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NET FINANCIAL IMPACT OF GRADUATE MEDICAL EDUCATION IN ROCHESTER, NY

Prepared for:
University of Rochester Medical Center

Kent Gardner, PhD.
Project Director

One South Washington Street
Suite 400
Rochester, NY 14614-1125
Phone: (585) 325-6360
Fax: (585) 325-2612

White Plains Office Park
707 Westchester Ave Suite 213
White Plains, NY 10604
Phone: (914) 946-1599
Fax: (914) 948-3671

100 State Street
Suite 930
Albany, NY 12207
Phone: (518) 432-9428
Fax: (518) 432-9489

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SUMMARY

The rising cost of medical care has caused some New Yorkers to question the level of financial support provided for graduate medical education (GME) and the process for negotiating this support. Misguided Money, a 1998 publication of the NYS Business Council's Public Policy Institute (PPI) notes that NYS educates 15.1% of the nation's physicians (about 15,000 residents) despite having less than 7% of the nation's population. PPI questions whether GME spending by NYS (through Medicaid) and private firms (through surcharges on health insurance plans) amounts to a subsidy of other states by New York taxpayers.

Similar concerns are expressed in Rochester, although Rochester's share of the state's residency programs is more in line with its population share. As of 1997-98, Rochester hospitals were educating 700 of the state's medical residents, about 4.4% of the state total. This is slightly less than the Rochester metro area's 5.8% share of the NYS population.

In this report, CGR studies medical education in Rochester and finds that graduate medical education makes a significant and positive net contribution to the regional economy. Although local government and employers (through their health plans) support graduate medical education in the Rochester area, there is also a tremendous amount of money supporting GME from the state and federal governments. *The elimination of graduate medical education would cost Rochester an estimated $34 million in net reimbursement and would require an additional $15 million to $43 million in added patient care costs (based on a range of assumptions).* Rather than being a drain on New York's regional economies, medical education may instead be a net contributor—both by attracting outside financial support and

by mobilizing a highly skilled but modestly-compensated labor force to care for the community's health needs.

Rochester benefits from graduate medical education in four ways:

- GME receives substantial financial support from non-Rochester payers, particularly the federal and state governments.

- Rochester's health care providers benefit from the substantial contribution made to patient care by medical residents, at low cost.

- HCFA and MedPAC analysis confirms that teaching hospitals—particularly academic medical centers such as URMC—treat patients with more serious illnesses than hospitals without a teaching program. Rochester residents have access to care for serious conditions that would otherwise be left untreated or would have to be treated in another community.

- Rochester's large GME program is an integral part of the University of Rochester's medical school and biomedical research program. These activities stimulate the local economy in numerous ways, attracting research funding plus highly skilled and well-paid new community members.

Graduate Medical Education makes an important contribution to health care in the United States, New York State and Rochester. Ongoing debate in Washington and Albany will likely have a substantial impact on GME funding streams, but under the present system of reimbursement the financial benefits of GME to a community the size of Rochester are undeniable.

Contributing Staff

Sarah Boyce, Senior Research Associate

Clifford Milligan, Senior Research Associate

TABLE OF CONTENTS

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GRADUATE MEDICAL EDUCATION: ASSET OR LIABILITY FOR ROCHESTER'S ECONOMY?

The rising cost of medical care has caused some New Yorkers to question the level of financial support provided for graduate medical education (GME) and the process for negotiating this support. *Misguided Money*, a 1998 publication of the NYS Business Council's Public Policy Institute (PPI) notes that NYS educates 15.1% of the nation's physicians (about 15,000 residents) despite having less than 7% of the nation's population. PPI questions whether GME spending by NYS (through Medicaid) and private firms (through surcharges on health insurance plans) amounts to a subsidy of other states by New York taxpayers.[1]

Similar concerns are expressed in Rochester, although Rochester's share of the state's residency programs is more in line with its population share. As of 1997-98, Rochester hospitals were educating 700 of the state's medical residents, about 4.4% of the state total. This is slightly less than the Rochester metro area's 5.8% share of the NYS population.[2]

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[1] The financing mechanism developed as part of the Health Care Reform Act of 1996 supports a range of "public goods"—not just graduate medical education, but health care for the uninsured and a number of other worthy activities—through a surcharge on health care premiums. While health care for the uninsured, for example, is acknowledged by most to be worthy of support, the business community argues that the cost of such programs would be better financed through general tax revenues instead of a dedicated "tax" on purchasers of health insurance. Unfortunately typical of NYS public finance, this financing arrangement diffuses accountability and muddles the debate over support for public goods.

[2] While the number of medical residents in Rochester has risen to 713, the NYS Department of Health was unable to provide more recent statistics for the rest of the state.

and federal governments. ***The elimination of graduate medical education would cost Rochester an estimated $34 million in net reimbursement and would require an additional $15 million to $43 million in added patient care costs (based on a range of assumptions).*** Rather than being a drain on New York's regional economies, medical education may instead be a net contributor—both by attracting outside financial support and by mobilizing a highly skilled but modestly-compensated labor force to care for the community's health needs.

