case with Medicare funding). Studies examining the economics of residency training have used different approaches to defining and investigating program costs and benefits that make direct comparisons and interpretation of their findings problematic. Many focus only on residency training costs and do not consider any offsetting benefits that might accrue to the educational partners.

We developed the framework shown in Figure 1.1 to illustrate both the costs and benefits of GME programs, primarily from the perspective of a teaching hospital and other clinical providers that participate in GME activities. Our focus is on clinical providers because most GME activities occur in clinical settings and are predominately funded through patient care revenues. The direct costs of operating a residency training program include resident salaries and fringe benefits, attending physician compensation, and the administrative costs of operating a residency program (including institutional overhead codes allocated to the program through accounting processes).

Direct benefits can be directly identified through cost accounting as factors that reduce the costs of operating the GME program. Direct benefits include revenues that are directly attributable to operating a GME program, such as Medicare and Medicaid payments tied to operating a GME program and other GME-related funding including grants from the Health Resources and Services Administration (HRSA).

Indirect effects cannot be directly identified through cost accounting as affecting the financial impact of the GME program on the sponsoring institution and its educational partners. For example, the value of the services furnished by the residents cannot be measured directly but is reflected in the impact of residents on hospital and other facility patient care costs and on attending physician clinical productivity. The indirect effect on hospital inpatient costs has been measured through statistical analyses and found to be a cost to the institution. However, the impact on physician productivity and other indirect effects are not clearly established in the literature and could be either a cost or a benefit of operating the GME program. A teaching

hospital may, for example, be able to attract more patients because of its prestige—or, conversely, it may attract fewer patients because patients may wish to avoid care provided by residents and/or payers may not be willing to pay for the higher costs associated with residency training programs.

Figure 1.1. Framework for Analyzing the Financial Impact of Operating GME Programs

Direct GME program Costs	=	Resident stipends & benefits	+	GME-related physician compensation	+	GME program administration costs (including overhead costs allocated to the program)
PLUS						
Indirect effects on net costs	=	Value of services performed by residents as measured by impact on institutional costs	+	Value of services performed by residents as measured by impact on attending physician productivity		
	+	Impact on hospital revenues (market share, payer mix, payment-to-cost ratios)	+	Impact on physician recruitment and retention costs		
MINUS						
Direct GME benefits	=	GME-labeled revenues				
EQUALS						
Financial impact of operating GME programs						

Study Approach and Methods

Using both qualitative and quantitative methods, we investigated how each component of the framework might differ by program characteristics. Specifically, we examined potential differences by type of sponsor, geographic location, and training venue and by selected disciplines (IM, cardiology, FM, dermatology, general surgery, urology, and radiation oncology). These disciplines were selected because they represent a mix of specialties and subspecialties that play a major role in the care of Medicare patients and different models for resident training, and they have experienced different growth rates in residency positions over 2005–2010. Key characteristics of the programs are summarized in Table 1.2.

Table 1.2. Overview of Programs Selected for Study[1]

	Medical				Surgery		Hospital-Based Ancillary
Specialty/Subspecialty	IM	Cardiovascular Disease (IM)	FM	Dermatology	General Surgery	Urology	Radiation Oncology
Programs							
Length of accredited training (years)	3	3	3	0.75	5	1.33	4
Min. no. of prior years	0	3	0	1.0	0	0.5	1
Number of programs	380	183	451	114	246	122	84
% change in number of programs 2005–2010	–2.1	6.4	–3.2	1.8	–2.4	2.5	3.7
Mean no. of participating sites[2]	2.6	2.5	3.0	3.3	4.2	3.7	2.7
Standard deviation	2.4	1.2	2.1	1.7	1.7	1.3	1.4
No. with rural tracks[4]	5	1	109	2	21	1	2
Residents							
Number of residents	22,937	2,497	9,943	1,179	7,435	1,086	621.0
% change in number of residents 2005–2010	4.1	13.0	3.1	12.1	2.3	11.4	15.0
Average number of residents per program	60.4	13.6	22.0	10.3	30.2	8.9	7.4
Average % international medical graduates[3]	53.7	41.8	41.6	3.5	20.5	4.9	3.6
Training hours/venues (year 1)							
Average hours on duty per week[3]	64.2	55.6	63.3	45.2	75.5	66.4	50.0
Average maximum consecutive hours on duty[3]	27.1	20.7	28.3	12.1	27.2	22.6	13.2
Average % of training in hospital outpatient settings (OP) clinics[3]	23.1	14.9	20.5	78.1	17.9	32.4	88.2
Average % of training in nonhospital ambulatory care community settings[3]	10.9	6.1	16.4	19.9	8.0	10.8	5.3

[1] Except where noted, the source for this information is the ACGME Data Resource Book for Academic Years 2005–6 and Academic Year 2010–2011. We calculated the average program size for general IM, cardiology, and general surgery based on the total number of residents and programs.
[2] A participating site is an organization that has a formal arrangement with the sponsor to providing educational experience or educational assignments/rotations for residents/fellows.
[3] AMA, 2011.

[4] AMA, 2013a.

Key study activities included the following:

- *Environmental scan of GME financing issues.* We conducted an environmental scan of available literature and reports on how different types of residency training programs are conducted and the costs and benefits of operating them.
- *Interviews.* We conducted seven semistructured interviews by telephone with individuals who are involved nationally in GME financing issues and the flow of funds between the various training venues. We also conducted interviews with GME program coordinators at ten sites that were selected primarily because they had recently added or closed a residency program and might have a more acute awareness of the business case for certain specialty programs. We supplemented these interviews with six additional interviews with directors of individual residency programs.[1] The interviews lasted 30–60 minutes. We used an interview protocol that was customized for each respondent but that also had common questions on general perceptions of the costs and benefits of operating residency programs and the differences in the costs and benefits across specialties, types of program sponsors, and training venues.
- *Analyses of readily available data on residency training costs*. We compiled information that quantified, to the extent possible, the various cost and benefit components of conducting residency training programs. Data sources included the annual residency salary and benefit survey conducted by the Association of American Medical Colleges (AAMC); the Medical Group Management Association (MGMA)'s annual *Academic Practice and Compensation and Production Survey*; the Accreditation Council for Graduate Medical Education (ACGME)'s *Data Resource Book 2010–2011* on accredited programs, faculty, and residents; and the American Medical Association's (AMA's) FREIDA Online system that contains both program-specific and specialty-specific information from the National GME Census (which is jointly conducted by the AAMC and the AMA). In addition, we analyzed Medicare cost reports to develop estimates of direct GME costs and Medicare DGME payments.[2]
- *Exploratory analyses of indirect costs and benefits.* We analyzed all-payer hospital utilization and financial data from California's Office of Statewide Health Planning and Development to explore such issues as the influence of residency programs on service line costs, profitability, and market share.
- *Technical expert panel.* We convened a one-day meeting of GME experts representing a mix of program directors from academic health centers and community-based programs, experts in hospital and faculty practice plan financing, and individuals who were familiar with the various data sources used in the report. The purpose of the panel was to discuss the conceptual framework used in the study, review the methodology and data used to investigate each potential cost/benefit component, discuss the study findings and

[1] We requested interviews with chairs of the various ACGME resident review committees (RRCs), but only the family medicine RRC chair granted our request.

[2] Hospitals file an annual cost report with the Medicare program reporting direct and overhead costs and revenues by cost center. The reports include two GME cost centers: one for resident salaries and benefits and a second one for other costs associated with operating GME programs.

limitations, and explore alternative approaches that might be used to examine the study questions and/or present the study findings.

2. Direct GME Costs

Direct GME costs are the resources and infrastructure directly attributable to GME activities. These costs fall into three basic categories: (1) resident salaries and fringe benefits, (2) physician compensation for GME-related activities, and (3) other administrative support and infrastructure costs directly attributable to GME activities at the program and institutional level. Table A.1 in Appendix A provides a summary of total GME costs per resident that we derived from Medicare cost report data for 2008. The median GME cost per full-time equivalent (FTE) resident across teaching hospitals was $134,803. The table includes only costs that were incurred by the teaching hospital and does not include costs incurred by a medical school or other educational partners. The hospital's costs for attending physician compensation for the time spent in GME-related administrative and didactic activities are included; compensation for the time spent in clinical supervision is included only if there is no simultaneous billing for direct patient care services.

Earlier studies examining the variation in per resident costs found that GME costs per resident do not vary systematically by cost of living, program size, or specialty mix (COGME, 2000; Anderson, 1996). While our findings are generally consistent with these analyses, we found some evidence of economies of scale for sponsoring institutions. The median costs for programs with 10–24 residents are higher ($142,627) than the median costs for programs with 25–99 residents ($137,971) and 100 or more residents ($136,578). GME programs that are predominately primary care tend to be smaller and less likely to benefit from economies of scale. Median GME costs per resident are higher for hospital GME programs with 75 percent or more primary care residents ($150,490) than for hospitals with less than 25 percent primary care residents ($116,626). Specialty-specific data on residency training costs cannot be derived from the Medicare cost reports.

Because of the variety of financing arrangements, the Medicare cost reports are not a reliable data source for examining the four basic cost categories.[3] Overall findings from our analysis of

[3] For example, a medical school may pay the resident's stipends and benefits and be reimbursed by teaching sites for the time the resident spends at those sites, in which case the teaching hospital would not report costs for resident salaries and fringe benefits but instead would include its costs in an "other" category. A comparable situation may occur with respect to attending physician compensation. Attending physicians may be employees of the medical school or faculty practice plan, and the hospital may pay the employer for time spent on GME-related activities. Instead of reporting compensation costs for attending physicians, any payments made by the hospital to the medical school or faculty practice plans for GME-related activities would be reported in an "other" cost category on the cost report. Residents rotate to hospitals and other training sites that pay for the resident time spent in those sites but do not have GME program administration costs. Evidence of the variation is seen in our 2008 analysis file. Nearly 20 percent of teaching hospitals did not report resident salaries and wage-related costs, and 14 percent reported resident wages but did not report other direct GME costs. Attending physician compensation is not separately reported in the GME cost center on the Medicare cost reports; however, hospitals do separately report any attending physician compensation and contract costs as part of the data reported for the hospital wage index. We found that only 336 hospitals reported attending physician compensation costs.

other data sources and interviews and input from our technical expert panel include the following:

- *Resident salaries and fringe benefits.* Resident compensation is largely a function of the postgraduate year in which the training occurs. Generally, a program sponsor sets the same compensation level for all residents in the same year of postgraduate training, regardless of specialty.
- *Attending physician compensation.* Program costs for attending physician administrative and didactic activities are largely a function of residency review committee (RRC) requirements for the specialty, program size, and specialty-specific compensation levels. While requirements for clinical faculty are generally based on program size, economies of scale affect the faculty-to-resident ratios.
- *Other direct costs.* Differences in other direct costs across specialty programs are largely related to malpractice insurance, training venues, and economies of scale. For example, FM programs have more characteristics that are likely to increase costs relative to other programs: more single programs, more rural training sites and community-based training sites, and a higher proportion of foreign medical school graduates. Primary care specialties that do not include obstetrics have the lowest malpractice premiums, while general surgeons have the highest.

Resident Stipends and Fringe Benefits

Resident stipends and fringe benefits are based on the postgraduate year in which the training occurs. In other words, the compensation for a third-year resident at a given institution in general internal medicine is generally the same as the compensation for a third-year resident in general surgery.

We calculated average compensation, including fringe benefits, for residents in the study specialties using data from the Association of American Medical Colleges (AAMC) *Survey of Resident/Fellow Stipends and Benefits* (2010). The number of years that each training program requires was determined using the *ACGME Data Resource Book 2010–2011.* Subspecialties often have prerequisites—for example, cardiology requires that residents complete a three-year general internal medicine program before entering as a cardiology fellow. A cardiology fellowship is a three-year program, but, because it follows a three-year residency in general internal medicine, fellows are compensated according to years four through six on the compensation schedule.

The compensation shown in Table 2.1 is based on the national weighted average stipend by year of residency training. For each type of program, we summed the stipends for all the appropriate training years (e.g., years 4–6 for cardiology fellows) and divided the total by the number of years spent in each program to get the average resident stipend. Total compensation includes fringe benefits, as well as the stipend. The mean ratio of benefits to stipends for all respondents was 30 percent, which we added to the average stipend to estimate the total average

compensation.[4] There is some variation in average salaries across types of ownership. Medical schools tend to pay less than other programs, while the "other nonprofit" hospital category tends to pay more.

Table 2.1. 2010 Average Resident Compensation for Selected Specialties

Specialty	Average Compensation Over Residency Period
Cardiology	$73,691
Dermatology	$69,549
Family medicine	$65,540
General internal medicine	$65,540
General surgery	$68,239
Radiation oncology	$70,939
Urology	$69,549

SOURCE: RAND estimates based on average compensation for AAMC survey respondents (2010) by postgraduate year (PGY) of training.

Attending Physician Compensation Costs

Attending physicians contribute to residency training programs through activities related to program administration and evaluation, didactic teaching, clinical supervision of residents, and supporting resident research and other scholarly activities. In addition to resident-related activities, attending physicians may teach medical students, engage in clinical activities and research without resident participation, and perform administrative activities that generally benefit the hospital, such as serving on the hospital's quality committee. In describing physicians engaged in GME activities in this report, we use two terms. *Attending physician* refers broadly to physicians who are engaged in clinical supervision of residents but who may also have other educational and administrative responsibilities for the GME program. *Faculty* refers to attending physician administrative or instructional activities that are directly related to the GME program, such as didactic teaching activities (morning reports, teaching grand round, lectures, etc.) and teaching preparation, academic administration, and other professional activities related to resident training.

[4] For example, if the average stipend is $56,685 (as it is for cardiology), the fringe benefits for those residents would equal $17,006 ($56,685 x 0.30 = $17,006), and total compensation including fringe benefits would be $73,691 ($56,685 + $17,006 = $73,691).

For purposes of determining direct GME costs, Medicare allows only the hospital's faculty compensation costs for GME-related activities. The time spent in clinical supervision of residents is excluded if the attending physician simultaneously bills for direct patient care services. Isolating the portion of physician compensation that is the allowable direct GME cost from the full compensation package was a challenge when the initial direct GME per resident amounts were established. It remains problematic today using secondary data because information on the distribution of attending physician time and compensation arrangements consistent with the Medicare definition of allowable direct GME physician compensation is not routinely collected. Hospitals may not compensate attending physicians for their full range of attending physician activities. For example, the hospital typically pays for only the program director and core faculty time spent in educational activities, with compensation for the time spent in clinical supervision coming through the faculty practice plan and attending physician revenues. ACGME and the MGMA collect information on the distribution of attending physician time, but the populations covered by the surveys and the categorization of activities differ. Based on the MGMA survey, the time spent by individual attending physicians in teaching and administrative activities among the study specialties ranged from more than 30 percent in general internal medicine, family medicine, and dermatology to 25 percent or less in the other specialties (MGMA, 2011; see Table B.1 in Appendix B).

At the program level, total teaching compensation is largely a function of specialty-specific compensation levels, RRC requirements for the specialty, and program size. Academic institutions typically benchmark their compensation arrangements against either the AAMC's *Faculty Survey* or the MGMA's *Academic Practice and Compensation and Production Survey.* The MGMA 2011 survey results indicate that, among the study specialties, the median compensation for attending physicians is lowest for family medicine ($163,319) and general internal medicine ($172,872) and highest for radiation oncology ($336,136) and urology ($311,057) (MGMA, 2011). The survey includes only academic health centers and may not be representative of attending physician compensation in community teaching hospitals.

Accreditation requirements for the selected specialties vary in their level of specificity in requirements for both the program director and core clinical faculty (see Appendix B, Table B.2). Core faculty is defined as the program director and faculty devoting at least 15 hours per week to resident education and administration. The definition does not include faculty primarily involved in clinical supervision of resident activities. The requirements are generally based on program size or faculty-to-resident ratios. They provide a baseline measure of the attending physician involvement with resident education but typically do not address attending physicians who are involved only in clinical supervision.

There are economies of scale so that the minimum number of core faculty needed to meet RRC program requirements translates into higher faculty-to-resident ratios in smaller programs relative to larger programs. This pattern is seen in the differences in faculty-to-resident ratios between different-sized programs within the same specialty and has implications for the marginal

cost of expanding programs. For example, an IM program with the minimum of 15 residents has the same administrative faculty requirements as an IM program with 23 residents and the same minimum clinical faculty requirements as a program with up to 59 residents (Nasca et al., 2001). Economies of scale are also seen across specialty programs. We estimated minimum core faculty-to-resident ratios based on average program size and found that the ratios are markedly higher for the two smallest specialty programs (radiation oncology, 0.53; urology, 0.51) and lower for the largest program (general internal medicine, 0.10). (See Appendix B, Table B.1.)

Other Administrative and Infrastructure Costs

In addition to faculty administrative costs, other expenses are directly related to GME activities at the program and institutional level (King et al., 2009; Nasca et al., 2001; VA, 2012). These include

- staffing to coordinate recruitment, orientation, schedules, and resident and faculty evaluation
- program-funded seminars, conferences, and travel expenses
- licensing, accreditation, match participation, and in-service examination fees
- space, supply, equipment, and information technology hardware and software costs directly associated with running the GME programs
- malpractice insurance expenses for residents and faculty.