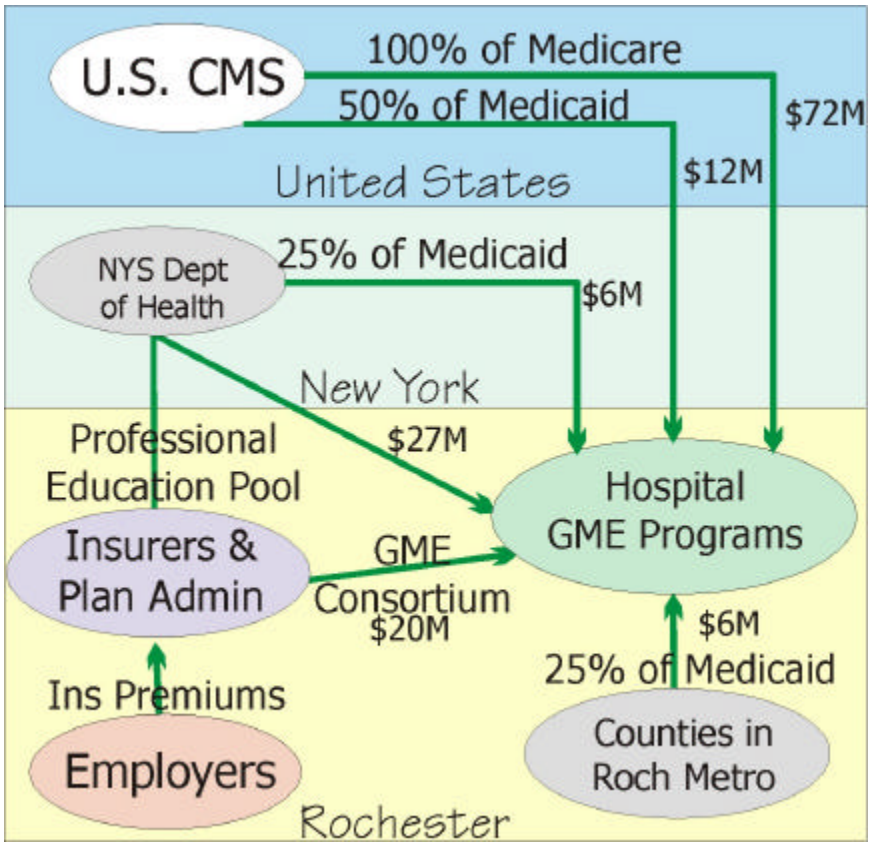
The report is presented in three parts. First, we explain the complex mechanism by which GME funding is collected and distributed. Second, we enumerate the benefits and costs of maintaining a residency program in Rochester. Finally, we explore the cost of substituting other health care professionals for Rochester's medical residents.

FUNDING GRADUATE MEDICAL EDUCATION

Source of funding for GME include the local, state and federal governments plus private insurers (thus private business):

- The federal government supports GME through Medicare and the federal portion of Medicaid;
- New York State supports GME through its support of Medicaid, and other publicly funded programs;
- Finally, commercial insurers support GME through payments to the Professional Education Pool passed into law in the Health Care Reform Act of 1996 (HCRA) and amended in 1999. Insurers make additional payments to teaching hospitals according to an agreement negotiated between the payers and the residency programs.[3]

[3] The flow chart below does not include several smaller flows.



Federal Support Through Medicare

Medicare is a health insurance program for people over the age of 65, some disabled persons under 65 years of age and individuals with End Stage Renal Disease. The original 1965 Medicare legislation explicitly allowed for the reimbursement of teaching hospitals for the cost of physician training programs.

In accordance with this provision, cost reimbursement limits under Medicare introduced in the 1970s excluded education and training costs, permitting full reimbursement of the direct cost of physician training. Health Care Financing Administration (HCFA) analyses of cost data showed, however, that hospitals with more residents also had higher patient care expenditures that could not be directly attributed to medical education. Reimbursement limits imposed by Medicare on patient care expenses were placing a disproportionate financial burden on teaching hospitals. In response, HCFA introduced compensating payments to teaching hospitals to cover these "indirect" costs. Congress codified this practice in 1982 and 1983, as part of legislation introducing a prospective payment system (PPS) based on diagnosis-related

groups (or DRGs). While many refinements have been made over the years, this system remains in place today.

Direct Medical Education or DME Payments

The "direct" cost of medical education is paid to hospitals in the form of prospective "Direct Medical Education" or DME payments. These payments are based on (1) hospital-specific training expenditures per resident as reported by the hospital in 1984 (trended forward to the present)[4], (2) the number of residents in a hospital and (3) Medicare's share of the hospital's inpatient days.[5]

Indirect Medical Education or IME Payments

The "indirect" costs associated with teaching hospitals are paid through "Indirect Medical Education" or IME payments. Unlike the DME payments, the rate of IME reimbursement is the same for all hospitals and is based on a hospital's resident-to-bed ratio.[6]

The DRG mechanism pays hospitals a fixed fee per discharge based on the specific diagnosis of the patient's condition. IME payments are proportional to the DRG payments. Currently, DRG payments increase by 6.25% for every 10% increase in the ratio of residents to beds.[7]

IME support for teaching hospitals is based on the empirical observation that per unit costs that are not directly attributable to medical education are higher in teaching hospitals. While some suggest that it is the teaching program that drives this differential in indirect costs (residents order more tests, etc), the Medicare Payment Advisory Commission (MedPAC) and others assert that America's teaching hospitals treat a disproportionate share of the

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[4] Costs allocated to DME include residents' salaries and benefits, faculty salaries and benefits, administration of residency programs and institutional overhead directed at educational programs.

[5] The Balanced Budget Act of 1996 (BBA) placed limits on the number of residents a hospital could count for GME payment purposes, however, reflecting a concern that hospitals were being inappropriately encouraged to expand the number of physicians being trained. DME payments were also adjusted to encourage hospitals to expand training of primary care and selected other specialties.

[6] AMA, 2000.

[7] The BBA reduced the IME payment percentage in increments from 7.7% and capped the number of residents for IME purposes. Amended by the 1999 Balanced Budget Refinement Act, the last step in this phased reduction will occur in October 2002 when the increment drops to 5.5%.

most critically ill patients. As DRG payments are based on *average* cases, these do not accurately reflect the actual difference in severity of illness within teaching hospitals.[8] The IME payments, therefore, make up for a deficiency in the DRGs' ability to adjust reimbursement to the cost of treating a particular diagnosis in this particular setting.

Do the Payments Accurately Reflect the True Cost Differential?

The decision of Congress in the Balanced Budget Act of 1997 (BBA) to reduce IME payments reflected a belief that the true cost differential between teaching and non-teaching hospitals was less than the historic IME differential. MedPAC analyses conclude that the true cost differential is about 3.2% for every 10% increase in the resident to bed ratio, about 2.3 percentage points less than the current rate of payment (5.5%). MedPAC has recommended eliminating separate DME and IME payments in favor of a more accurate system of prospective payments. This would be coupled with a single DRG adjustment (similar to the IME percentage) aimed at compensating teaching hospitals for providing a setting in which more complex patient care can be provided.

Reforming Support for GME

MedPac's recommendation acknowledges what many have said for a very long time: The IME component of GME support (and this applies to the use of IME-type support from sources other than Medicare) is not tied to clearly identified and well-understood costs of graduate medical education. While the differential in cost between teaching hospitals and other hospitals is acknowledged by most to be driven by a difference in mission, the IME payment mechanism making up this difference has a large component that appears to be arbitrary, particularly as the cost basis on which payments are made is driven by a fixed date in the past, trended forward on the basis of general changes in medical costs. As the practice of medical care and the economic structure of hospitals and other health care institutions has been evolving rapidly, the practice of tying IME payments to an arbitrary date from the 1980s is hard to defend.

MedPac argues that the IME payments are generally making up for the deficiencies embedded in the current DRG system of payments. This assertion applies equally to every payer from

[8] MedPAC, 1999; Nicholson, 1999.

Medicare through private insurers. Payments through the IME vehicle continue with only modest annual adjustments because the entire health care system adjusts to the *status quo*, whatever that may be at any point in time. A radical adjustment to a major funding mechanism would create major dislocations in nearly every major institution.

Medicaid

Often confused with Medicare, Medicaid is a publicly funded program providing health care for the poor. While Medicare is a wholly federal program, Medicaid is paid for and administered jointly by the federal government and the states. Unlike most states, New York shifts up to half of the state cost of Medicaid to 57 counties and New York City.

State support for graduate medical education through Medicaid is voluntary, although nearly all states with medical schools do support GME through their fee-for-service Medicaid programs and 33 states support GME in their capitated Medicaid programs.[9]

GME Support in NYS

Changes in New York's support of GME date from passage of the 1996 Health Care Reform Act (HCRA). Prior to HCRA, hospital reimbursement for fee-for-service medical care was regulated directly by the NYS Department of Health based on individual facility cost reports. Support for GME was embedded in these rates and totaled $1.8 billion. HCRA restructured GME support and reduced total GME spending.[10] Under the original HCRA legislation, state support for GME through Medicaid and other state programs totaled $841 million.[11] HCRA also established a third party payer fund of $544 million known as the Professional Education Pool (reduced to $494 million in HCRA 1999). The Professional Education Pool was structured to guarantee teaching hospitals 56% of the financial support provided by private payers before HCRA. The remaining 44% was left to negotiations between teaching hospitals and regional health care stakeholders.

NYS Medicaid

Medicaid hospital payments incorporate support for GME in much the same way as Medicare. DME payments by Medicaid to

[9] U.S. DHHS, COGME, 2000.

[10] Burke, 1999.

[11] This constitutes about one third of total state Medicaid support for GME nationally.

teaching hospitals are based on a 1981 base year (instead of the 1984 base year used by the federal government).[12] The direct cost per discharge in 1981 (trended forward) is added to the DRG. In the case of Strong Memorial Hospital (SMH), this "add-on" to the DRG is $322. The case mix index (CMI) adjusts the DRG (and, therefore, the DME payment) for the severity of the cases served.