Our environmental scan of the literature, interviews, and discussion with the technical expert panel identified several ways that these costs might vary by program characteristic, particularly on a per resident basis. We first summarize these costs and then note the implications for operating different types of residency programs.

Economies of Scale

As previously discussed, programs and institutions are likely to benefit from economies of scale because the fixed administrative costs can be spread over a larger number of residents (Nasca et al., 2001). One implication is that fixed costs for GME program administration, such as accreditation fees, are higher on a per resident basis for smaller programs than for larger programs. When an institution sponsors more than one program, there may be opportunities for sharing certain costs, such as a simulation laboratory, seminars on such cross-cutting issues as practice management, staff support for resident recruitment and assessment activities, and accreditation costs. Among the specialties selected for this study, single-program sponsored programs are most likely to be FM programs.[5] FM programs at community hospitals are often

[5] There are 358 programs operated by single-program sponsors (ACGME, 2011). About half of these are operated by community hospitals and are mostly primary care programs. Other single-program sponsors include specialty hospitals; for example, a children's hospital may offer a pediatric residency program, or a rehabilitation hospital may operate a physical medicine and rehabilitation residency program.

less able to take advantage of the economies of scale for administrative costs and may need to purchase access to, for example, a medical library and other resources needed for staff development. Urology and radiation oncology are most likely to benefit from the economies of scale associated with large academic GME programs.

VA Affiliations

U.S. Department of Veterans Affairs (VA) training sites enter into disbursement agreements with affiliated sponsors for the central administration of resident salaries and benefits. These agreements cover only the portion of the resident's compensation attributable to the time spent in a VA facility. In addition, the VA may contract to pay for a prorated portion of selected educational costs for operating the program. For example, the contract may reimburse for the prorated share of accreditation fees, resident match participation fees, and user fees for simulation experiences that are not available at the VA facility. Recruitment expenses are limited to general outreach materials and cannot include recruitment and orientation expenses that involve travel or entertainment expenses. In addition, there is no reimbursement for program administration expenses for the program director and GME office staff (U.S. Department of Veterans Affairs, 2012). Because sponsors of programs affiliated with VA sites incur costs for residents who spend only part of their time at the sponsoring institution, they have higher per resident administrative costs.

Recruitment and Orientation Costs

Recruitment costs are higher for programs that have more difficulty filling resident slots, such as primary care residency programs. In addition to using more resources to attract residents to the programs, programs that fill positions with foreign medical graduates who might need help with visas and settling into a new culture tend to have higher orientation costs (Zeidel et al., 2005). Among the specialty programs, the FM and general IM programs have the highest percentages of new foreign medical school graduates, while dermatology and radiation oncology have the lowest.

Program-Funded Seminars, Conferences, and Travel Expenses

In our interviews, we probed as to how costs, such as resident expenses for attending conferences, might vary across types of specialty training programs. We found that some GME sponsors pay for these costs at the institutional level, often by allocating a fixed amount per resident to the departments, while others expect the departments to pay for these costs. Per resident allocations allow some cross-subsidization of these expenses across departments. However, even when a per resident allocation is made, there is variation in the total level of funding available at the departmental level for resident recruitment, orientation, and enrichment because "wealthier" programs have the resources to supplement any per resident allocations from the sponsor with departmental funds while the "poorer" programs do not.

Malpractice Insurance

Malpractice insurance costs were identified as a source of cost variation in our interviews. The institution sponsoring the residency program is required to pay for the resident's malpractice insurance (Kachalia and Studdert, 2004; ACGME, 2011a).[6] A hospital that directly employs physicians typically self-insures or purchases a policy that covers both the hospital and its medical staff, but in the teaching hospital context, the hospital may not employ the faculty; instead, they may be employed by the medical school or other sponsoring institution or act as independent contractors, in which case they must purchase coverage, often through a faculty practice plan (Mello, 2006). Professional malpractice insurance premium costs are largely determined by physician specialty and degree of surgical and obstetrical involvement and geographic location. For some specialties, the rates vary based on whether the physician performs surgical procedures. For example, the national normalized premium rates malpractice premium for FM with obstetrics was $41,490, compared to $18,968 for IM (O'Brien-Strain et al., 2010).

Ambulatory Training

Teaching in ambulatory settings is considered less efficient than inpatient teaching. Preceptors must be continually available, providing "real-time" teaching based on patient availability and needs, and the efficiencies of inpatient teaching rounds and other activities scheduled on "doctor time" are not feasible (McCue, 1995). Among the specialties selected for this study, during the first residency year, the highest percentage of training occurs in ambulatory settings (hospital outpatient and nonhospital) in dermatology (98 percent) and radiation oncology (93.5 percent). The lowest percentage of training occurs in ambulatory settings in cardiology (21 percent) and general surgery programs (26 percent). IM and FM residents spend about a third of their first year training in ambulatory settings (AMA, 2011). These percentages increase in subsequent years. Within IM programs, ambulatory-intensive IM programs are likely to have higher costs than inpatient-intensive programs because the resident-to-faculty ratio is higher on ambulatory rotations than inpatient rotations (Nasca et al., 2001).

Multiple Training Sites

Programs that rotate residents to multiple sites, particularly ambulatory settings, are likely to incur higher administrative costs (Zeidel et al., 2005). Staff may be needed to coordinate resident rotation schedules and assessments, as well as any formal agreements between the sites.

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[6] Some teaching hospitals directly allocate these costs to their GME program cost centers, while others treat malpractice expense as an administrative and general expense allocated as indirect costs. Hospital premiums for malpractice vary with the hospital location, the clinical services offered, and malpractice claims experience. Different tort environments (litigiousness, average award size, and state regulation of medical malpractice) have led to substantial state variation in costs.

Rotations to VA and other hospitals usually involve reimbursement to the rotating hospital for the resident's salary so that the hospital receives some compensation for losing the resident's services during the rotation. General surgery and urology have the highest average number of participating sites per program, and general internal medicine and cardiology have the fewest (ACGME, 2011). Participating sites provide at least a one-month nonelective rotation and are formally reported to the ACGME as being engaged in the residency program.

Both IM and FM programs are more likely to have elective rotations to ambulatory sites that are not formally identified as participating sites. During rotations to nonhospital settings, the hospital usually continues to pay the resident's compensation costs and may pay some or all of the training site's costs, in addition to absorbing the loss of the resident's patient care services during his or her time away from the hospital. Training in nonhospital settings is discussed below in the section on Medicare GME payments.

Rural Training Sites

Training in rural areas involves a diversity of training sites, including community hospitals, critical access hospitals, rural health clinics, and other community-based training sites. The costs that these sites incur are similar to those of other training sites, with the added challenges of long-distance coordination with the sponsoring teaching hospital and obtaining adequate resources and other support for training (National Rural Health Association & American Academy of Family Physicians, 2008; Talley, 1990; Dewitt et al., 2001). Some programs face issues of sufficient patient load to meet RRC requirements for particular types of care and need to rotate residents to other sites to obtain that experience. For example, an FM program in a rural area may need to send residents to a children's hospital to gain sufficient experience in treating pediatric patients; a rural general surgery program may need to rotate residents to another hospital for experience with more specialized surgery cases. While resident rotations to other sites for training are not unique to rural training programs, the costs for rotations involving rural training are higher. An urban program with a rural training track is likely to incur additional GME administrative costs for recruiting and coordinating with the rural training sites and overseeing the quality of the educational experience. Residents may receive travel and housing subsistence, in addition to the usual stipends and benefits, when they rotate from their home training sites.

Family medicine has been far more proactive than other specialties in promoting training opportunities in rural areas through establishing rural programs, as well as urban FM programs with rural training tracks. There are 109 FM programs with a rural training track, compared to 21 in general surgery and five general internal medicine programs. The other specialty/subspecialties have only one or two programs with a rural training track (AMA, 2013a).

Safety-Net Hospitals

Safety-net hospitals that sponsor residency training programs are likely to assume a higher percentage of the GME program costs than other sponsors. This is because the faculty practice plan may not be able to share in the costs of supporting the GME program because of low collection rates for faculty patient care services. At the same time, these hospitals are more likely than other hospitals to be under financial pressure and may have fewer resources to devote to GME activities.

Summary of Variation in GME Direct Costs

In Table 2.2, we summarize our findings for selected cost factors on the net costs of operating different types of programs. The program characteristics that are likely to produce relatively higher costs per resident are shown with ⬆, those that are likely to be least affected are shown with ⇧, and those that fall in the middle are shown with ⇧. For example, cardiology residents have the highest average compensation level (PGY5) and are assigned a ⬆, while IM and FM residents have the lowest average compensation level (PGY2) and are assigned a ⇧.

Some identified program characteristics have a greater impact on costs per resident than others. Differences in faculty compensation levels and economies of scale affect faculty compensation costs per resident. Because the most highly compensated specialties also tend to have the smaller programs, these programs are likely to have higher per resident costs for GME program administration (including accreditation) than the larger programs, such as IM, before taking other characteristics into account. Other important characteristics that are likely to increase net costs are associated with primary care residency programs. These include the greater likelihood of being a single program or one of a few programs, the higher costs associated with recruiting and training international medical graduates (IMGs), and the emphasis on training in ambulatory settings. The latter has several implications for the increasing the cost of primary care residency programs, including the higher administrative costs associated with training in multiple sites and the inefficiencies of ambulatory training relative to inpatient training.

Table 2.2. Comparative Impact of Selected Factors on Direct Costs of Operating a Residency Program

	General Internal Medicine	Cardiology	Family Medicine	Dermatology	General Surgery	Urology	Radiation Oncology
Resident compensation increases by postgraduate year of training.	⇧	⬆	⇧	⇧	⇧	⇧	⇧
Attending physician compensation							
Compensation levels vary across specialties.	⇧	⇧	⇧	⇧	⇧	⬆	⬆
Attending physician administrative and teaching time does not generate patient care revenues.	⇧	⇧	⬆	⇧	⇧	⇧	⇧
RRC minimum requirements have economies of scale.	⇧	⇧	⇧	⇧	⇧	⬆	⬆
Other direct costs							
Malpractice insurance	⇧	⇧	⇧	⇧	⬆	⬆	⇧
Single-program sponsors lack economies of scale.	⬆	⇧	⬆	⇧	⇧	⇧	⇧
Multiple training sites require additional coordination.	⇧	⇧	⬆	⇧	⬆	⬆	⇧
Outpatient hospital and other ambulatory training is less efficient than inpatient training.	⇧	⇧	⬆	⬆	⇧	⇧	⬆
Nonhospital training sites require more coordination and oversight.	⇧	⇧	⬆	⬆	⇧	⇧	⇧
Difficulty in filling slots increases recruitment and orientation costs for foreign medical school graduates.	⬆	⇧	⬆	⇧	⇧	⇧	⇧

NOTE: The program characteristics that are likely to produce relatively higher costs per resident for the effect under consideration are indicated by ⬆, those that are likely to produce relatively lower costs are indicated by ⇧, and those that fall in the middle are indicated by ⇧.

3. Indirect Effects of Operating Residency Training Programs

Because most GME occurs in joint production with patient care in clinical settings, an assessment of GME costs should consider the impacts of residency training on patient care costs and revenues. These financial impacts can be on hospitals, attending physicians, and community-based physicians. Some effects, such as the indirect effect of residency training on hospital inpatient costs, are established in the literature as increasing patient care costs. However, other indirect effects could be either a cost or benefit. For example, residents providing services under the supervision of an attending physician may increase the attending physician's productivity by providing complementary services or may reduce productivity by taking longer to perform the services. The effect on productivity and faculty practice plan revenues may vary across specialties.

In this section, we first consider the value of the patient care services that residents provide and discuss how the financial impact is measured indirectly through the teaching effect on institutional costs, the costs of community-based training sites, and teaching physician productivity. We then explore other indirect effects, such as the financial impact of teaching on hospital market share and payer mix.

Resident Impact on Patient Care Costs

Residents provide patient care services and teach medical students, more-junior residents, and other students in health professional training programs. Some patient care activities are services to the hospital, while others are services to the attending physician. The latter include not only furnishing direct patient care under an attending physician's supervision but also administrative tasks, such as obtaining prior authorization for care from payers, entering information into the patient's electronic medical record, and coordinating post-discharge care.

Framework for Examining the Financial Impact of Residents on Patient care costs

Resident services are typically valued by estimating the cost of replacing the resident with other health professionals. In theory, hospital responses to implementation of the AGME restrictions on resident work hours should provide information on replacement costs. There have not been cross-institutional assessments of how GME programs adjusted to the duty hour limitations, but it appears that large-scale innovative changes did not occur after the implementation of the initial rules effective July 2003 (Philibert et al., 2009). To preserve resident service commitment, the intensity of resident services was increased by reducing elective rotations, didactic activities, and mentoring of medical students and junior residents (Philibert et al., 2009). There is also some evidence that the duty hour standards increased

attending physician responsibilities and working times (ACGME, 2003; Pauwels, 2006; Steinman et al., 2009). Some teaching hospitals also responded by hiring nurse practitioners, physician assistants, and hospitalists to replace services provided by residents (Steinman et al., 2009). Program expansions are another potential replacement strategy and may be a factor in explaining why the number of subspecialty positions have expanded despite the Medicare limits on funded FTE residents (see the subsection below entitled "Limits on Funded FTE Residents").

Several studies have found that residents provide inpatient services at a lower cost than what their employers would need to pay alternative providers. Residents are harder to replace in inpatient settings because nonphysician providers have not been trained in the specialized services offered by residents and are unwilling to work long and irregular hours (DeLia and Cantor, 2002). Primary care residents working in ambulatory settings are easier to replace because they generally provide services that are less medically complex during regular working hours (DeLia and Cantor, 2002). Hiring physician specialists to assume subspecialty resident teaching and specialized care activities is more costly than replacing primary care residents because of the higher compensation levels (Green and Johnson, 1995; Franzini et al., 1999; Mitchell et al., 2007).

Replacement cost approaches to valuing resident services are typically based on labor cost differentials and do not estimate the net value of resident services. A full valuation of resident services requires taking into account other factors, such as the relative productivity of residents and the replacement providers, changes in direct GME costs and GME-related revenues that would occur if the resident were replaced, and the additional revenues that might be generated by the replacement provider for professional services that may not be billed by a resident.

The net value of a resident's patient care services can be largely measured through the indirect teaching effects on institutional patient care costs (net of direct GME costs) and on attending physician productivity and revenues. The indirect teaching effect on institutional costs incorporates both the value to the hospital of any labor provided by the resident and any inefficiencies associated with having residents into a single measure. Similarly, attending physicians may have lower productivity because of supervisory responsibilities or increased productivity because residents provide complementary labor. The net financial impact can be measured by comparing attending physician productivity with the productivity of physicians who are seeing private patients without resident involvement. To separately value the resident's patient care services by estimating replacement costs would in essence be double-counting the value of the resident's patient care services. However, there are two components of resident activities that are not accounted for in these indirect cost measures: (1) providing on-call services to the hospital and (2) teaching younger residents, medical students, and other health professionals. In both activities, the resident is providing services that would otherwise need to be provided by a physician.

On-Call Services

Typically, on-call services are provided during inpatient rotations either through extended hours or night float. With the implementation of the ACGME's work hour limits, programs are increasingly using night float rotations, during which residents cover one or more inpatient clinical services and may do the workups on emergency admissions for up to six nights in a row. The ACGME does not allow PGY-1 residents to take at-home (or beeper) call because appropriate supervision is not possible when a resident is on at-home call. On-call responsibilities for residents in surgery and other interventional disciplines include emergency department coverage. Having residents reduces the likelihood that a hospital will have on-call issues (Rao, Lerro, and Gross, 2010). The value of on-call coverage provided by residents to the hospital is the difference between what the resident is paid for on-call coverage and what the hospital would otherwise need to pay. For attending physicians, the value is the convenience of not needing to be involved during nonwork hours unless a resident determines that personal examination by the attending physician is warranted. Among the study specialties, most on-call services are furnished by residents in general surgery, IM, and FM; residents in dermatology, cardiology, and radiation oncology residents provide infrequent on-call services (RAND analysis of a convenience sample of on-call schedules).

Resident Teaching Activities

The second activity that is not measured in the indirect teaching effects is the amount of time that residents spend teaching. Senior specialty and subspecialty residents spend a significant time teaching more-junior residents and medical students. Most resident teaching activities occur in the course of patient care activities. Senior and subspecialty residents teach junior trainees how to apply clinical principles, as well as how to carry out processes necessary for patient care (e.g., writing admission orders, contacting consultants). More-junior residents, including PGY-1 residents, also teach medical students, usually at a more basic level and as an adjunct to the teaching of senior residents. The value of resident teaching activities is determined by the percentage of time spent in teaching medical students and junior residents, the difference between the hourly rates for residents and attending physicians who would otherwise need to spend more time teaching, and the estimated impact of teaching on attending physician productivity and revenues. Studies conducted prior to the implementation of the duty-hour restrictions estimated that residents spend up to 25 percent of their time teaching. More-recent studies are mixed regarding whether the work hour limits have reduced teaching activities. Contrary to the perception among residents and attending physicians that the work hour limits would provide less time for resident teaching, studies of medical student perceptions found that the work hour limits had either no difference or an increase in resident direct teaching on medical students (Nixon et al., 2011). If residents (senior specialty and subspecialty residents) were not teaching medical students, faculty members would need to assume these responsibilities. They

would do so much of the time in conjunction with billable clinical activities, which would make them less efficient in these clinical activities and therefore would decrease the amount they could bill. (See the subsection below on the effect on attending physician productivity). More medical student teaching time would be needed in specialties that are required medical student rotations and therefore teach more students, such as IM, FM, and general surgery.[7] Less replacement time would be needed in specialties and subspecialties that are generally elective rotations and teach fewer medical students, such as dermatology and radiation oncology.