The Medicaid case mix index for SMH is 2.4 (for comparison purposes this is roughly twice the CMI for Highland Hospital). The average Medicaid DME payment for Strong Memorial, therefore, is $322 multiplied by 2.4, or $780.

IME payments provide teaching hospitals with a premium over the DRG rate of 7.65% for each 10% increase in the resident-to-bed ratio.[13] Also treated as an add-on to the DRG, the IME rate for Strong Memorial is $1,084. The case-mix adjusted average IME payment per DRG, then, is $2,630.

Medicaid GME support is split among the federal, state and county governments. Half of the cost of acute care under Medicaid is paid by the federal government; New York State and the counties share the remainder equally. The GME payment received by hospitals is determined by the number and severity of inpatient Medicaid discharges by hospital and historic resident intensity.

NYS Professional Education Pool

The Professional Education Pool (PEP) is funded through surcharges paid by health care insurers and self-insured funds. The surcharges can be paid either as a percentage of all payments for hospital inpatient services or as a fixed surcharge for each covered life. The surcharge amount varies by region and is set to generate a fixed sum of money. HCRA 1996 established the annual total support for GME at $544 million. Except for a portion of the pool allocated according to various incentives ($54 million), PEP funds were distributed to teaching hospitals

[12] Harwell

[13] In New York, the ratio applied to a particular facility is determined by a weighted average of its own ratio and that of the group of hospitals to which it belongs. Thus 55% of the resident-to-bed ratio for the University of Rochester Medical Center is determined by the average for all academic medical centers in New York State and the remainder by URMC itself. This does not actually adjust as programs change size but is based on historical data from 1987. Sources: Chang, Hetterich.

according to amounts received in 1995. The original HCRA legislation fixed this distribution in nominal dollars for a period of three years. The renewal, HCRA 1999, changed some of the conditions and extended the term for an additional three and one-half years (expiring June 2003). Strong Memorial and Highland hospitals received about $21 million from the pool under HCRA 1996 while Rochester General and Genesee hospitals received about $7 million. The HCRA extension shrank the aggregate PEP pool to $494 million and the incentive carve-out to $31 million, leaving $463 million for distribution to the state's teaching hospitals (a 5.5% reduction).[14]

In Rochester in 2001, the Professional Education Pool is financed through payments by commercial insurers (Excellus, Preferred Care, etc.) of $50.23 for each individual contract and $165.77 for each family contract (although payers can choose instead to pay a surcharge of 17.02% on inpatient discharges).

2002 distributions from the Professional Education Pool are estimated to be $20.8 million to Strong Health, $4.3 million to ViaHealth and $1.3 million to Unity Health.

Rochester Graduate Medical Education Consortium

The original HCRA legislation made provision for continuing state spending of about $841 million and commercial insurer spending of $544 million to support GME. Prior to HCRA, total spending on GME was about $1.8 billion. HCRA left negotiations over the difference to the stakeholders in each region. The Rochester GME Consortium is the result of these negotiations in Rochester.

The agreement provides for GME payments totaling the difference between pre-HCRA support for GME and the total available from the PEP pool, with a reduction of 12% to be phased in over a five year period. The funding obligation for commercial insurers is divided according to the number of covered lives by insurer. Commercial insurers that are not formally part of the agreement are billed for GME such that fees pay approximate the payment made by Rochester insurers.

Total funding for the GME Consortium pool began at about $19.4 million in 1997 and has subsequently declined to $17.1 million at

[14] Burke, 1999.

present. Strong Health receives $10.3 million, ViaHealth receives $4.7 million and Unity Health receives $2.1 million. The Rochester GME Consortium is administered by the Rochester Regional Healthcare Association.

THE BENEFITS OF GRADUATE MEDICAL EDUCATION IN ROCHESTER

Rochester benefits from graduate medical education in four ways:

- GME receives substantial *financial support from non-Rochester payers*, particularly the federal and state governments.[15] While there are also financial contributions from local taxpayers and businesses, local spending is dwarfed by funds contributed from outside the Rochester economy.
- Rochester's health care *providers benefit from the substantial contribution made to patient care by medical residents.* As residents are paid a "training wage" and work unusually long hours, the cost of replacing them with other health care professionals would be substantial.
- HCFA and MedPAC analysis confirms that *teaching hospitals*—particularly academic medical centers—*treat patients with more serious illnesses* than hospitals without a teaching program. Rochester residents have access to care for serious conditions that would otherwise be left untreated or would have to be treated in another community. Not only do people living in the Rochester area have better access to health care, but Rochester's hospitals bring patient care revenue to the local economy instead of sending Rochester income to Buffalo, Syracuse, New York City or Cleveland.
- Rochester's large GME program is an integral part of *the University of Rochester's medical school and biomedical research program.* These activities *stimulate the local economy* in numerous ways, attracting research funding plus highly skilled and well-paid new community members and spurring the growth of businesses either serving in

[15] While Rochester residents are also state and federal taxpayers, Rochester's relatively large GME program guarantees that support received from federal and state sources exceeds the tax cost to Rochester residents of providing this support.

the medical center's supply chain or spun-off from its research endeavors.