Teaching Effect on Hospital Costs

Inpatient Hospital Costs per Discharge

Teaching hospitals have higher inpatient costs per discharge that are generally attributable to higher service intensity, greater use of new technology, unmeasured case mix differences, and reduced productivity of hospital staff working with residents. This teaching effect led to an indirect medical education (IME) adjustment under the Medicare prospective payment system to pay for higher costs attributable to teaching that are not reflected in direct GME costs (the Medicare IME adjustment is discussed in greater detail in the section below on Medicare GME-related revenues). The magnitude of the teaching effect on inpatient costs has declined over time as technology has diffused, length of stay has decreased, and case mix measures have improved. MedPAC has estimated that Medicare costs per discharge increase 2.2 percent for each 0.10 increment in the resident-to-bed ratio (MEDPAC, June 2009). Most recently, HHS researchers estimated that the Medicare cost per discharge increases 1.88 percent for each 0.10 increment in the ratio (Nguyen and Sheingold, 2011).

Within the context of measuring the financial impact of residents on inpatient costs per discharge, there are several limitations to these analyses. The resident counts used in the estimations include residents working not only in inpatient areas but also in outpatient areas and in nonhospital settings for which the hospital is claiming Medicare IME payments. Inpatient costs are measured at the institutional level and do not distinguish between patient care costs on teaching services versus nonteaching services within the hospital. Further, the estimates of the teaching effect are sensitive to the other variables used in the equation. In the traditional formulation, the teaching intensity measure (resident-to-bed ratio) captures the effect not only of resident training but also of associated activities that occur in teaching settings, such as undergraduate medical and health professions education, research, and highly specialized services including trauma and transplant, as well as any impact that low-income patients may have on Medicare costs per discharge. The result overstates the teaching effect and understates the cost of other social missions. Other formulations have controlled for one or more of these

[7] The Liaison Committee on Medical Education (LCME) recommended rotations are in family medicine, internal medicine, obstetrics and gynecology, pediatrics, preventive medicine, psychiatry, and surgery (LCME, 2013).

factors to try to isolate the teaching effect from other social missions. A 2007 MedPAC study controlled for other missions in estimating the teaching effect. The study found that adding a variable for the share of low-income patients in hospitals with more than 100 beds to the regression decreases the teaching effect (from 2.2 to 1.7 percent). Adding standby services to the regression also reduced the teaching effect (from 2.2 percent to 1.4 percent), but adding research to the regression did not affect the teaching coefficient (MedPAC, 2007). Using an estimate of all-payer hospital inpatient costs per case for 1998, Koenig et al. found that the teaching effect declined nearly 50 percent when variables were added to the model for research and standby capacity needed to provide highly specialized care (e.g., burns, neonatal intensive care, trauma) (Koenig et al., 2005). To date, studies have not assessed the extent to which the higher costs might be attributable to hospital inefficiencies. However, a higher proportion of major teaching hospitals are under financial pressure than nonteaching hospitals (as measured by non-Medicare profit margins), which would suggest that they are also under more pressure to constrain costs (MedPAC, 2011).

There is little evidence regarding the effect that residents in a given specialty program have on the costs of caring for patients with conditions treated by that specialty. We used data from the California Office of Statewide Health Planning and Development to investigate through regression analysis whether, for example, a teaching hospital that has a cardiology training program has higher costs for patients with cardiovascular disease than a teaching hospital that does not have a cardiology program. We explored this question through patients with conditions that would be cared for by one of the following study specialties: primary care (IM and FM combined into a single category for analysis purposes because of the overlap in common conditions), cardiology, general surgery, and urology. The data, methods, and the results for the individual regressions for the four types of residency programs are in Appendix C. We found that having residents in primary care and cardiology did not significantly affect the costs of discharges assigned to those specialties after controlling for teaching status and case mix. However, having a residency program increased cost per discharge 8.3 percent for general surgery and 15.8 percent for urology after accounting for teaching status. Overall, urology discharges are not on average more costly in teaching hospitals than in nonteaching hospitals, but they are more costly in teaching hospitals with urology programs than in other teaching hospitals. As noted earlier, the teaching effect captures higher costs associated with having residency programs and could be attributable to a number of factors, including unmeasured case mix differences and resident inefficiencies.

Outpatient Clinic Costs

Most studies examining the indirect effects of teaching in ambulatory settings have examined the costs in FM and IM continuity clinics. These clinics are likely to have higher costs than their

nonteaching counterparts because they must provide adequate facilities and patient panels needed to sustain residency training.[8]

A standard cost measure—a discharge—is used to determine the indirect teaching effect on inpatient costs. There is no commonly accepted measure or methodology in the literature for assessing whether there is a teaching effect on outpatient costs. Cost has been measured using dollars, relative value units, encounter time, and/or number of encounters or patients. Overall, findings indicate that residents take longer to provide care, use more resources than physicians, and may lower overall productivity. For example, a 2005 study compared the utilization of health resources by chronic care patients under the care of residents supervised by attending physicians in a large urban general IM practice with the utilization by patients cared for by the attending physicians without residents. Total annual ambulatory care costs for the residents' patients were 30 percent higher after adjustment for differences in case mix. The residents ordered more consultations and radiologic procedures (Charlson et al., 2005).

Most studies suggest that resident productivity increases as the resident's experience level increases (Bowen and Irby, 2002). A benchmarking case study comparing the number of office visits per hour in FM centers found that the average number of patients per hour increased each residency year (first-year resident, 1.2 visits; second-year resident, 1.8 visits; third-year resident, 2.3 visits) (Pauwels, 2006). Another study found that first-year residents were on average 25 percent as productive as attending physicians, while second- and third-year residents were on average about 50 percent as productive as attending physicians (Jones et al., 1995).

Longer encounter times reduce facility turnover rates, lower staff productivity, and increase unit costs. However, the fee-for-service revenues associated with higher ancillary service usage by residents may contribute to the hospital's overall profitability. Further, the overall financial impact of providing more services to fewer patients in hospital outpatient settings is not readily apparent. The Health Care Financing Administration (HCFA, the predecessor agency to the Centers for Medicare & Medicaid Services [CMS]) examined the teaching effect on a hospital's cost per relative weight when the Medicare hospital outpatient prospective payment was implemented. The agency tried several measures of teaching intensity and concluded that the effect was small and did not warrant an IME adjustment (HCFA, 2000). We were unable to identify more-recent analyses of the outpatient teaching effect.

[8] The RRC-FM requires that the family medicine center be for the exclusive use of the residency program. Two examining rooms must be available for each resident and preceptor when they are providing care, as well as space for individual and small-group counseling. Space must be available for a resident work area, a separate private area for precepting, an office resource library, and a conference room (ACGME, 2007d). The RRC-IM has a less prescriptive requirement that adequate clinical and teaching space must be available (ACGME, 2009a).

Financial Impact of Community-Based Training

Community-based training sites have direct and indirect costs associated with teaching that are similar to those of teaching hospital outpatient clinics (Boex et al., 2000). As is the case with hospital outpatient clinics, residents negatively affect the site's productivity both in terms of longer patient encounters when residents are providing services and the opportunity cost of time spent by the preceptor in nonbillable educational activities. A challenge in estimating the teaching effect on community providers is selection bias: Sites enlisted as training sites must have sufficient facilities and patient panels to support educational objectives and may have higher infrastructure costs than other sites prior to becoming teaching sites. After controlling for selection bias, one econometric study estimated that teaching sites are approximately 22 percent more costly than nonteaching sites (Hogan et al., 2000). With respect to direct costs, the setting and the compensation arrangements for the attending physician will determine whether the time spent by a preceptor in nonbillable educational activities will be a cost to the clinic and/or to the attending physician.

From a GME program's perspective, rotating a resident to a community-based provider setting affects its net costs in two ways. First, the program is likely to incur additional GME administrative costs for coordinating with the community providers, providing remuneration or non-monetary rewards to the community providers for the value of their teaching activities and the costs of infrastructure changes that may be required to accommodate residents, and overseeing the quality of the educational experience. Second, the hospital and faculty will need to absorb the loss of the resident's patient care services. Assuming that the community rotation substitutes for a rotation in the hospital's ambulatory clinic where a resident's marginal contribution is much less than a physician's and replacement costs are lower, there may not be an adverse impact, particularly if Medicare's requirements for continued DGME and IME subsidies are met.

The Affordable Care Act requires hospitals that claim Medicare GME payments for rotations to nonhospital settings to report the time spent by the residents in the nonprovider sites. Our analysis of the available cost report data as of the December 31, 2012, update indicates that 53 percent of residents in primary care programs train at hospitals that provide training opportunities in nonhospital settings. Those residents spent 12.6 percent of their time in nonhospital settings. Fewer than half of the hospitals with primary care programs reported that residents rotated to nonhospital settings. It is likely that most rotations to nonhospital settings are included in the FTE count for the sponsoring hospital and that the other participating hospitals might not rotate residents to nonhospital settings.

The Medicare cost report collects only aggregate information on non–primary care resident rotations to nonhospital settings. A higher percentage of non–primary care residents trained in hospitals with nonhospital training opportunities (57 percent versus 53 percent), but the percentage of time they spent in nonhospital rotations was lower (8.7 percent).

Impact on Attending Physician Revenues and Margins

Attending Physician Productivity and Revenues

Studies reach different conclusions regarding whether residents have a positive or negative impact on attending physician revenues. Studies that use resident replacement costs to value the services provided by residents compare the productivity of residents to their replacement providers. The focus is on whether the higher productivity of the replacement providers is sufficient to offset their higher salary costs (Franzini et al., 1999; Jones et al., 1995; Bridges and Diamond, 1999). From the perspective of measuring the financial impact of residents, the underlying question is different. It is whether attending physicians are more productive when supervising residents than when furnishing clinical services without residents. Even though residents may be less productive than attending physicians, they increasingly assume more care activities as they progress through their training programs and may enable the attending physician to treat more patients than would otherwise be the case.

Relative value units (RVUs) for the work component of Medicare's physician fee schedule measure a physician's effort (time and skills) required to perform a particular service relative to other services. One approach to comparing the teaching effect on physician productivity is to compare the total work RVUs generated by physicians in academic practices to those in private practices. The total work RVUs reflect the estimated value of the physician services (both volume and intensity) provided in the two types of practices. MGMA survey data (2011) provides benchmarking data comparing work RVU productivity for faculty standardized to 100 percent time in billable clinical activity.[9] For the selected study specialties, the lowest ratio of the median RVUs for academic practices to the median reported for physicians in private practice was for dermatology at 0.91, indicating that dermatologists in academic practices billed 9 percent fewer work RVUs than dermatologists in private practices for comparable time spent in clinical activity. The difference could reflect the impact of residents on productivity or it could reflect the referral of patients with more complex conditions from community physicians to the teaching clinics. The ratios for general surgery and urology were relatively high (1.17 and 1.24, respectively); the ratios for the other specialties were within four percentage points of 1.0, indicating that when total clinical activity is considered, the teaching effect is relatively minor for these specialties (see Table B.3 in Appendix B). Differences in service mix affect the productivity comparisons. Other MGMA benchmarking data show that the specialties that mostly bill evaluation and management services—IM, FM, and noninvasive cardiology—have fewer ambulatory encounters but more inpatient encounters than physicians in private practice. Academic general surgeons have fewer ambulatory and hospital encounters than surgeons in

[9] The hours required for faculty 100 percent clinical effort varied, with 40 hours or less used for 36 percent of respondents, 45–54 hours for 28 percent, 55–59 hours for 17 percent, and 60 or more hours for 18 percent of the respondents. These hours represent an institution's definition of a standard work week and may not represent the actual hours worked.

private practice. Academic general surgeons perform 40 percent fewer surgeries, while urologists perform 25 percent fewer surgeries than surgeons in private practice. According to the MGMA, more resource-intensive surgeries account for surgeons in academic practices having higher work RVUs.

The above comparisons are based on total clinical activity by attending physicians—both when residents are present and when physicians are seeing private patients. A somewhat different question is whether attending physicians have lower productivity when they are supervising residents than when they are seeing private patients. An econometric study comparing the marginal contribution of a primary care resident to a physician in hospital outpatient departments and freestanding outpatient diagnostic centers found that adding a resident makes a minimal contribution to clinic productivity relative to adding a fully trained physician. The study estimated that the resident's contribution was only 3 percent of the marginal contribution of a nonresident physician and decreased as program size increased (DeLia and Cantor, 2002). A potential explanation is that the clinical assistance from residents in performing clinical services is offset by the time that attending physicians spend supervising residents and other operational changes at the site needed to meet educational requirements. While this study found a slight increase in productivity, another study evaluating the impact of residents in a general internal medicine ambulatory clinic found that resident involvement reduced physician productivity, but the impact varied by training year. The loss was 0.81 work RVU for each first-year resident (who may have also been taught by senior residents), 0.89 RVU for each second-year resident, and 0.49 RVU for third-year residents during each 4-hour session, with most faculty supervising 3–4 residents per session (Johnson et al., 2008). With regard to inpatient services, a comparison of RVUs generated by a resident-staffed teaching service and a hospitalist-staffed nonteaching inpatient service found that the mean RVUs generated per encounter were not significantly different between the two services. However, the mean RVUs generated per clinical FTE provider were significantly higher in the resident-staffed service, which the authors attributed to lower time commitments of the attending physicians on the teaching service where residents provided 24-hour coverage. On the nonteaching service, the hospitalist, sometimes in combination with physician extenders, was responsible for providing the coverage (Alexandraki et al., 2009).

The Medicare rules pertaining to billing for direct patient care services provided by attending physicians supervising residents affect how much time the attending physician must spend with the patient in order to bill for the services and, therefore, affect clinical productivity. The general rule is that the attending physician must be present for all key or critical portions of the service and remain immediately available to furnish care for the duration of the care (CMS, 2012a).[10] For evaluation and management services, the attending physician must be physically present

[10] Because these requirements were adopted after audits by the HHS Office of the Inspector General found widespread lack of compliance with the Medicare attending physician rules in effect prior to 1996, studies investigating the impact of residents on teaching productivity that use data from 1996 or earlier may not be relevant.

during the portion of the service that determines the level of visit billed (history, physical examination, and medical decisionmaking), regardless of the extent of the work performed by the resident. The attending physician must be present for all three elements for new patients and two out of the three for established patients. The primary care exception allows an attending physician to be paid for certain low- and mid-level evaluation and management services performed by a resident in a continuity clinic when the preceptor is not present.[11] The documentation and supervision requirements for evaluation and management services place time demands on attending physicians that may be manifested in productivity decreases and/or increased working hours. The overall level of patients' medical complexity (the midlevel code may describe a lesser service than what is usually required) and the time the attending physician spends reviewing each case with the resident and documenting participation will determine whether the primary care exception enables higher productivity.

The supervision requirements are likely to lower attending surgeon intra-operative productivity. Total operating times are longer when residents perform the procedure than when surgeons perform the procedure without a resident (Bridges and Diamond, 1999). However, assuming sufficient operating room capacity, procedures can be scheduled with overlapping times as long as the attending physician is present for the key portion of each procedure and the resident assumes much of the pre- and post-recovery care. One reported outcome of implementation of the 80-hour work rule for residents has been to require attending surgeons to spend more post-recovery time with patients (because the resident surgeon must leave the hospital to stay within work-hour requirements). More importantly, major surgical procedures have a global period during which the surgeon is responsible for pre- and postoperative visits. These can account for a significant portion of the total time for the procedure. For example, the time required to perform a laparoscopic cholestectomy (a common urologic procedure) is apportioned for the Medicare fee schedule work RVUs as follows: preoperative, 24 percent; operative, 33 percent; and postoperative, 43 percent (CMS, 2012b). Medicare rules allow the attending physician to decide which postoperative visits are considered critical and require attending physician presence.

The supervision requirements for other procedures generally require that the attending physician be present throughout the procedure and negatively affect productivity of procedures that residents take longer to perform, such as endoscopies (McCashland, 2000). The attending physician must also be present throughout complex or high-risk procedures, such as interventional radiology, cardiovascular stress tests, and transesophageal echocardiography, that require physician personal supervision for Medicare coverage.

[11] The exception applies to services provided by a resident who has completed at least six months training in the residency program. The attending physician must be immediately available, supervise no more than four residents, have no other responsibilities at the time the services are provided, and review the care furnished by the resident during or immediately after the visit and document the extent of his or her participation.

Faculty Practice Plan Patient Care Costs and Revenues

In most GME programs, faculty practice plans collect and disburse the clinical revenues of attending physicians. The plans may be operated by the medical school or the teaching hospital or may be an independent organization. Plan structures range from multispecialty group practice models in which all departments and clinical facility act as a single unit with a common governing board and a high degree of common management systems to a departmental practice model in which there is no common governance or management system and little or no sharing of expenses or income between the departments (Bentley et al., 1991). In general, practice plan revenues are expected to cover at least supervision of residents providing clinical services but are also an important source of revenue to support patient care, research, and other education-related activities at both the medical school and teaching hospital. Because some specialties are able to generate relatively more patient care revenues than others, the faculty practice plan model has implications for the extent to which lower-income producing specialties are cross-subsidized by higher-income producing specialties. Some revenue redistribution may occur in faculty practice plans using the departmental practice model through a "tax" on the more-profitable departments that is used to subsidize the less-profitable departments.

Under the typical faculty practice plan arrangement, the faculty is responsible for covering at least some practice expenses, such as scheduling and billing costs for professional services. In some arrangements, clinical departments also assume the staffing and other operating costs for the ambulatory clinics. FM programs emphasize providing services in an office-like setting and frequently locate their continuity clinics off campus; training in other specialties may also occur in ambulatory clinics owned and operated by the faculty rather than the hospital. The faculty practice plan may assume the full costs (operating and capital-related costs, such as office rents or depreciation) of the ambulatory clinic. Across specialties, programs in which a high percentage of clinical activities occur in ambulatory clinics (such as IM, FM, and dermatology programs) have higher practice expenses than hospital-based programs. Depending on payer mix, the revenues may not be sufficient to cover clinic costs, and subsidies may be required. In particular, faculty teaching in ambulatory clinics serving Medicaid and uninsured patients will be less able to cover their compensation costs than faculty teaching in a clinic offering services to insured populations. Although radiation oncology is also largely outpatient, it is typically a hospital-based practice in which space and equipment costs and most staffing costs are assumed by the hospital, and the program is often responsible only for the administrative costs of operating the practice, such as billing costs. The other specialties in this study that are primarily hospital-based (i.e., cardiology, general surgery, and urology) have relatively low costs for ambulatory care even if they are responsible for those costs, but they may assume the administrative costs for their professional clinical services (e.g., billing costs).

Other Indirect Teaching Effects

Research

ACGME requires that the GME faculty establish and maintain "an environment of inquiry and scholarship with an active research component" and encourage and support residents in scholarly activity. Participation in scholarly activity varies across institutions, departments, and individuals and can range from formal research programs to such activities as drafting case reports and reviews and holding journal clubs (Fitzgibbons, 2006).

With the exception of IM, FM, and dermatology, the study specialties have program-specific requirements for research.[12] The time spent in research activities increases GME costs by reducing a resident's available time for patient care services. Medicare counts the time spent in scholarly activity in determining its payments but excludes the time spent in "pure research" as a non–patient care activity.

In addition to supporting resident research activities, academic health centers in particular have formal research programs that are a distinct activity separate from resident training. The MGMA data show differences in faculty levels of effort devoted to research activity, and the literature suggests, contrary to common perceptions, that most research has an unfunded component that must be covered by internal funding sources, often faculty practice plans. In addition to direct research costs, there could be an indirect effect on patient care costs. When we included a separate variable for research costs in our regressions measuring specialty-specific indirect costs, we found that it was not significant. MedPAC's earlier IME analyses also found no relationship between research spending and costs (MedPAC, 2007).

Market Share and Payer Mix

The teaching effect on hospital market share is uncertain. On one hand, teaching, research, and state-of-the-art care enhance the prestige of teaching hospitals relative to other hospitals in the community and potentially enable them to attract more patients and obtain higher prices for their services. Primary care practices in academic settings can have a "multiplier effect" on the revenues of specialty clinics and teaching hospitals (Pungo et al., 2000; Schneeweiss et al., 1989). For example, one study found that the hospital and specialty clinics generated $7.23 of charges for every $1 of charges in primary care (Saultz et al., 2001). On the other hand, higher costs may make it more difficult for teaching hospitals to contract with private insurers in

[12] The RRC for cardiovascular disease requires that fellows take part in an active research program either in blocks or concurrent with clinical rotations (ACGME, 2007b). The RRCs for general surgery (ACGME, 2009d) and urology (ACGME, 2009e) allow up to six months for research. However, about a third of general surgery residents interrupt their training to spend one to three years in full-time research that is funded by departmental funds and institutional training grants. They may have some clinical duties as well (Robertson, 2009). The RRC for radiation oncology requires residents to complete an investigative project and allows up to 12 months for research (ACGME, 2009c).

competitive markets. Teaching hospitals might be able to attract patients who are insensitive to price differences (such as Medicare and Medicaid fee-for-service beneficiaries, workers' compensation patients, and charity care) but might have more difficulty in competing for patients insured by other payers.

We used the California OSHPD data to explore how the market share and payer mix of teaching hospitals in California compares to nonteaching hospitals and to assess whether having a specific specialty program affects the market share for that discipline. The data, methods, and the results for the four residency programs are in Appendix C. We defined major teaching hospitals as members of the Council of Teaching Hospitals and Health Systems (COTH). We found that the California market areas are quite competitive for inpatients with the selected conditions. Further, we found no statistically significant differences in inpatient market share between teaching hospitals with and without the relevant residency programs of interest. In terms of outpatient market share, we found that COTH members command a far larger portion of the market for on-campus primary care than nonteaching hospitals. This is an indirect cost rather than a benefit because the payment-to-cost ratio for outpatient clinics was 0.30 (RAND analysis of OSHPD financial data). Hospital teaching status does not have a statistically significant effect on market share for the other outpatient services that we examined.

We found that a hospital's payer mix for the specialty-specific discharges does not appear to vary significantly from its overall payer mix. Medicare fee-for-service patients have equal access to all hospitals—and appear to prefer nonteaching and community teaching hospitals to COTH hospitals. Many of the latter are public hospitals with substantial charity care and educational missions that might detract Medicare patients from using their services. When price comes into play—as it does with Medicare managed care patients—the COTH hospitals are utilized disproportionately less. A common theme raised in our interviews was that the primary care residency programs serve a disproportionate share of low-income patients, and, as a result, hospitals with these programs have a disproportionate share of low-income patient admissions. We found that this was the case with the COTH hospitals (which all have primary care residency programs) but not with non-COTH teaching hospitals. The non-COTH teaching hospitals with primary care residency programs have a lower proportion of county indigent and self-pay patients than non-COTH hospitals without primary care programs.

Payment-to-cost ratios are a measure of whether hospitals are able to cover their higher costs through patient care revenues. We used the California OSHPD data to calculate payment-to-cost ratios by payer category.[13] We found significant differences only in the payment-to-cost ratios by

[13] We estimated payment by applying the ratio of the payer's total net revenues to total gross charges from the financial data to gross charges for inpatient services from the OSHPD discharge data. We estimated cost by applying the ratio of total costs to total gross charges in the financial data to the gross charges for inpatient services from the OSHPD discharge data. Because the payment and cost estimates used to compute the ratios are based on combined inpatient and outpatient data, a major limitation of our analysis is that it assumes that the payment-to-cost ratios for a given payer are the same across all services, but in actuality it could vary for particular types of services. A hospital

teaching status for the third-party payer category, other than Medicare and Medicaid. The average payment-to-cost ratios were 1.47 for COTH hospitals, 1.0 for non-COTH teaching hospitals, and 1.51 for nonteaching hospitals (see Appendix C for more-detailed information). One potential explanation is that, to the extent that the COTH hospitals are used, they are for "must" services for which the payer is unable to negotiate a more favorable payment rate, while the payer is able to negotiate more favorable rates with community teaching hospitals where there is more service competition.

Physician Recruitment, Retention, and Referrals

Reputational benefits and the opportunity to practice "cutting-edge" medicine in a teaching environment allow teaching hospitals to recruit and retain highly qualified physicians at lower compensation levels than physicians in private practice receive.

The difference between attending physician compensation and the compensation of physicians in private practice is one measure of the indirect value of this benefit. We were unable to locate data on the differences in compensation for employed physicians in academic and private practices. For example, the MGMA data for physicians in private practice include both employed physicians and partners, so the compensation levels are not directly comparable and the differences between academic and private practice compensation are overstated (see Appendix B, Table B.4).[14] The difference is less in the primary care specialties than in other specialties. AAMC comparisons for selected specialties indicate that the median starting salary for clinical practice positions is consistently higher than the median salary for an assistant professor, and, consistent with the MGMA data, the difference is less for the primary care specialties than for other specialties. For example, the difference for urology was $295,000 versus $281,000; for family medicine, the difference was $160,000 versus $155,000 (AAMC, 2012, 2013). We received different explanations from our interviewees for the lower compensation in academic practices. The attraction of working in a teaching environment was one of the explanations, but other explanations were the lower percentage of time spent generating clinical service revenues and the opportunity for research activities. Generally, compensation is higher in community teaching hospitals, where less time is spent in research activities.

There are also important downstream effects for teaching hospitals. Faculty can recruit the most promising future physicians from their programs and avoid the time-consuming and costly process of recruiting physicians. The cost of recruiting one physician ranges from $20,000 to

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could attract a higher or lower payment relative to cost depending on its costs for that service and the availability of the services elsewhere.

[14] The Medscape Physician Compensation Report (2012) does not standardize for full-time or part-time status and includes within the academic physician category research and government employers, as well as academic employers. The compensation for physicians in the academic category was consistently lower than the compensation for hospital-employed physicians.

$40,000 and averages about $30,000 (Franklin Joseph and Associates, undated). Further, physicians who train at the hospital and remain in the community become a source of hospital referrals. One survey of hospital administrators found that the average annual net revenue generated by physicians annually on behalf of their affiliated hospitals through patient referrals, admissions, procedures, and tests averaged $1.5 million in 2009 (Merritt Hawkins, 2010). The annual net income generated by primary care physicians was $1.4 million, compared to $1.6 million for physicians in other specialties. Invasive cardiology and general surgery were among the highest income–generating specialties ($2.2 million each), while urology and noninvasive cardiology generated about the same income as the primary care specialties. Dermatology and radiation oncology were not included in the survey. Hospital–physician affiliations will be become increasingly important as health systems evolve into accountable care organizations.

Summary of Indirect Effects of Teaching on Patient Care Costs and Revenues

In Table 3.1, we summarize our findings for selected indirect effects of teaching on the financial impact of operating different types of programs. These are factors that are likely to vary by type of residency program. Other factors, such as the financial impact of GME programs on market share and on physician recruitment and retention, are important effects at the institutional level that may also affect decisions regarding GME program offerings but do not appear to vary by specialty.

Those program characteristics that are likely to increase costs per resident are shown with upward-pointing arrows (⇧), while those that are likely to reduce costs are shown with downward-pointing arrows (⇩). The relative magnitude of the direction is reflected in the shading. If the impact across programs is in the same direction, the specialty program that is estimated to be most affected is shown with black arrows, the program likely to be the least affected is shown with white arrows, and those that fall in between are shown with gray arrows. If the impact is a cost for one or more programs and a benefit for the remaining programs, the shading of the arrow depicts the magnitude of the direction. For example, the IM and FM faculty practice plans are estimated to operate at a loss, whereas the other specialties are estimated to operate at a profit, with the highest profit per resident estimated for urology and the lowest profit estimated for cardiology and general surgery.

The estimates are based on the factors outlined in the earlier discussion of each characteristic. For example, the value of resident on-call services is a function of the amount of on-call services and the difference in the hourly compensation rates for the physician who would otherwise provide the services and the resident. IM and FM residents have more on-call duties, but the hourly cost of replacing their services with those of a hospitalist is lower than the hourly cost of paying a surgeon to provide the on-call surgical services. When both factors are taken into account, general surgery resident on-call services have the highest value, and the lowest values

are estimated for radiation oncology and dermatology residents, who provide relatively few on-call services. The higher productivity for general surgery and urology may be more reflective of more complex surgeries than residents contributing to increased throughput.

Table 3.1. Indirect Effects of Operating a Residency Program on Per Resident Costs

	General Internal Medicine	Cardiology	Family Medicine	Dermatology	General Surgery	Urology	Radiation Oncology
Residents provide on-call services that benefit both the hospital and attending physicians.	⇩	⇩	⇩	⇩	⇩	⇩	⇩
Residents teach more-junior residents and medical students.	⇩	⇩	⇩	⇩	⇩	⇩	⇩
Some specialty programs have a larger cost impact on inpatient costs than others after controlling for hospital-level teaching effect.	⇔	⇔	⇔	N/A	⇧	⇧	N/A
Resident training increases the cost of ambulatory care.	⇧	⇧	⇧	⇧	⇧	⇧	⇧
Teaching affects attending physician productivity and revenues.	⇧	⇧	⇧	⇧	⇩	⇩	⇩
Faculty practice plan collections and practice expenses differ.	⇧	⇩	⇧	⇩	⇩	⇩	⇩
Resident research activities increase net costs.	⇧	⇧	⇧	⇧	⇧	⇧	⇧
Sponsors benefit from lower salaries in academic practices.	⇩	⇩	⇩	⇩	⇩	⇩	⇩

NOTES: Program characteristics that are likely to increase costs per resident are shown with upward-pointing arrows (⇧), while those that are likely to reduce costs are shown with downward-pointing arrows (⇩). The relative magnitude of the direction is reflected in the shading. If the impact across programs is in the same direction, the specialty program that is estimated to be most affected is shown with black arrows, the program likely to be the least affected is shown with white arrows, and those that fall in between are shown with gray arrows. If the impact is a cost for one or more programs and a benefit for the remaining programs, the shading of the arrow depicts the magnitude of the direction. Sideways arrows indicate no significant impact on costs.

4. GME Direct Benefits

In this section, we discuss the major sources of funds that relate directly to GME activities: Medicare and Medicaid GME-related revenues and HRSA grant programs.

Medicare

Medicare is the largest explicit source of funding for GME. Medicare's contribution is allocated to hospitals through two formula-driven payments related to inpatient hospital care and number of residents: direct graduate medical education (DGME) and indirect medical education (IME). Medicare's DGME payments are intended to cover Medicare's share of the direct costs of residency training and apply to both acute care and specialty hospitals (children's, cancer, inpatient psychiatric, inpatient rehabilitation, and long-term care). Medicare's IME payments to teaching hospitals are intended to subsidize the higher patient care costs and are an add-on payment to prospective payment amounts. Teaching hospitals also receive DGME and IME payments for managed care enrollees based on the amounts that would have been payable on a fee-for-service basis. Medicare paid an estimated $3.0 billion for DGME and $6.5 billion for IME in FY 2010 (MEDPAC, June 2010).

Limits on Funded FTE Residents

The Balanced Budget Act of 1997 limited the number of allopathic and osteopathic residents that are counted for both DGME and IME purposes to the unweighted number reported on the hospital's most recent cost report as of December 31, 1996, and adopted a three-year rolling average methodology for determining resident counts. Since then, unused slots have been reallocated, and exemptions have encouraged new programs to begin operating. To obtain a current snapshot of the number of residents in training relative to the limits, we examined the most recent available cost report data for cost reporting periods beginning on or after May 1, 2010.[15] These cost reports incorporate revisions to the cost reporting forms that facilitate analyzing the impact of the limits. The file contained 1,116 hospitals that reported having 99,364 FTE residents throughout the hospital complex. Because the FTE counts are different for purposes of DGME and IME, we show the reported resident counts for each type of payment in Table 4.1 but discuss only the results for DGME limits.

In total, 1,097 hospitals reported having 99,135 residents for purposes of determining DGME payment. Of these, 3,159 were podiatry or dental residents who are not subject to the limits. After subtracting these residents, there were 95,976 allopathic and osteopathic residents in 1,055

[15] The cost reports included 239 hospitals with cost reporting periods beginning in FY 2010 (mostly beginning July 1, 2010) and 936 beginning in FY 2011 (on or after October 1, 2010).

teaching hospitals. After taking various adjustments and exceptions to the limits into account, the adjusted FTE resident limit was 85,228 residents.[16] Of the 1,055 hospitals reporting medical doctor (MD) and doctor of osteopathy (DO) DGME resident counts, 399 were at or below their adjusted FTE limit, while 656 hospitals had in total 12,847 residents above their limits.