Funding for GME From Outside Rochester

Money flowing into Rochester from outside the community comes from three sources. The federal government fully funds Medicare and pays half the cost under Medicaid. The state government pays one quarter the cost of acute care under Medicaid. Finally, the ability of Rochester's teaching hospitals to provide care for particularly serious conditions attracts individuals living outside the community who are covered by commercial insurance.

Federal Support for GME

For services provided under Medicare, the federal government spent $72 million in 2001 in Rochester *over and above* Medicare reimbursement that would have been received by a community hospital without a residency program. Were the residency program to close, the financial consequences would likely exceed the loss of the $72 million, however, as the medical community's ability to care for particularly sick patients—whether from Rochester or not—would be diminished. Either the remaining hospitals would care for these patients at a loss (remembering MedPAC and HCFA's conclusion that teaching hospitals attracted patients for whom the DRGs provided inadequate reimbursement) or these particularly challenging cases would be served outside the metropolitan area.

The federal government reimburses the State of New York for half of the state's Medicaid costs. With total Medicaid support for GME in Rochester at about $24 million, the federal contribution is $12 million. Federal support for GME in Rochester was, therefore, about $84 million in 2001. Again, without the medical sophistication found in Rochester's teaching hospitals, the sickest Medicaid patients would either be served locally at a loss or sent to another community.[16]

NYS Support for GME

The only direct contribution to GME from state taxpayers comes through Medicaid, although NYS does administer the Professional Education Pool. The non-state portion of Medicaid-driven GME in Rochester is an additional $12 million, split evenly between

[16] This estimate is based on information provided by Rochester's hospitals in response to a request by URMC; analysis of these data was jointly conducted by URMC and CGR.

NYS and the county of residence for the patient (usually Monroe, in this instance). For the purposes of our study, we calculate one-half the amount ($5.9 million) as revenue from the state, and the other half as a local cost.

GME Support Through Out of Region Residents

Rochester already attracts particularly severe cases from outside the region. Strong Memorial Hospital, for example, reports almost 900 discharges during 2001 from outside of the nine county Rochester region having an average Case Mix Index (CMI) of 4.25. For comparison purposes, the CMI for Medicare discharges at Highland Hospital over the period was 1.33, indicating a much lower level of case severity.

Although payers from outside the region do not make payments to the Rochester region's Professional Education Pool, they are billed for GME at the rate negotiated through the GME Consortium (see below). We estimate the total contribution to GME on behalf of patients living outside the nine county region to be at least $2.5 million.[17]

Health care provided under Workers Compensation and No-Fault insurance programs supports GME according to the same rate structure as Medicaid. Total GME support through these programs totals about $5.5 million. This is a local cost.

Local GME Support

Local taxpayers and businesses support graduate medical education through three vehicles: 1)Taxes paid to Monroe County for its share of Medicaid, 2)Payments by insurers into the NYS Professional Education Pool and 3)Payments by insurers to teaching hospitals through the Rochester GME Consortium.

As noted above, Monroe County's share of the cost of Medicaid totaled about $6 million in 2001.

Payments by all parties into the PEP totaled about $29 million under HCRA 96 and fell to about $27 million under HCRA 99. Payments into the GME Consortium pool began at about $23 million, declining 12% to about $20 million at present. The total received by Rochester's teaching hospitals under the GME

[17] This estimate is based on CGR analysis of out-of-region billings for Strong Health only. Similar information from ViaHealth and Unity Health Systems would increase the size of this estimate.

Consortium agreement is fixed on a per contract basis. While an increase in aggregate payments to the Professional Education Pool would result in a subsequent reduction in the amount of the assessment (as the PEP remains fixed in dollar terms during the life of the HCRA legislation), contributions to the GME Consortium could rise as the total number of covered lives increases.

Total local support for GME from Rochester taxpayer and insurers in 2001 was about $53 million, or $58 million including the Worker's Compensation and No-Fault insurance programs.

Summary of Net Reimbursement

With four primary revenue components, and four primary cost components, the net reimbursement to our local area is $34 million, as illustrated below.

Total Revenue	**$92,624,022**
Medicare (federal)	$72,362,759
Medicaid (federal)	$11,826,088
Medicaid (state)	$5,913,044
Private reimb (out of region)	$2,522,131
Total Costs	**$58,172,306**
PEP (local)	$26,779,342
GME Consortium (local)	$19,991,691
Medicaid (county)	$5,913,044
Workers Comp (local)	$5,488,229
Net Reimbursement	**$34,451,717**

GME's Net Contribution to Patient Care Costs

Currently Rochester has 731 medical residents employed at Strong Memorial, Rochester General and Park Ridge hospitals.[18] Were the residency programs of area hospitals eliminated, the patient care services now provided by the medical residents would have to

[18] 591 medical residents are employed by URMC, although some rotate through other hospitals. RGH employs 42 residents directly and Park Ridge employs 55. URMC also employs 43 dental residents.

be made up in some other way. CGR reviewed studies that attempted to determine the scope and character of a program to replace residents with permanent health care professionals. This portion of the report attempts to estimate the cost of this substitution.

How Do Residents Spend Their Time?

Residents perform a myriad of tasks, from diagnosing patient illnesses to searching for patient records to drawing blood for testing. Some of these tasks would become the responsibility of another physician, while some could be performed by another medical caregiver (physicians assistant, nurse practitioner, or clinical nurse specialist) and others, like searching for patient records, could be handled by someone with little or no medical training. Still other tasks, such as education and time spent on personal tasks, would not require any replacement.

The challenge is to quantify what tasks are completed by residents, and how much time they spend on each task. With that information, the required labor mix and associated costs required for substitution of residents can be calculated. A small number of time-motion studies have been conducted, to collect necessary data to answer the questions surrounding substitution.

We summarize two studies that attempted to model the replacement of medical residents with other health care professionals: Knickman, Lipkin, Finkler, Thompson and Kiel (1992) and Lurie, Rank, Parenti, Woolley and Snoke (1989). These studies were chosen due to the detail of the data results. Each study reported the tasks that residents completed, and the time that residents spent on each task. To evaluate the reliability of our results, we also referred to Pisetsky, Lubarsky, Capehart, Lineberger and Reves (1998), which also looked at replacement of medical residents by other medical/hospital personnel.

Knickman, et al*: Methodology*

Knickman and colleagues[19] used a time-motion study of eight internal medicine residents in two large New York City hospitals to analyze the time that residents spent on various tasks. Undergraduate premedical students followed the residents for 28

[19] Knickman JR, M Lipkin, SA Finkler, WG Thompson, J Kiel. 1992. "The Potential for Using Non-Physicians to Compensate for the Reduced Availability of Residents." Academic Medicine, 67, 7, p. 429-438.

hours each. The students then coded the residents' time into one of 67 distinct activities.

The authors and their research team analyzed each resident activity and determined the level of medical personnel required to adequately perform each activity. The team then asked physicians and nurses not involved in the project to identify the appropriate type of non-physician personnel to complete each of the activities.

The authors then developed two substitution models, one with a physician as primary medical manager and one with a midlevel practitioner as primary medical manager.

Each of the 67 activities coded by the pre-med students was then assigned to the job classification of the type of person to whom the activity could be transferred. The job classifications used were: physician, midlevel practitioner, nurse, lab technician and unskilled laborer. Time spent in education or on personal matters (sleep, eating, hygiene) was not categorized for replacement by other job classifications.

Knickman, et al. Findings

By applying the Knickman model to URMC data, CGR was able to build a substitution model for URMC, using actual salary data to substitute personnel at different levels for current residents.

Knickman and colleagues found that residents spent slightly over one-third of their time on activities that did not need to be replaced by other medical personnel. Twenty percent of residents' time was spent in educational activities while 13% was spent on personal activities such as sleeping and eating. Table 1 details the broad tasks as assigned in the Knickman study.

Table 1: Percent of Residents' Time Spent on Various Tasks	
Task	**Percent**
Total	100%
Education	21%
Information gathering	14%
Personal	13%
Testing	12%
Consulting	12%
Documenting	10%
In transit	8%
Procedures	5%
Interaction with patients	3%
Administration	2%
Source: Knickman, et al., Table 3, p. 434	

Within each broad task are a number of more detailed tasks. For example, under the Information Gathering category the authors grouped five activities: 1) History, 2) Physical, 3) Chart review (not lab tests), 4) Phone calls (not lab tests), and 5) Searching for medical records. Combined, these five activities accounted for 13.7% of the study residents' time. Table 2 shows the Knickman study's detailed findings for the Information Gathering task for both the Traditional Model and the Midlevel Practitioner Model.

Table 2: Personnel Who Could Substitute for Medical Residents in Information Gathering			
Activity	**% of Resident's Time**	**Traditional Model**	**Midlevel Practitioner Model**
History	3.4	Physician	Midlevel Practitioner
Physical	2.3	Physician	Midlevel Practitioner
Chart Review (not lab tests)	5.9	Physician	Midlevel Practitioner
Phone Calls (not lab tests)	1.8	Physician	Physician
Searching for Medical Records	0.3	Unskilled	Unskilled
Source: Knickman, et al. Table 6 pp 436-437			

Table 2 shows that under the Traditional Model, a physician would be required to perform all these tasks except searching for medical records, which could be substituted with unskilled personnel. A physician would therefore replace 13.4% of the 13.7% of the resident's time spent on Information Gathering, while the remaining 0.3% would be replaced by unskilled personnel.

Under the Midlevel-practitioner model, a midlevel practitioner would be substituted for the history, physical and chart review tasks. Physicians would replace just 1.8% of the resident's time spent on Information Gathering, while the midlevel practitioner would replace 11.6% and unskilled personnel would replace 0.3%.

In both Knickman models, the authors assume that a resident and a substitute staff person (physician, mid-level, etc) would take the same length of time to perform a specified task. This assumption is likely incorrect. An experienced practitioner at any level is likely to be capable of completing a task more quickly than a resident with very little experience. CGR believes that the assumption of equal time for residents and other practitioners will render our cost conclusions based on the Knickman model too high. Suggestions for modification of the results are discussed later in this section.