Table 4.1. Comparison of FTE Resident Counts to FTE Limits for Hospital Cost Reporting Periods Beginning in FY 2010/2011

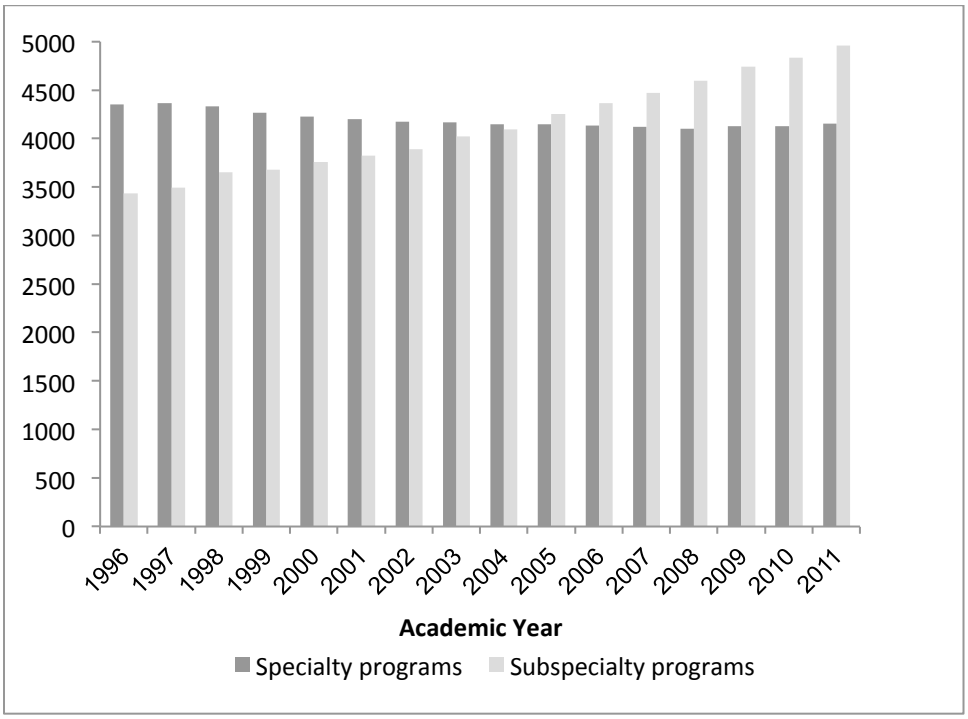
	DGME Residents		IME Residents	
	Number of Hospitals	FTE Residents	Number of Hospitals	FTE Residents
Total number of residents	**1,097**	**99,135**	**1,003**	**91,183**
Dental and podiatric residents	433	(3,159)	358	(3,228)
Current number of MD/DO residents subject to limits	**1,055**	**95,976**	**957**	**87,956**
Adjusted limit on MD and DO residents	**1,055**	**85,228**	**945**	**78,141**
At or below 1996 limit	399	(2,098)	344	(2,029)
Over 1996 limit	656	12,847	613	11,843

SOURCE: RAND analysis of December 31, 2012, HCRIS update of FY 2010/2011 cost reports. Analysis does not include impact of rolling average or 17 hospitals reporting adjusted limits for 117 residents but no current MD or DO residents. DGME counts include all hospitals, but IME counts are for acute care hospitals only.

A hospital's status under the GME limits has major implications for the financial impact of adding additional residency positions through new programs or expansions of existing programs. Because no Medicare revenue will be received for excess positions, the marginal costs are substantially higher. As seen in Figure 4.1, there has been a steady increase in the number of subspecialty programs since the initial limits were put into effect and a slight decline in the number of pipeline or initial residency programs.

[16] For the hospitals included in this analysis, the various adjustments resulted in a net increase of 4,055 positions, or about a five percent increase above their 1996 limits. About half of the increases are from the exception for new programs and represent newly funded positions. The other increases are from reallocations of unused slots from other hospitals rather than an actual increase in the total number of funded residency slots. The cost reports for this period do not fully reflect adjustments made by the Affordable Care Act.

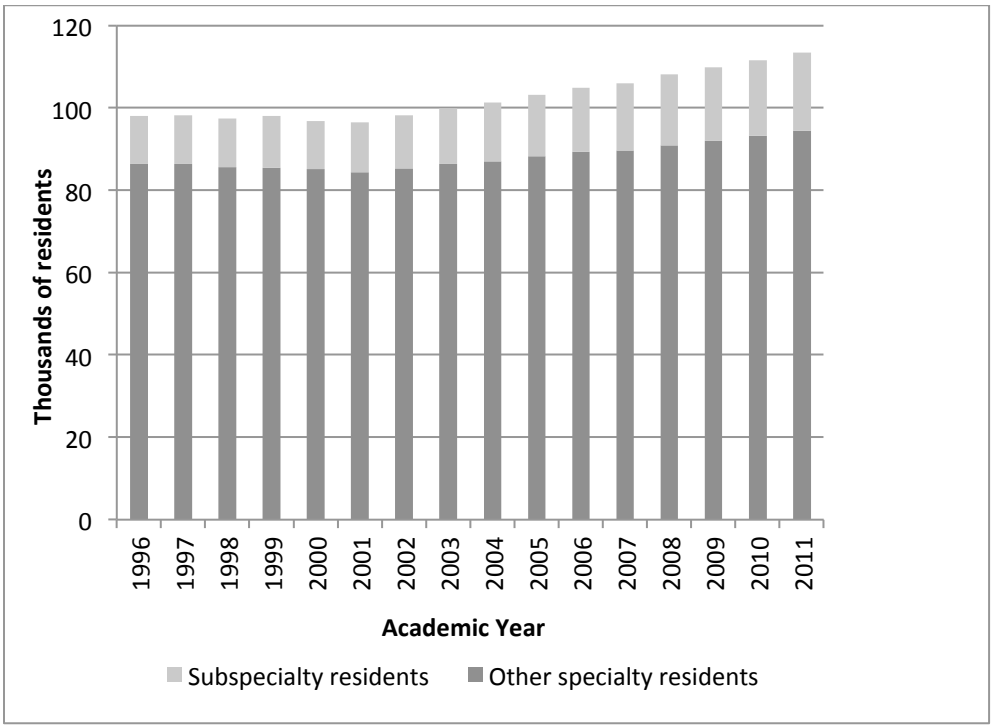
Figure 4.1. Number of Specialty and Subspecialty Programs from Academic Year 1996–1997 Through Academic Year 2011–2012



SOURCES: RAND analysis of JAMA, 1996; Brotherton et al., 2001; and Brotherton and Etzel, 2006, 2011, and 2012. Specialty programs are initial or pipeline specialty programs. Subspecialty programs offer additional training beyond the initial residency period.

In terms of resident growth, the total number of residents slowed when the limits were first put into effect, but since academic year (AY) 2002, the number of residents has been steadily increasing despite the limits on Medicare funded positions (Figure 4.2). In total, the number of residents has increased 16 percent, from 98,076 in AY 1996 to 113,427 in AY 2011. Over that period, the proportion of residents in subspecialty training increased from 12.0 percent to 16.7 percent. Within the specialty programs, primary care programs increased by 8.4 percent, compared to 10.3 percent for other specialty programs. In contrast, the number of subspecialty residents increased 61.1 percent (Table 1.1). The questions of why there has been a disproportionate increase in the number of subspecialty residents and how the positions are being funded are discussed below in Chapter 5, Summary of Findings and Discussion.

Figure 4.2. Total Number of Specialty and Subspecialty Residents from Academic Year 1996–1997 Through Academic Year 2011–2012



SOURCES: RAND analysis of JAMA, 1996; Brotherton et al., 2001; Brotherton and Etzel, 2006; Brotherton and Etzel, 2011; and Brotherton and Etzel, 2012. Specialty programs are initial residency or pipeline specialties. Subspecialty programs offer additional training beyond the initial residency period.

Medicare Direct GME (DGME) Payments

Medicare's DGME payments are the product of three factors: (1) a hospital-specific per resident amount (PRA), (2) the weighted number of FTE residents working in the hospital (including hospital outpatient sites and certain nonhospital ambulatory sites), and (3) the hospital's Medicare share of total inpatient days (i.e., the ratio of Medicare inpatient days [including managed care days] to total inpatient days).[17] Residents in their initial residency period are counted as 1.0 FTE by Medicare, while residents beyond their initial residency period are weighted as 0.5 FTE.[18] The weighted average PRA for the hospitals in our 2008 analysis file was $98,846 (see Table A.2 in Appendix A).

[17] Medicare Part B DGME payments may also go directly to qualified nonhospital sites, such as federally qualified health centers and rural health clinics, for training residents if they incur all or substantially all of the training costs. Prior to the implementation of the Teaching Health Center program established under the Affordable Care Act, minimal payments had been made directly to nonhospital sites. The Teaching Health Center program is administered by HRSA and discussed later in this section.

[18] The initial residency period is defined generally as the minimum number of years of formal training required for initial board eligibility in a specialty. For the study specialties, these policies resulted in an average PRA of $41,091 for IM and FM; $38,765 for dermatology, general surgery, urology, and radiation oncology; and $19,383 for cardiology.

The PRAs are based on 1984 per resident direct GME costs updated by the Consumer Price Index—All Urban (CPI-U) for inflation and do not reflect changes that have occurred since 1984 in the financing arrangements and cost structure for GME programs. For a given teaching hospital, the PRA for residents is about 6 percent higher for primary care specialties, obstetrics and gynecology, geriatrics, and preventive and public health than for other specialties because the PRAs for the other specialty programs did not receive inflation updates for two years.

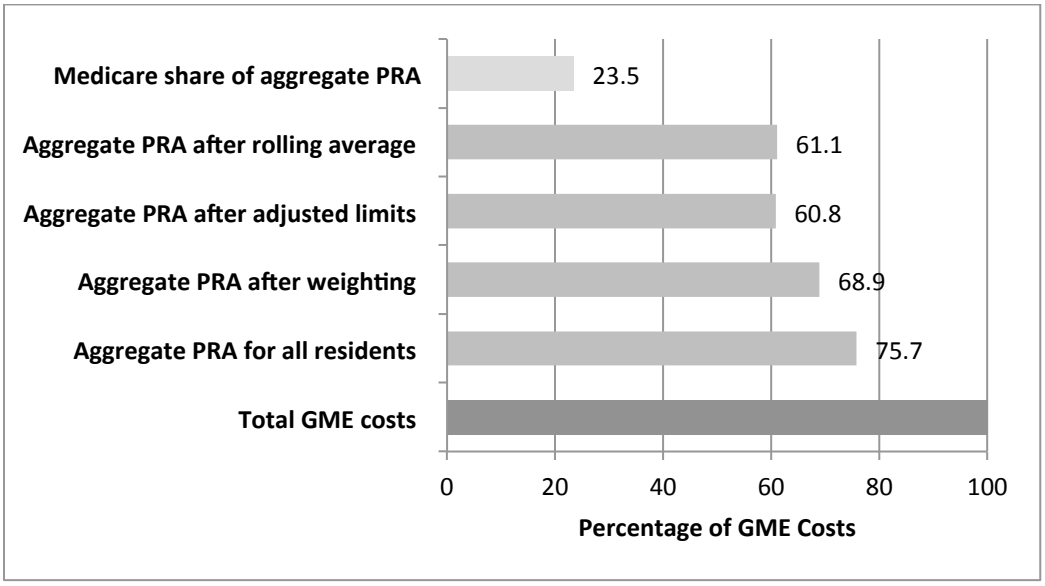
The weighted average ratio of the PRA to total GME cost across all hospitals was 0.70 in 2008 but varied by hospital categories (Appendix A, Table A.2). Across GME cost quartiles, the PRA as a percentage of GME cost decreases. On average, hospitals in the lowest cost quartile have a PRA that is nearly 10 percent more than per resident costs, while the PRA for those in the highest cost quartile is about 52 percent of costs. The weighted average ratio was 0.86 for hospitals with less than 25 percent primary care residents, compared to 0.72 for hospitals with at least 75 percent of their residents in primary care programs. The ratio is similar for hospitals above and below the cap on number of residents.

On average, Medicare's share of the PRA (defined by law as the ratio of Medicare inpatient days to total inpatient days) is 37 percent. Hospitals with a low Medicare utilization receive less support than hospitals with higher Medicare utilization. In particular, the hospitals with high percentage of low-income patients have a lower Medicare share than hospitals with a low percentage of low-income patients.

Based on the 1,071 hospitals reporting both GME costs and residents in approved training programs on their FY 2011 cost reports, we estimate that on average hospitals received $23.50 in Medicare DGME payment for each $100 of direct GME costs (Figure 4.3).[19] Because direct GME costs have risen more rapidly than the CPI-U, the average PRA is approximately 76 percent of the average GME cost per resident, or $76 for each $100 in direct GME costs. A further reduction to $69 occurs through weighting of residents beyond their initial residency period as 0.5 FTE. The application of the Medicare limit on FTE funded positions reduces payment to 61 percent, while the rolling average increases the aggregate payment amount slightly. Medicare's share of this is 37 percent, or $23.50 for each $100 in direct GME cost. Approximately 78 percent of this amount was attributable to fee-for-service beneficiaries and 22 percent to enrollees in managed care plans.

[19] We excluded 42 hospitals in this analysis that reported no GME costs, 26 of which had residents in the current year. We also excluded another 41 hospitals that reported GME costs but no current year residents in approved training programs. Most hospitals with no current-year residents received funding through the rolling average; two had only residents in unapproved training programs.

Figure 4.3. How Much Does Medicare DGME Cover of Each $100 of Direct GME Cost?



SOURCE: RAND analysis of FY 2010/2011 cost reports as of December 31, 2012, update.

Medicare IME Payments

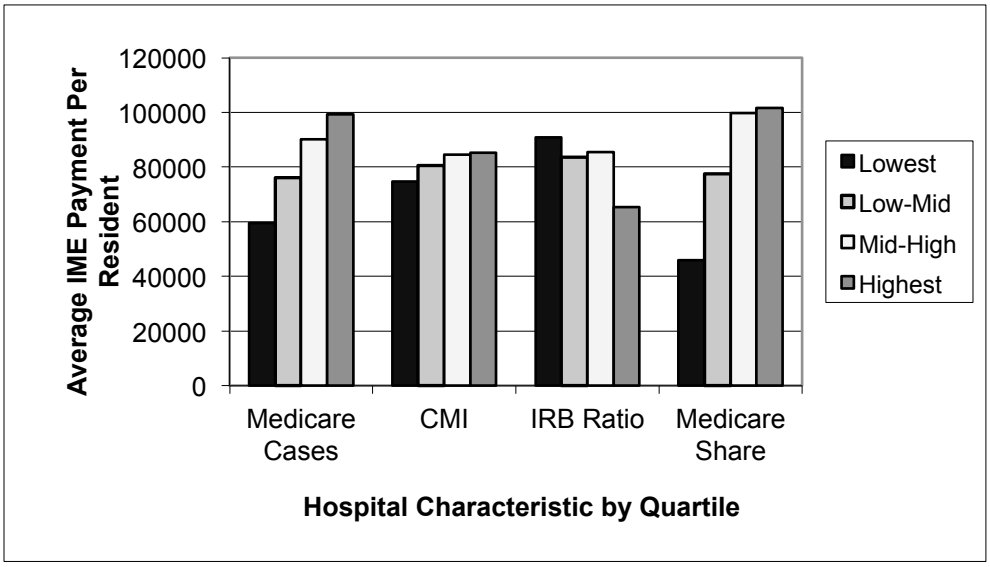
The Medicare IME subsidy consists of a percentage add-on to each per discharge payment for inpatient services under its prospective payment systems for acute care, psychiatric, and rehabilitation hospitals. The add-on is based on teaching intensity. For acute care hospitals, the payment formula for the operating costs uses an intern and resident-to-bed ratio (IRB). The payment formula for capital-related costs uses an intern and resident-to-average daily census ratio. In both formulae, the numbers of residents involved in patient care activities in the hospital and certain ambulatory settings are counted.[20] The current operating formula increases payment 5.5 percent for each 0.10 increase in the hospital's resident-to-bed ratio and produces an adjustment that is more than twice the level indicated through multivariate regression analysis as the teaching effect on hospital Medicare costs per discharge (MedPAC, 2010; Nguyen and Sheingold, 2011).

The IME adjustment is typically examined in terms of the added payment per discharge. In 2010, it added an estimated 11 percent to standard wage-adjusted payments, but the percentage varies significantly by teaching intensity. Hospitals in the lowest quartile of IRB ratios (IRB ratio < 0.035) average an add-on of less than one percent, while those in the highest quartile (IRB ratio > 0.268) average a 25 percent add-on (RAND analysis of Medicare FY 2010 prospective payment system (PPS) for acute care hospital impact file).

[20] The resident count is subject to the cap and a rolling average, but residents beyond their initial residency period are not weighted at 0.5. Only the time spent in the acute care portion of the hospital is counted, but hospital units that are excluded from the prospective payment system have their own IME adjustments.

When considering the economics of GME financing and the financial impact of adding a residency position, it is also important to consider the value of the IME adjustment on a per resident basis. On this basis, the adjustment is a function of number of Medicare discharges, case mix, and the geographic adjustment factor, as well as teaching intensity. For FY 2010, the estimated resident-weighted average payment is $71,112, and the facility-weighted average is $81,234. Figure 4.4 shows how the facility-weighted average varies across quartiles of acute care hospitals based on the number of discharges, case mix index, teaching intensity, and Medicare share. Despite having an add-on of a higher percentage, the adjustment on a per resident basis is lower for hospitals in the highest IRB quartile than other hospitals. These hospitals have, on average, a lower proportion of Medicare discharges (31.5 percent) and have more residents (227) than other teaching hospitals. For comparison, the hospitals in the 50th to 75th percentiles have, on average, 42 percent Medicare utilization and 55 residents. There are no specialty-specific distinctions in the IME formula, but the time spent in research activities unrelated to the diagnosis and treatment of an individual patient is not counted (e.g., time spent evaluating the safety and efficacy of medical treatments), and research involvement varies across the specialties.

Figure 4.4. Estimated Average IME Payment per Resident, FY 2010



SOURCE: RAND analysis of FY 2010 PPS Impact File.

Payment for Training in Nonhospital Settings

The Medicare law allows hospitals to include in their FTE count residents who rotate to nonhospital settings if the hospital pays all or substantially all of the costs of training. The requirements that must be met in order to count the time that residents spend in nonhospital settings for purposes of DGME and IME were relaxed by the Patient Protection and Affordable

Care Act (ACA). The ACA provides that the hospital need only pay for the resident's stipend and fringe benefits to qualify for payment.