In Table 3, the physician replaces 46.4% of the residents' time, the midlevel practitioner replaces 7.5%, unskilled personnel replaces 5.9%, the nurse replaces 4.3% and a lab technician replaces 1.3%. The remaining 34.6% of the residents' time does not need to be replaced as it is spent in educational or personal activities.

Table 3: Percentage of Residents' Time Covered by Other Workers Traditional Model

	Physician	Nurse	Lab Tech	Unskilled	MP
Education	na	na	na	na	na
Information gathering	13.4	0.0	0.0	0.3	0.0
Personal	na	na	na	na	na
Testing	4.4	0.1	0.2	2.8	4.6
Consulting	11.4	0.0	0.0	0.0	0.5
Documenting	9.7	0.0	0.0	0.0	0.0
In transit	5.6	0.0	0.0	2.3	0.0

Table 3: Percentage of Residents' Time Covered by Other Workers Traditional Model					
	Physician	Nurse	Lab Tech	Unskilled	MP
Procedures	1.7	2.5	1.2	0.1	0.0
Interaction with patients	0.2	0.0	0.0	0.5	2.4
Administration	0.0	1.7	0.0	0.0	0.0
Total	**46.4**	**4.3**	**1.3**	**5.9**	**7.5**
Source: Knickman, Table 6, p. 436-437					

In Knickman's Midlevel Practitioner Model, the residents' time is divided up as follows: 39.3% to the midlevel practitioner, 15.5% to the physician, 3.3% to nurses, 1.3% to lab technicians, and 5.9% to unskilled personnel (Table 4). The remaining resident time does not need to be replaced (education and personal time).

Table 4: Percentage of Residents' Time Covered by Other Workers Midlevel Practitioner Model					
	Physician	Nurse	Lab Tech	Unskilled	MP
Education	na	na	na	na	na
Information gathering	1.8	0.0	0.0	0.3	11.6
Personal	na	na	na	na	na
Testing	4.4	0.1	0.2	2.8	4.6
Consulting	1.6	0.0	0.0	0.0	10.3
Documenting	1.1	0.0	0.0	0.0	8.6
In transit	5.6	0.0	0.0	2.3	0.0
Procedures	0.9	1.5	1.2	0.1	1.9
Interaction with patients	0.2	0.0	0.0	0.5	2.4
Administration	0.0	1.7	0.0	0.0	0.0
Total	**15.5**	**3.3**	**1.3**	**5.9**	**39.3**
Source: Knickman, Table 6, p. 436-437.					

In Tables 3 and 4 the total percentage of residents' time replaced by a physician (46.4% and 15.5%) are based on the hours in the workweek of a resident. In New York State, medical residents are limited to just 80 hours per week. When those percentages are applied to a physician's average workweek of 60 hours, we

estimate that physicians would cover 37.1 hours of a residents' time under the Traditional Model and 12.4 hours under the Midlevel-Practitioner Model. It was assumed that physicians, on average, work 60 hours/week and all other job groups work, on average, 40 hours/week.

Knickman Model Results

CGR obtained salary information by job group from the University of Rochester Office of Human Resources. Knickman and colleagues describe a midlevel practitioner as a nurse practitioner, a physician's assistant or a registered nurse with special training. (Knickman *et al.*, p 431). From the URMC salary information CGR used the job group which included Nurse Managers, Nurse Practitioners and Clinical Nurse Specialists to represent the midlevel practitioner.

For unskilled personnel CGR used the URMC grouping for Technical/Paraprofessional, which includes Biomedical Equipment Technicians, Health Technologists/Technicians and Computer Operators. This is not meant to imply that individuals in these job groupings are truly unskilled, only that they do not have the medical skills of a nurse, nurse practitioner, resident, or physician.

The clinical/research faculty job group was used for physicians, and the staff nurses job group was used for nurses and laboratory technicians.

In addition to salary costs, CGR also included 22.2% in benefits costs into the substitution calculations.

As illustrated in Table 5, replacing a resident's 80 hour workweek would cost $2,046/week under Knickman's Traditional Model. Under the Midlevel-Practitioner Model the requisite mix of labor would cost $1,872/week. Residents, in addition to working long hours, are one of the lower paid job groups at URMC, averaging

Table 5: Cost per week for Replacing Medical Residents

	Substitution Cost/week	Resident's Cost/week	Net Cost to Substitute/resident
Knickman Traditional Model	$2,046	$917	$1,130
Knickman Midlevel Practitioner	$1,872	$917	$956

$750/week plus benefits. As a result, the net cost of replacing one resident is $1,130/week under the Traditional Model and $956/week under the Midlevel-Practitioner Model.

Knickman Model Substitution Cost: $36-$43 million

CGR estimates that to replace all of Rochester's 731 residents, it would cost $43.0 million per year under the Traditional Model and almost $36.3 million per year under the Midlevel-Practitioner Model.