Medicaid

Medicaid is the second-largest explicit funder of GME activities. States have considerable flexibility in the methods that they use to pay providers. While they distribute funds primarily to teaching hospitals, several variations in distribution mechanisms exist, and, in some cases, medical schools or nonhospital training sites receive funds (Wynn et al., 2006; COGME, 2000; NY State Council on Graduate Medical Education, 2008; Henderson, 2010). CMS does not collect information from the states on the amounts paid for GME. An AAMC-sponsored state survey estimated that Medicaid GME support totaled $3.8 billion (both federal and state) in 2009, representing approximately 6.6 percent of payments for inpatient hospital care (Henderson, 2010). The level of support for GME-related activities and the methods used to distribute the funds to providers varied widely, but the majority of the 40 states and the District of Columbia that reported paying for DGME and/or IME under their fee-for-service Medicaid programs either used Medicare methods (16 states) or a per resident payment (15 states) for DGME and/or IME.

Combining the AAMC survey data with information on the number of residents in ACGME-accredited programs provides an estimate of average Medicaid (federal and state) support of $35,594 per resident in 2009 (see Appendix D). The actual per resident payments for a given hospital, however, depends on its state's level of GME support, method for allocating funds, and whether managed care plans are required to redistribute any GME amounts implicit in their payments to hospitals. For the three states with the largest complement of residents, Medicaid GME funding per resident was estimated at $97,857 for New York, compared to $20,174 for California and $0 for Texas.

HRSA Funding Directly Related to GME Activities

The Health Resources and Services Administration (HRSA) had $1.2 billion in active grants pertaining to health professions as of November 30, 2011. These include temporary funding under the American Recovery and Reinvestment Act, as well as ongoing grant programs that are subject to periodic reauthorization and the annual appropriations process. Essentially all of the HRSA grant programs other than the Children's Hospital Graduate Medical Education (CHGME) program are directed at expanding primary care residency training programs. Although the dollar amounts of individual grants are relatively small, the awards can provide important leverage for program improvement and innovation.

The CHGME program was established in 1999 to provide GME support to approximately 60 teaching children's hospitals. Because these hospitals typically serve few Medicare patients, they did not have the same level of GME support as other acute care hospitals. Unlike Medicare GME payments, funding is not an entitlement but requires an appropriation. As a result, the CHGME

program competes with other federal programs for funds and provides less-stable funding than the Medicare funding. For example, the CHGME program had a five-year authorization for FY 2007–2011 that had not been renewed as of January 2013. The Administration's FY 2012 budget request did not include appropriations for the CHGME program, and the FY 2013 budget request includes reduced funding for DGME costs only.

At the same time, HRSA's competitive grants are targeted more toward specific workforce objectives and are more flexible than Medicare's formula-based funding. For example, the ACA provides a five-year, $230 million authorization and appropriation to increase the number of primary care residents trained in community-based ambulatory settings. Payments are made for the direct and indirect expenses of training residents to the program sponsor, which must be the ambulatory training site or a GME consortium that has a teaching health center as an essential partner. Unlike the little-used Medicare provision that provides direct support to community training settings based on Medicare utilization, the support levels are based on estimates of total training costs in the community-based settings. The program is too new to evaluate its effectiveness in creating financially sustainable primary care training in community settings.

Summary of Direct Benefits of Operating GME Programs

Our conceptual framework defines the direct benefits of operating GME programs as revenues that are directly related to GME programs. Medicare is the largest explicit source of funding for GME. Medicare's direct GME payments are intended to cover Medicare's share of the direct costs of residency training and apply to both acute care and specialty hospitals (children's, cancer, inpatient psychiatric, inpatient rehabilitation, and long-term care). In the aggregate, Medicare covers about 23.5 percent of direct GME costs incurred by teaching hospitals (RAND analysis of FY 2010/2011 Medicare cost reports). Relative to the average per resident payment, payments are about 6 percent higher for residents in primary care specialties and about 14 percent lower for residents beyond their initial residency period.

Medicare's IME payments to teaching hospitals are intended to subsidize the higher patient care costs. In 2010, IME payments added approximately 11 percent to standard wage-adjusted payments for acute care services (RAND analysis of FY 2010 PPS Impact File). The current formula produces payments that are more than twice the level indicated through multivariate regression analysis as the teaching effect on hospital Medicare costs per discharge level (MedPAC, 2010; Nguyen and Sheingold, 2011). The IME formula does not vary by specialty.

Medicaid is the second largest explicit funder of GME activities. Total GME-related payments were approximately 6.6 percent of payments for inpatient hospital care in 2009, but the level of support for GME-related activities and the methods used to distribute the funds to providers varied widely across states (Henderson, 2010). HRSA ongoing grant programs are subject to periodic reauthorization and the annual appropriations process. Other than the CHGME program, the grants are directed at expanding primary care residency training

programs. Although the dollar amounts of individual grants are relatively small, the awards can provide important leverage for program improvement and innovation and are more flexible than Medicare's formula-based funding in targeting specific workforce objectives.

Potentially, direct GME benefits are a significant factor in weighing the marginal financial impact of expanding GME programs. However, the impacts vary significantly across teaching hospitals, depending on the hospital's position relative to the FTE limits on resident counts, the GME policies for the state in which the hospital is located, and the hospital's Medicare and Medicaid (if the state makes GME payments) utilization rates. A hospital that is above its FTE limits and is located in a state that does not provide GME payments would receive no direct GME benefits for adding a residency program. In contrast, a hospital that is below its FTE limits and is located in a state that follows Medicare policies (particularly with respect to the pass-through for managed care enrollees) would receive substantial benefits from adding a residency position.

5. Summary of Findings and Discussion

Determining how different types of GME programs affect the financial performance of sponsoring institutions and their educational partners is a complex undertaking. Costs are borne by multiple teaching hospitals and community providers and by medical schools that receive support for those costs via fund transfers from hospitals and faculty practice plans. Most funds supporting GME activities—patient revenues—are not restricted to being used to support GME and support patient care and other provider missions as well. Greater consistency in hospital cost reporting for such costs as malpractice insurance and contract attending physician compensation would increase comparability across teaching institutions, but the financing arrangements among the educational partners are probably more important determinants of the resident financial impact than any other factor. Cost and revenue information is needed from all participants in the educational program to determine the net financial impact of operating a residency training program.

Key factors affecting variation in the direct costs of GME programs include program size, attending physician compensation levels, and malpractice insurance. Economies of scale affect both variation across specialty programs and between large GME programs at AHCs and smaller community-based programs. Smaller specialty programs with relatively high faculty compensation levels and malpractice insurance costs are likely to have higher direct GME costs per resident than other programs. However, residency programs also have a number of indirect effects on hospitals and attending physicians. These indirect effects are important from the perspective of the overall economics of operating GME programs and the marginal impact of changing program offerings, but they are problematic to measure. Studies examining the value of resident services predate implementation of the limits on resident work hours, and updated information is needed regarding how residents spend their time. From our interviews, it is clear that residents continue to be an inexpensive source of labor to the hospital and attending physicians. One GME director who we interviewed noted that he made it a point to schedule an all-resident retreat one weekend per year so that faculty would be reminded of how they benefit from resident on-call services.

With the exception of on-call and teaching activities, the value of resident services is primarily captured as indirect effects on hospital costs and attending physician productivity. The indirect teaching effect on hospital inpatient costs most clearly affects teaching hospitals and should be given further attention. Our analysis of the OSHPD data confirmed MedPAC's earlier findings that AHCs have higher cost structures than community-based teaching hospitals and raises a policy issue regarding the extent to which the adjustment should compensate for other activities, such as undergraduate medical training and standby services. Further, we found some indications that IME costs may vary by specialty. The teaching effect on outpatient facility costs

is less substantiated in the literature but generally suggests that residents increase infrastructure costs and reduce productivity. However, CMS did not find that the effect was substantial enough to warrant an indirect teaching adjustment under the Medicare prospective payment system for outpatient services when it was initially implemented in 2000. Given the importance of training in ambulatory settings, more-recent analyses are needed to understand the teaching effect on the costs of services provided in hospital outpatient settings and community-based ambulatory settings.

With respect to physician productivity and patient care revenues, the literature suggests that there may be no impact or a favorable impact on attending physician productivity in inpatient settings (where teaching can be more efficient and residents perform on-call duties for attending physicians) but an adverse impact in ambulatory settings. However, few studies involve multiple training sites, and we were unable to locate recent literature quantifying the indirect costs on attending physician productivity across different types of residency programs. Our interviewees identified attending physician patient care revenues and the share of outpatient clinic costs and other practice expenses covered by the faculty practice plan as key differences in the financial impact of training programs in different specialties. Attending physicians in specialties with relatively high compensation levels that also provide most services in hospital-operated facilities are able to support resident clinical supervision activities through their patient care revenues. Primary care residency programs are disadvantaged relative to other specialties because of lower physician revenues and a higher proportion of training in ambulatory clinics. These programs are often subsidized by the hospital or cross-subsidized by faculty practice plan revenues from other departments. While funding disparities can be addressed in academic health centers through cross-subsidization, this opportunity does not exist in community hospitals with a single primary care program.

Other indirect effects are the additional revenues and cost reductions that are indirectly associated with having residency programs. While these benefits are not readily quantified, they should not be ignored. One potential benefit is prestige and name recognition that allows the hospital to compete in competitive markets. Our analysis of the California data suggests that this is a general benefit of being a teaching hospital that does not seem to be affected by specific specialty program offerings. Despite having higher patient care costs and higher proportions of charity care, teaching hospitals consistently have private payer payment-to-cost ratios greater than 1.0, and margins have been positive in recent years. Both measures suggest that teaching hospitals are able to command payments from private payers that are sufficient to cover their share of GME costs. Other indirect benefits include the positive effect on physician recruitment and retention and referrals from community physicians.

Direct benefits are the GME-related revenues that hospitals and programs receive for their GME programs. Medicare's DGME payments cover about 23.5 percent of current direct GME costs per resident. On a per resident basis, Medicare IME payments are much higher than DGME

payments (see Table 5.1) and may be indirectly supporting unfunded residency positions. In many states, Medicaid subsidies for GME activities are also likely to be an important factor.

The public policy debate over GME financing often focuses on only one component of the cost and benefit equation and, by doing so, leads to the perplexing but commonly heard adage that "it costs to train residents and it costs to replace them." This seeming contradiction arises from looking only at the average cost of residency training in determining that "it costs to train residents" and only at benefits derived from having residents in determining that "it costs to replace them." It is best resolved by examining the marginal financial impact of adding or subtracting residents to existing teaching programs. The marginal impacts are more likely to influence the decisions on changes in GME program size and offerings and help explain why GME programs are expanding above the Medicare FTE limit on funded positions.

In Table 5.1, we illustrate the marginal financial impact for a general internal residency program relative to a cardiology program. The table takes three basic components into consideration: marginal resident-related costs, service needs, and direct resident-related benefits.

- **Marginal resident-related costs.** For existing programs, minor changes in residency program size are unlikely to have an impact on the either GME infrastructure costs or IME costs (Cromwell et al., 2005). The marginal cost of adding a position to an existing program is primarily the resident's stipend and fringe benefits and other resident-specific allowances. Marginal costs may be higher if adding the resident requires additional capacity, which might be the case with an FM continuity clinic, where there must be two exam rooms per resident and no more than four residents can be supervised by an attending physician at the same time. However, most other costs—such as the core faculty and accreditation costs—should be fixed. Our estimate for resident-related expenses ranges from 20 to 40 percent of GME program costs, exclusive of resident compensation.
- **Service needs.** If the hospital has service needs that would otherwise need to be met through hiring other health professionals, the marginal resident-related costs are offset by the financial impact of hiring an alternative provider—i.e., the compensation costs for the alternative provider reduced by the revenues that this provider could generate for services that are non–revenue-generating when furnished by a resident. Alternative provider compensation costs are higher for residents in subspecialty programs than in specialty training programs (Nuckols et al., 2009; Green and Johnson, 1995; Franzini et al., 1999; Mitchell et al., 2007; DeLia and Cantor, 2002). To estimate the additional revenues that could be generated by the alternative providers, we compared estimated collections for attending physician billings (including billings for services furnished by residents under their supervision) to collections adjusted for the impact of residents on attending physician billings. For both IM and cardiology programs, residents were estimated to have a slightly negative impact on productivity (see Appendix B, Table B.3). As a result, the alternative providers would generate additional revenues that would lower the cost of hiring them. The financial impact will vary depending on the type of additional services that are needed (e.g., revenues will be lower if the services are largely for on-call coverage that does not generate substantial billing for professional services or if the services are provided largely to Medicaid and uninsured patients whose services have

relatively low collection rates). If there are no additional service needs, there would be no offset for resident replacement costs. Therefore, we show each component as a range from $0 to the estimated financial impact of hiring an alternative provider to meet service needs.

- **Direct resident-related benefits.** For those below the FTE limit, the hospital would also receive Medicare GME-related funds and may receive Medicaid funding. GME-related funding from other payers is not accounted for in the table. A hospital above the FTE limit would not receive any direct resident-related benefit unless Medicaid and other payers make GME-related payments.

Table 5.1 suggests that the major financial driver in deciding whether to add a residency program is whether there are service needs that would otherwise require hiring alternative providers and the financial impact of doing so. If there are no additional service needs, neither program can break even unless there are direct GME-related revenues. However, if there are additional service needs, either program can break even without any GME-related revenues. The financial gain is greater for the cardiology program ($151,694 versus $43,707) because of the higher costs of hiring an alternative provider.

Table 5.1 focuses on the marginal financial impact of expanding an existing residency program and assumes that the infrastructure needed for the residency program is already in place. In the case of primary care programs that have higher infrastructure and supervisory costs, unmet service needs and GME funding may not be sufficient to break even, and the program may require hospital subsidies. For example, if the average resident compensation in Table 5.1 were replaced by the average national average GME cost per resident from Table A.1 in Appendix A ($141,240), the general IM program does not break even without GME funding, while the cardiology program does as long as there are unmet service needs. This may explain why most new primary care programs are being sponsored by hospitals that previously have not had residents and are entitled to a new program exception to the Medicare cap for five years.

Table 5.1. Estimated Financial Impact of Adding an Internal Medicine Resident to an Existing Program Compared to a Cardiology Resident in 2010

	General IM		Cardiology	
Marginal cost component				
Resident compensation[1]	($65,540)		($73,691)	
Resident-related allowances	($16,950–$33,898)		($16,950–$33,898)	
Alternative provider cost component				
Alternative provider compensation cost[2]	*No service need* $0	*Need 1 FTE* $127,936	*No service need* $0	*Need 1 FTE* $256,908
Marginal effect on clinical revenues[3]	$0	($1,740)	$0	($14,574)
Net impact before GME-related revenues	*High cost estimate* ($101,178)	*Low cost estimate* $43,707	*High cost estimate* ($107,589)	*Low cost estimate* $151,694
GME-related revenues				
Medicare[4]	*Above cap*	*Below cap*	*Above cap*	*Below cap*
IME	$0	$71,112	$0	$71,112
DME	$0	$41,091	$0	$19,393
Medicaid[5]	$0–$98,000		$0–$98,000	
Total GME-related revenues	$0–$210,203		$0–$188,505	
Financial impact of adding a resident	($101,178)–$253,910		($107,589)–$340,199	

NOTE: Numbers in parentheses represent a GME cost, while positive numbers are GME benefits, including resident replacement costs.

[1] RAND-derived compensation from AAMC (2011) average compensation by PGY. An average of PGY1–PGY3 was used for internal medicine, and an average of PGY4–PGY6 was used for cardiology. Fringe benefits were assumed to be 30 percent. Other marginal costs were assumed to be 20–40 percent of average GME cost per resident exclusive of resident compensation. RAND analysis of 2008 Medicare cost report data found that the average GME cost per resident exclusive of resident compensation costs was $84,744, or 60 percent of the total GME cost per resident.

[2] In estimating replacement costs, Nuckols et al. (2009) assumed that physicians would replace subspecialty residents, while a combination of lower- and mid-level practitioners and physicians would replace residents in specialty programs. Our estimate uses MGMA (2011) median compensation in academic practices and assumes 100 percent replacement for a cardiology fellow by a cardiologist and 50/50 replacement of an internal medicine resident by a hospitalist and nurse practitioner (NP). The cost for the alternative provider may be underestimated for internal medicine because the resident workweek is longer than the NP workweek (in which case the net benefit shown in the low cost estimate would be higher). If the cardiology resident were replaced in part by specialized nursing staff, the cost for the alternative provider may be overestimated, assuming that there is no difference in the workweek.

[3] RAND estimate derived from MGMA (2011) data. We estimated the teaching effect on collections for each specialty as median collections multiplied by a factor equal to 1 divided by the teaching effect on academic physician billings (see Appendix B, Table B.4). The result is an estimate of the marginal effect of the resident/fellow on collections

assuming no difference in the service mix.
[4] RAND estimate of average per resident payments derived from analysis of 2008 cost report data and PPS FY 2010 impact file.
[5] RAND-derived estimate of range of Medicaid per resident payments using Henderson (2010) and Brotherton and Etzel (2009).

One national GME expert who we interviewed suggested that the limits on the number of positions that Medicare will fund provide a natural experiment that demonstrates the overall economics of operating residency programs. Since 1996, there has been a steady increase in the number of subspecialty programs and residents. While some subspecialty expansions, such as those in hospice and palliative care, are consistent with physician workforce priorities, others are not. Unless workforce priorities are reinforced by the hospital's internal service needs, program expansions are more likely to occur in the more-lucrative specialty and subspecialty programs. This suggests that Medicare's GME-related payments should be more differentiated to take into account the differences in financial impact of various specialty programs and to focus support on primary care residency programs. The experience under the limits and the Table 5.1 estimates indicate that the business case for subspecialty training is not predicated on Medicare funding. Redirecting Medicare payments to target primary care residency programs might facilitate the educational investments needed in primary care. However, the difficulties that many primary care residency programs are experiencing in filling their slots with qualified candidates suggest that simply increasing payments for primary care programs relative to other specialty and subspecialty programs will not be sufficient. Significant investments are needed not only to enhance primary care training programs but also to attract future physicians into primary care.

Appendix A. 2008 Direct GME Costs, Payments, and Sources of Funding

This appendix contains information from our analysis of Medicare cost report data. We first present two tables summarizing our findings, followed by an explanation of our data and methods for analyzing the cost report data. The purpose of the tables is to provide information on the variation in GME costs and Medicare per resident payments across hospital characteristics.

Table A.1. 2008 Direct GME Costs by Hospital Characteristics

Hospital Characteristic	Number of Hospitals	Number of Residents	Total GME Costs Per Resident	Total GME Costs: Facility Percentiles		
				25th	50th	75th
All hospitals	1,141	97,577	$141,240	$95,403	$134,803	$177,674
Geographic location						
Large urban	690	71,787	$142,391	$95,382	$133,369	$171,239
Other urban	391	24,603	$137,583	$95,403	$137,971	$190,157
Rural	60	1,186	$147,485	$100,604	$125,786	$189,824
Number of FTE residents						
0–9	319	1,314	$145,697	$75,075	$117,199	$197,090
10–24	231	3,963	$153,938	$103,270	$142,627	$189,405
25–99	313	15,888	$142,077	$106,914	$137,971	$170,703
100 or more	278	76,412	$140,331	$104,128	$136,578	$171,054
% Primary care						
0–24	165	3,525	$161,779	$77,511	$116,626	$180,391
25–49	239	59,802	$132,956	$92,982	$124,292	$154,419
50–74	242	22,720	$154,753	$107,448	$139,548	$171,487
75 or more	426	11,082	$153,162	$107,772	$150,490	$199,507
GME affiliations						
AHC	828	88,342	$141,269	$98,976	$137,323	$180,336
Community-based	292	8,779	$140,073	$88,935	$126,457	$169,777
GME cost quartile						
Q1, lowest	285	20,326	$75,197	$57,741	$73,977	$85,528
Q2	286	29,423	$115,810	$106,238	$116,551	$125,388
Q3	285	27,731	$153,042	$142,717	$152,635	$164,765
Q4, highest	285	20,096	$228,988	$200,159	$226,731	$273,394
DSH patient percentage						
0–14	274	11,218	$140,933	$86,371	$125,628	$183,667
15–24	303	16,139	$143,401	$103,270	$137,971	$184,424

Hospital Characteristic	Number of Hospitals	Number of Residents	Total GME Costs Per Resident	Total GME Costs: Facility Percentiles		
				25th	50th	75th
25–49	392	45,010	$135,278	$100,039	$135,332	$170,743
50–64	80	14,143	$150,956	$92,416	$129,675	$168,558
65 or more	92	11,068	$150,236	$92,299	$140,325	$203,982

SOURCE: RAND analysis of 2008 Medicare cost reports.

Table A.2. 2008 per Resident Amounts and Medicare Share by Hospital Characteristic

Hospital Characteristic	Number of Hospitals	Number of Residents	Total GME Costs Per Resident	Average PRA	PRA as % of Cost	Medicare Share of Days	Medicare Share of PRA
All hospitals	1,103	97,067	$141,452	$98,846	69.9%	37.0%	$36,556
Geographic location							
Large urban	671	71,481	$142,543	$102,261	71.7%	35.9%	$36,751
Other urban	379	24,414	$138,015	$89,820	65.1%	39.8%	$35,737
Rural	53	1,171	$146,508	$86,218	58.8%	48.6%	$41,903
Type of ownership							
Not for profit	812	66,758	$148,935	$101,040	67.8%	41.0%	$41,476
Proprietary	114	3,908	$122,477	$97,308	79.5%	37.1%	$36,113
Government	177	26,400	$125,340	$93,483	74.6%	25.8%	$24,078
FTE residents							
0–9	294	1,241	$145,371	$95,644	65.8%	42.5%	$40,612
10–24	222	3,808	$156,172	$96,243	61.6%	47.3%	$45,506
25–99	309	15,607	$143,039	$95,791	67.0%	44.2%	$42,343
100 or more	278	76,412	$140,331	$99,696	71.0%	34.9%	$34,762
% primary care							
0–24	161	3,518	$161,928	$104,084	64.3%	41.9%	$43,596
25–49	239	59,802	$132,956	$96,438	72.5%	35.5%	$34,232
50–74	241	22,696	$154,758	$102,358	66.1%	36.0%	$36,897
75 or more	419	10,864	$154,478	$102,673	66.5%	44.3%	$45,460
GME cost quartile							
Q1, lowest	268	20,080	$75,311	$82,679	109.8%	30.0%	$24,780
Q2	281	29,257	$115,871	$95,986	82.8%	37.2%	$35,734
Q3	280	27,665	$153,029	$98,235	64.2%	38.4%	$37,713
Q4, highest	274	20,065	$228,982	$118,784	51.9%	39.7%	$47,112
Disproportionate share of low-income patient percentage							
0–14	260	11,025	$141,526	$93,180	65.8%	30.8%	$28,669
15–24	293	16,109	$143,371	$95,927	66.9%	48.8%	$46,857
25–49	384	44,836	$135,461	$97,221	71.8%	39.3%	$38,247
50–64	79	14,098	$151,146	$103,698	68.6%	32.9%	$34,141
65 or more	87	10,999	$150,568	$108,789	72.3%	23.3%	$25,306
Status under resident cap							
Above	651	79,288	$138,852	$97,207	70.0%	36.1%	$35,055
At	29	738	$148,031	$108,015	73.0%	46.0%	$49,722
Below	379	16,854	$153,827	$106,156	69.0%	40.4%	$42,841

SOURCE: RAND analysis of Medicare 2008 cost reports.

Data and Methods to Analyze Medicare GME Payments

Direct GME Costs and Payments

We constructed two GME analysis files from an extract of Medicare cost reports for 2008 provided by MedPAC staff and a second file of the latest cost reporting periods beginning on or after May 1, 2010, as of the December 31, 2012, update of the HCRIS files that was obtained from HHS for another study.

1. Analyses using the 2008 cost report data:

The 2008 file contained 1,233 hospitals that reported that they had residents in an approved program during the cost reporting period falling mostly in 2008 (31 cost reports mostly covered 2007). Of these, 1,158 reported both a count for residents in the facility on Worksheet S-3 and GME costs on Worksheet B. We eliminated 17 hospitals with direct GME costs that were plus or minus three standard deviations from the geometric mean cost per resident. Most hospitals with outlier GME costs had fewer than ten residents, but two hospitals with substantial residency programs were eliminated as low-cost outliers: 46-3301, Primary Children's Medical Center, with 116 residents, and 450289, Harris County Hospital District, with 525 residents. The file for analysis of 2008 GME costs contained 1,141 hospitals. For the analysis of per resident amounts and payments, we also eliminated 38 hospitals that had reported GME costs but did not receive DGME payments based on a current-year resident. Further investigation is needed to understand the reasons for the inconsistency between the facility-reported resident counts and costs and the counts for direct GME payment purposes. Those that incurred costs but received no DGME funds may have been disadvantaged by the cap on resident positions, while those that reported no residents or costs but received DGME funds may have benefited from the rolling average count used to determine DGME payments.

Other variables describing hospital characteristics were added to the file, as follows:

- We obtained the ownership variable from a file available on the CMS website listing the status of cost report filings.
- We used the PPS impact file for FY 2010 supplemented by the Provider of Service file to classify hospitals into three geographic locations: large urban, other urban, and rural. (The cost report file only contained an urban/rural category).
- We used the AHA survey to determine a hospital's academic affiliations. These categories are not mutually exclusive.

Derived variables pertaining to hospital categories were determined as follows:

- Program size was based on the number of reported residents in the facility (from Worksheet S-3).
- The percentage of primary care residents was determined as the percentage of weighted residents in primary care programs (defined consistent with the Medicare PRA differential as residents in family medicine, general internal medicine, general pediatrics,

preventive medicine, geriatric medicine, osteopathic general practice, and obstetrics/gynecology) to the total weighted residents in primary care and other specialty allopathic/osteopathic programs (i.e., exclusive of residents in podiatric and dental programs). By definition, primary care residents are more likely to be in their initial residency period than non–primary care residents. Because residents in non–primary care specialty programs are more likely to be weighted at 0.5 FTE (including primary care residents who enter fellowship programs), using a weighted count overstates primary care as a percentage as a percentage of total residents.

- Status under cap is a comparison of the hospital's unweighted GME allopathic and osteopathic resident count cap with the total number of residents reported, based on the 1996 cap adjusted for new programs and the reallocation of residency slots. In the 2008 cost reports, there were 44 hospitals with only dental or podiatric residency programs and 26 hospitals with GME costs that did not report a current year resident count on Worksheet E-3, Part IV.
- Medicare utilization was defined consistent with Medicare's share for purposes of determining DGME payments ([Medicare fee-for-service + managed care days]/total inpatient days).

The comparison of 2008 GME costs and payments included the 1,103 hospitals that reported both GME costs and a 2008 resident count for purposes of DGME payments. Except where noted, the resident counts are taken from Worksheet E-3, Part IV, CMS-2552-1996.

2. The file for cost reporting periods beginning on or after May 1, 2010, included 218 cost reports beginning in FY 2010 (mainly beginning on July 1, 2010) and 936 cost reports beginning in FY 2011 (beginning on or after October 1, 2011). We used FY 2010/2011 reports to supplement the analyses using the 2008 cost reports.
    a. Resident time spent in nonhospital settings: The data for these analyses were first collected for the revised cost reports. The data are on the Worksheet S-2, lines 64–67.
    b. Impact of the Medicare FTE limits: The data on current resident counts and on the FY 1996 limits and adjustments are on the revised Worksheet E-3, Part 4. The analysis excluded 57 hospitals that did not report having any residents during the cost reporting period.
    c. Comparison of aggregate GME payments and costs: This analysis included only hospitals that reported both GME costs and resident counts for the cost reporting period. We excluded 42 hospitals in this analysis that reported no GME costs, 26 of which had residents in the current year. We also excluded another 41 hospitals that reported GME costs but no current-year residents in approved training programs. Most hospitals with no current-year residents received funding through the rolling average; two had only residents in unapproved training programs.

Step 1. We computed for each hospital a weighted average PRA based on aggregate payments for DGME divided by the weighted sum of primary care and other residents. Any payments made under the Medicare Modernization Act (MMA) and the related residents were included in the calculation.

Step 2. We defined the total number of residents as the sum of the unweighted allopathic resident count plus the number of dental and podiatric residents reported.

Step 3. *Aggregate GME payment amounts based on total resident count* = Step 1 PRA x total number of residents in Step 2.

Step 4. *Aggregate GME payment amounts after weighting* = Step 1 PRA x (sum of uncapped weighted MD/DO resident counts + dental and podiatric weighted resident counts).

Step 5. *Aggregate GME payment amounts after cap* = Step 1 PRA x (sum of capped weighted DO/MD for the current year + estimate of residents paid under the MMA).

Step 6. *Aggregate payment amounts after rolling average* = Step 1 PRA x (sum of adjusted rolling average weighted primary care [PC] and nonprimary counts + estimate of residents paid under the MMA).

Step 7. *Medicare share* = Step 6 X Medicare share (including managed care [MC] days).

IME Payments

We estimated the FY 2010 IME payments by simulating payments under both fee-for-service and managed care using the PPS impact file. The resident counts used in the analysis were for the number of residents counted for IME purposes. The hospital characteristics were also taken from the PPS impact file so that Medicare share for this analysis is the proportion of discharges rather than days. We used the impact file instead of the cost report file in order to show differences by case mix index.

Appendix B. Faculty-to-Resident Ratios and Time Spent in GME-Related Activities

This appendix contains information related to attending physicians and time spent in resident-related activities. Estimating the costs of faculty engagement in GME activities is challenging because there is not a single data source that collects specialty-specific information on faculty compensation per resident.

- Table B.1 compiles information from ACGME accreditation data, FREIDA Online data, and MGMA survey data. It demonstrates the differences in the measure of faculty-to-resident ratios generated from the different data sources, which in turn affect any estimates of financial impact per resident.
- Table B.2 provides the RRC requirements for the selected study specialties and was used to generate the minimum core faculty-to-resident ratios and inform how GME costs might differ across the programs.
- Table B.3 provides the ratio of academic physician to private practice physician billings and was used to estimate the teaching effect on academic physician clinical billings for the study specialties.
- Table B.4 compares MGMA data on academic physician compensation and private physician compensation that were used to inform the discussion of the physician recruitment and retention benefits of teaching programs.

Table B.1 compiles information from ACGME accreditation data, FREIDA Online data, and MGMA survey data. For faculty-to-resident ratios, we report three different measures because we received mixed opinions in our interviews regarding the relative merits of the alternative measures. The AMA's FREIDA Online faculty-to-resident ratios are based on FTE faculty counts and are available for both specialty and subspecialty programs. Several interviewees noted that the FREIDA Online ratios seem high and suggested that they might include medical school didactic teaching time, as well as time spent with residents.

We used the ACGME data to calculate the ratio of the average number of core faculty to the average number of residents in each of the specialty programs for which the AGME data are reported. *Core faculty* is defined as the program director and faculty devoting at least 15 hours per week to resident education and administration and does not include faculty primarily involved in clinical supervision of resident activities. We constructed a third measure based on the minimum number of faculty needed to meet RRC program requirements.[21] The minimum

[21] The general IM programs are more difficult than the other programs to estimate because no minimum time is required for the subspecialty coordinators, and they can also be core clinical faculty. Following the approach taken in an earlier study (Ziedel, 2005), we included in our estimate for the average program six subspecialty coordinators at 0.2 FTE, along with the required administrative faculty (one program director and two assistant program

ratios are considerably below either of the other two measures. Several interviewees indicated that the RRC-based faculty-to-resident ratios do not reflect the level of faculty commitment needed to provide a rich educational experience and meet the general ACGME requirement that "a program must provide appropriate supervision of residents in patient care activities" (ACGME, 2007a). However, there may be considerable variation across specialties in the extent to which this measure is an underestimate, as other interviewees indicated that the FM programs rarely exceed the required faculty-to-resident ratios and often do so by using volunteer faculty who would not be included in either the FREIDA count or the ACGME core faculty count.

We report the MGMA survey data on the median total compensation for each specialty. Under the rows for percentage of time spent in administration and teaching, we report the proportion of faculty time spent on teaching and "other," according to MGMA and ACGME survey data. The MGMA reports the distribution of faculty time individually for specialty and subspecialty programs for four activities: clinical, teaching, research, and other. The MGMA's categorization of teaching approximates Medicare's definition of direct GME costs by defining clinical time as billable clinical activity and, therefore, classifies time spent furnishing patient care in the presence of residents as clinical rather than teaching time, but the survey has other limitations. The MGMA surveys the clinical departments of medical schools and is not restricted to faculty engaged in resident training. Teaching time may include medical student educational activities, and, relative to community-based hospital programs, more time is likely to be spent on research. Also, instead of a specific category for administration, the MGMA survey uses a catchall "other" category that may encompass activities that are not defined as GME costs, such as participation on hospital quality assurance committees.

directors) and core faculty (four at 0.3 FTE each). The low resident-to-faculty ratio reflects the economies of scale in the RRC-IM requirements. Additional core faculty would be required if the program size exceeded 59 residents.

Table B.1. Estimates of Faculty Time and Compensation for Teaching and Administration Using Various Measures for Faculty Time

	General Internal Medicine	Cardiology	Family Medicine	Dermatology	General Surgery	Urology	Radiation Oncology
Average number of residents per program[1]							
Mean	59.9	13.6	21.6	10.3	29.9	8.8	7.3
Faculty-to-resident ratio							
FREIDA Online FTE ratio[2]	1.6	1.9	0.6	1.2	1.1	1.4	1.6
ACGME core faculty ratio[3]	0.22	0.22	0.43	0.57	1.1	1.63	0.65
RRC-based minimum ratio[4]	0.06	0.16	0.21	0.33	0.21	0.51	0.53
MGMA total compensation[5]							
Median ($)	172,872	256,908	163,319	258,132	284,698	311,057	336,136
% time spent in teaching and administration							
MGMA (%)[6]	31	25	38	32	22	26	25
ACGME (%)[7]	47	47	28	23	28	23	19

[1] ACGME Data Resource Book Academic Year 2010–2011. Average program size calculated for general IM, cardiology, and general surgery.
[2] AMA, 2011.
[3] ACGME, 2011. Calculated as the ratio of the FTE core faculty to average program size. The FTE core faculty count was derived by multiplying the average number of core faculty reported for the program by the ratio of the total hours worked by the core faculty to the hours worked by the program director. The estimates for IM and general surgery are calculated based on the IM and surgery faculty and residents.
[4] Estimated as the minimum faculty required to meet RRC requirements for the average program size. RAND derived estimates based on RRC requirements (see ACGME, 2007b–d and 2009a–e).
[5] MGMA, 2011. Compensation for FM is based on non-OB faculty compensation; compensation for cardiology is based on compensation for noninvasive cardiology faculty.
[6] Calculated as the percentage of time spent in teaching and "other" activities reported in MGMA (2011). The percentages of all activities were scaled so that the sum equaled 100 percent.
[7] Calculated as the ratio of average hours per week reported by core faculty (including the program director) for administration and teaching to the total average hours reported by core faculty.

Table B.2. Summary of RRC Requirements for Faculty Administrative and Teaching Activities for Selected Specialties

RRC	Administrative Faculty	Clinical/Core Faculty
Internal medicine (ACGME, 2009a)	Program director (PD) and assistant directors (ADs): at least 20 hours per week; AD-to-resident ratio based on program size: 1: 24–40 residents; 2: 41–79; 3: 80–119; 4: 120–159; and 5 for >159 residents.	At least 15 hours per week devoted to the residency program. Minimum of 4 core faculty for <60 residents; 1 added for each 1–15 additional residents; specialty education coordinators in 11 IM subspecialties. Core faculty may also serve as subspecialty education coordinators.
Cardiology (ACGME, 2007b; 2009a)	PD: an average of 20 hours per week	At least 2 key clinicians (in addition to the PD) who devote at least 10 hours. If more than 5 fellows, 1:1.5 ratio
Family medicine (ACGME, 2007d)	Full-time PD (defined as at least 1,400 hours exclusive of time spent in nonteaching direct patient care)	1 FTE (at least 1,400 hours) per 6 residents, with a minimum of 2 (excluding the PD); at least 1 supervising physician per 4 residents in continuity clinic
Dermatology (ACGME, 2007c)	Full-time PD	Faculty-to-resident ratio of 1:3 is desirable. Minimum of 2 geographically close full-time members of the clinical faculty (including the PD)
General surgery (ACGME, 2009d)	PD: At least 30 percent protected time	1 FTE faculty for each chief resident (in addition to the PD)[1]
Urology (ACGME, 2009e)	Single PD (no hours specified)	At least 2 clinical urology faculty in addition to the PD. A faculty-to-resident ratio of at least 1:2 (including the PD) is required.
Radiation oncology (ACGME, 2009c)	Single PD (no hours specified)	Minimum of 4 FTE faculty devoting their professional time to teaching clinical radiation oncology

[1] Fifth-year general surgery residents are called chief residents.

Table B.3. Teaching Effect on Academic Physician Clinical Billings

Specialty	Ratio of Academic Physician Billings at 100% Clinical Activity to Private Practice Physicians
Internal medicine: General	0.99
Cardiology: Noninvasive	0.97
Family medicine (without OB)	0.97
Dermatology	0.91
Surgery: General	1.17
Urology	1.24
Radiation oncology	1.04

SOURCE: RAND-derived ratios from MGMA (2011).

Table B.4. Comparison of Compensation for Private and Academic Practices and Estimated Impact per Resident on Faculty Compensation Costs

	MGMA Compensation Data[1]	
Specialty	Private practice	Academic practice
Internal medicine: General	$197,080	$172,872
Cardiology	$421,377	$256,908
Family practice (w/o OB)	$183,999	$163,785
Dermatology	$385,088	$258,132
General surgery	$336,084	$284,698
Urology	$390,678	$311,057
Radiation oncology	$518,991	$336,136

[1] MGMA, 2011. Compensation for physicians in private practice includes both employed physicians and partners so that the compensation levels are not directly comparable and the differential is overstated. Compensation for noninvasive cardiology is shown.

Appendix C. Analyses of California OSHPD Data

This appendix contains information on the methods and results from our exploratory analyses investigating the indirect teaching effects using publicly available inpatient hospital data and financial data from California's Office of Statewide Health Planning and Development (OSHPD) for all nonfederal short-term general hospitals in the state of California during 2009. These data had several advantages: The administrative data for hospital discharges is for all payers; payment-to-cost ratios for both inpatient and outpatient services can be computed by payer from the financial data; and the financial data have more detailed information on physician compensation and resident compensation and activities than is available in the Medicare cost reports. To perform these analyses, we classified hospitals into three categories: members of the Council of Teaching Hospitals (COTH), community teaching hospitals (based on the presence of residents but no membership in COTH), or nonteaching hospitals. Where appropriate, hospitals were further divided based on whether they had residents in one of the specialties of interest in the study. The distribution of hospitals, programs, and residents is shown in Table C.1.

Table C.1. Summary of California Hospitals by Teaching Status, Residency Programs, and FTE Residents Reported in 2009 OSHPD Data

Teaching Status	Internal Medicine	Cardiology	Family/ General Medicine	Dermatology	General Surgery	Urology	Radiation Oncology
COTH N=20							
Programs	20	13	13	12	20	11	6
Residents	1,073	105.3	278.0	71.5	504[1]	62.1	19.0
Non-COTH teaching N=64							
Programs	18	3	42	4	27	13	0
Residents	238.3	25.5	704.8	7.2	138.3	15.0	0
Total teaching N=84							
Programs	36	16	55	16	45	24	6
Residents	1,311.3	130.7	982.8	78.7	642.7	77.1	19
Nonteaching N=246							

[1] The total does not include two hospitals (Loma Linda and Scripps Green) that have general surgery residency programs but did not report an FTE count for general surgery residents.

Impact on Inpatient Hospital Costs of Different Specialty Programs

We used multivariate regression analysis to examine whether having a particular type of residency program affected cost per discharge after controlling for having a teaching program.

We derived an overall inpatient cost-to-charge ratio for each hospital from the OSHPD financial data and applied it to the charges for the relevant hospital discharges to estimate an average cost per discharge for each of the selected sets of stays. We performed hospital-level multivariate regressions using the log of each hospital's estimated cost per discharge for the specialty program as the dependent variable. For each set of discharges, our explanatory variables included a geographic adjustment factor, the average Medicare-severity diagnosis-related group (MS-DRG) relative weight, the ratio of low-income days to total inpatient days (defined as the proportion of days in the selected discharges attributable to Medicaid, indigent care, and self-pay patients), and dummy variables for teaching status (COTH, non-COTH teaching, and nonteaching) and whether the hospital had a residency program in the specialty.[22]

There are several limitations to our analysis. First, we are only able to measure the average costs for all patients within a given diagnostic category and were not able to separately examine costs for teaching and nonteaching patients treated at the same hospital. Second, other than categorizing teaching hospitals by COTH and non-COTH status, we did not control for the presence of other residency programs that might affect the hospital's infrastructure and costs or for teaching intensity in the particular specialty (e.g., ratio of residents to average daily census). Third, we used an overall cost-to-charge ratio to estimate costs. We did not have the data to estimate costs on a departmental basis. Finally, we used the Medicare relative weights to account for case mix variation, which may not appropriately measure cost differences applicable to the non-Medicare population.

The primary care discharges were defined as a principal diagnosis included in the top 100 most common family medicine diagnoses, as identified by the American Academy of Family Physicians (AAFP, 2011). General surgery discharges were those in which the principal procedure was included in the ACGME's defined category for this residency program. The list is available at http://www.acgme.org/acgmeweb/tabid/377/ProgramandInstitutionalGuidelines/SurgicalAccreditation/Surgery/CaseLoginformation.aspx (ACGME, 2013). Urology discharges were defined by the International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) principal procedure as involving operations on the urinary system or male genital organs. Operations on the female genital organs were excluded due to gynecologists, particularly urogynecologists, also performing these procedures. Cardiology discharges were defined by ICD-9-CM principal diagnoses classified as diseases and disorders of the circulatory system. Radiation oncology was excluded because most services, other than palliative radiation, are provided to outpatients. Similarly, dermatology was excluded because

[22] We also ran regressions that included a variable for research intensity (percentage of costs reported for research). The research variable was not significant.

most services are outpatient services, and admissions for dermatologic conditions are typically handled by internal medicine.

Our regressions separately examined the costs of COTH members, other teaching hospitals, and nonteaching hospitals for discharges in the selected disciplines.

- Except for urology discharges, discharges from COTH hospitals were significantly more costly than discharges from nonteaching hospitals. The difference ranged from 6.3 percent for general surgery discharges to 14.1 percent for cardiology discharges. The costs for urology discharges from COTH hospitals were not significantly different from the costs for discharges from nonteaching hospitals.
- Cardiology discharges from non-COTH teaching hospitals were 4.7 percent more costly than discharges from nonteaching hospitals. The costs for other discharges from non-COTH teaching hospitals were not significantly different from the costs for discharges from nonteaching hospitals.
- Having residents in primary care and cardiology did not significantly affect the costs of discharges assigned to those specialty programs after controlling for teaching status. However, the costs for discharges assigned to the other residency programs were significantly more costly when there was a residency program in the particular specialty than when there was not. Specifically, having a residency program increased cost per discharge 8.3 percent for general surgery and 15.8 percent for urology after accounting for teaching status. Overall, urology discharges are not on average more costly in teaching hospitals than in nonteaching hospitals, but they are more costly in teaching hospitals with urology programs than in other hospitals.

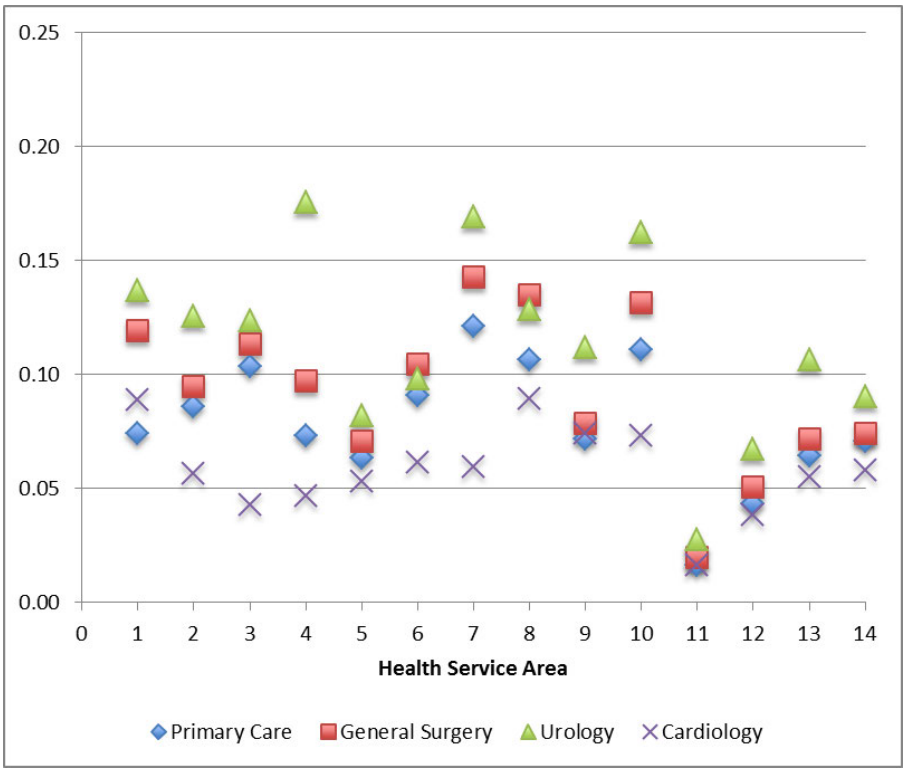
Impact on Market Share

We also used the OSHPD data to examine the indirect effects of teaching programs on market share and explore whether it differs by specialty program. We used OSHPD's 14 health service areas (HSAs) to define the market area for both inpatient and outpatient services.[23] We calculated a Herfindahl Index (HI) for each HSA in the four inpatient specialties of interest, defining market share(s) as the ratio of a hospital's number of discharges in that specialty to the total number of discharges in that specialty among all hospitals in the HSA, using the standard formula $HI = \sum_{i=1}^{N} s^2$, in which HI ranges from 0 (perfect competition) to 1 (absolute monopoly). The U.S. Department of Justice and Federal Trade Commission consider a market with an HI value below 0.15 to be an unconcentrated market and one below 0.25 to be only moderately concentrated (U.S. Department of Justice and Federal Trade Commission, 2010).As shown in Figure C.1, California's HSAs are unconcentrated in each of the four specialties, with the exception of HSAs 4, 7, and 10, which are moderately concentrated with respect to urology services. This is an indication that the market areas are quite competitive in the service lines of

[23] These HSAs should not be confused with the hospital service areas as defined in the Dartmouth Atlas of Health Care that are also sometimes referred to as HSAs in health policy publications. Notably, the OSHPD HSAs are larger than the Dartmouth areas. All HSAs have one or more teaching hospitals.

interest and that a hospital operating a GME program is not exerting monopoly pressure on payers.

Figure C.1. Herfindahl Indexes by HSA for Inpatient Discharges in Study Specialties



SOURCE: RAND analysis of OSHPD utilization data.

In addition to finding that teaching hospitals are not dominating their markets for inpatients with the selected conditions, we found no statistically significant differences in inpatient market share between types of teaching hospitals, both with and without the relevant residency programs of interest. In terms of outpatient market share, we found that COTH members command a far larger portion of the market for on-campus primary care than nonteaching hospitals. Hospital teaching status does not have a statistically significant effect on market share for the other outpatient services that we examined.

Appendix D. Medicaid 2009 GME Payments

This appendix examines variation in Medicaid GME payments as a percentage of inpatient hospital payments and on a per resident basis. The Medicare payment information is from Henderson (2010). The number of residents is from Brotherton and Etzel (2009). We derived the GME payment per resident using these two sources.

Table D.1. State-Level Estimates of Medicaid 2009 GME Payments in the Aggregate, as a Percentage of Inpatient Hospital Payments, and on a per Resident Basis

State	Medicaid GME Payments *Dollars in Millions*[1]	GME Payments as % of Inpatient Hospital Payments[1]	Number of Residents [2]	GME Payment per Resident
Alabama	**	**	**	**
Alaska	$0.5	<0.1	36	$ 13,889
Arizona	$42.4	Unreported	1,336	$ 31,737
Arkansas	$11.0	Unreported	695	$ 15,827
California	$187.3	5.0	9,284	$ 20,174
Colorado	$5.1	Unreported	1,147	$ 4,446
Connecticut	$14.6	4.6	2,025	$ 7,210
Delaware	$3.0	4.6	245	$ 12,367
D.C.	$59.6	16.5	1,767	$ 33,729
Florida	$145.2	Unreported	3,279	$ 44,282
Georgia	$89.6	Unreported	1,998	$ 44,845
Hawaii	$0.9	<0.1	400	$ 2,175
Idaho	$1.2	<0.1	50	$ 24,000
Illinois	*	*	5,745	0
Indiana	$27.6	4.2	1,318	$ 20,941
Iowa	$26.7	9.0	811	$ 32,922
Kansas	$20.0	4.5	687	$ 29,112
Kentucky	$36.5	4.0	1,071	$ 34,080
Louisiana	$42.3	4.2	1,681	$ 25,164
Maine	$4.1	1.8	296	$ 13,851
Maryland	$40.5	6.0	2,457	$ 16,484
Massachusetts	*	*	5,181	0
Michigan	$169.0	7.8	4,514	$ 37,439
Minnesota	$154.6	Unreported	2,143	$ 72,142
Mississippi	$30.9	2.8	486	$ 63,580
Missouri	$115.3	22.0	2,530	$ 45,573

Montana	*	*	19	0
Nebraska	$14.8	7.8	658	$ 22,492
Nevada	$3.3	<0.01	249	$ 13,253
New Hampshire	$4.4	6.9	376	$ 11,702
New Jersey	$110.5	Unreported	2,699	$ 40,941
New Mexico	$7.8	2.0	521	$ 14,971
New York	$1,525.0	20.0	15,584	$ 97,857
North Carolina	$99.1	10.5	2,862	$ 34,626
North Dakota	*	*	112	0
Ohio	$69.4	Unreported	5,318	$ 13,050
Oklahoma	$106.5	6.25	740	$ 143,919
Oregon	$57.9	Unreported	776	$ 74,613
Pennsylvania	$81.9	7.9	7,242	$ 11,309
Rhode Island	*	*	754	0
South Carolina	$87.0	11.0	1,109	$ 78,449
South Dakota	$3.7	3.2	95	$ 38,947
Tennessee	$48.0	Unreported	2,075	$ 23,133
Texas	*	*	6,846	0
Utah	$40.0	12.8	667	$ 59,970
Vermont	*	*	267	0
Virginia	$125.9	16.4	1,981	$ 63,554
Washington	$112.1	Unreported	1,703	$ 65,825
West Virginia	$11.7	4.0	625	$ 18,720
Wisconsin	$40.1	Unreported	1,698	$ 23,616
Wyoming	*	*	40	0
TOTALS	$3,780	6.6%	106,198	$ 35,594

* These states do not pay for GME.

** Alabama did not respond to the survey. There are 1,233 ACGME-accredited resident physicians in the state.

[1] Henderson, 2010.

[2] Brotherton and Etzel, 2009.

NOTE: D.C. = District of Columbia.

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