Lurie, et al: Methodology

Lurie and colleagues[20] conducted a time-motion study of 35 internal medicine house officers (residents) at three hospitals in Minnesota to determine how they spent their on-call time for five nights. Each house officer was followed by a trained lay observer.

Each observer recorded the time spent on various tasks performed by house officers. The time covered was 6pm to 8am for one shift and 10pm to 8am for the second shift at the Minneapolis Veteran's Administration Hospital. At the University of Minnesota and the Hennepin County Medical Center the shift covered was from 4pm until 8am.

Resident time was recorded for 21 categories. The authors did not suggest what other hospital personnel could be substituted for residents.

Lurie et al.: Findings

CGR applied the Knickman methodology to the data presented in Lurie and colleagues. Slight differences existed in the way the Lurie and colleagues and Knickman and colleagues studies were performed. The most significant difference is that the residents in the Knickman study were followed at various times during the day, while the house officers in the Lurie study were only observed during the overnight hours.

By not following the house officers during the day, the Lurie study has very little data on educational activities, which was a non-substitutable activity in Knickman. In addition, since most testing and procedures are performed during the day while a patient is awake, there is comparatively less time spent on these activities (17.4% in Knickman vs. 3.6% in Lurie). Given that the house

[20] Lurie N, B Rank, C Parenti, T Woolley, W Snoke. (1989). "How do House Officers Spent Their Nights?" New England Journal of Medicine, 320, 25, p. 1673-1677.

officers were followed at night, more time was spent on personal activities (13.2% in Knickman vs. 40.1% in Lurie). Table 6 details the percentage of time spent by house officers in the five primary tasks in the Lurie study.

Table 6: Percent of Resident's Time Spent on Various Tasks

	Percent
Total	100.0%
Information gathering	23.4
Personal	40.3
Communication	26.5
Miscellaneous	6.2
Procedures	3.6
Source: Lurie, Table 2, p. 1674.	

Tables 7 and 8 detail the percentage of residents' time replaced by other staff, applying the Knickman substitution approach to the Lurie data. Based on the Lurie data, 43.1% of house officers' time would be substituted by a physician under the Traditional Model, while 15.7% of house officers' time would be substituted by a physician under the Midlevel-Practitioner Model.

Table 7: Percentage of House Officer's Time Covered by Other Workers Traditional Model

	Physician	Nurse	ML	unskilled
Information gathering	22.2	0.0	0.0	1.2
Personal	na	na	na	na
Communication	20.9	0.0	5.3	0.3
Miscellaneous	0.0	0.0	0.0	6.1
Procedures	0.0	3.6	0.0	0.0
Total	43.1	3.6	5.3	7.6
Source: Lurie et al., 1989.				

Table 8: Percentage of House Officer's Time Covered by Other Workers Midlevel Practitioner Model

	Physician	Nurse	ML	unskilled
Information gathering	6.9	0.0	15.2	1.2
Personal	na	na	na	na
Communication	8.8	0.0	17.4	0.3
Miscellaneous	0.0	0.0	0.0	6.1
Procedures	0.0	3.6	0.0	0.0
Total	15.7	3.6	32.6	7.6
Source: Lurie et al., 1989.				

Lurie Model Results

The net cost of substituting house officers' labor with other hospital personnel using the Lurie data is $944/week under the Traditional Model after accounting for the salary and benefits of the house officer. Under the Midlevel-Practitioner Model the net cost is $781/week.

Table 9: Cost per week to Replace One Medical Resident

	Substitution Cost/week	Resident's Cost/week	Net Cost Per Resident
Lurie Traditional Model	$1,861	$917	$944
Lurie Midlevel Practitioner	$1,698	$917	$781

Lurie Model Substitution Costs: $30 to $36 million

CGR estimates that under the Lurie data assumptions, to replace all residents in Rochester would cost $35.9 million under the Traditional Model and $29.7 million under the Midlevel-Practitioner Model.

Pisetsky, et al.

Pisetsky and colleagues[21] analyzed the cost of replacing anesthesiology residents at Duke University Medical Center. Researchers conducted a time-motion study of 15 residents and 10 certified registered nurse anesthetists (CRNAs). The study analyzed the cost of substituting a midlevel-practitioner (CRNA, physician assistant or advanced practice nurse) for a resident.

[21] Pisetsky MA, DA Lubarsky, BP Capehart, CK Lineberger, JG Reves. (1998). Anesthesia & Analgesia, 87, 2, p. 245-254.

After accounting for the difference in salary, work schedule and GME subsidies, the authors concluded that it would cost $153,000 throughout a 3 year clinical anesthesiology residency to replace a resident. This averages out to $51,000 per year or $980.77/week.

Pisetsky Model Substitution Cost: $37 million

Since the study did not provide specific time data, CGR could not apply the Knickman substitution model, nor the URMC salary data to this study. Nonetheless, using the $980.77 figure, CGR estimates that to replace 731 residents in the Rochester system would cost $37 million per year.

Summary of Substitution Analyses

If GME were eliminated, Rochester hospitals would need to replace the labor currently provided by 731 medical residents. These residents work 80 hours per week, at low cost. Potential substitutes may be more efficient, but work fewer hours per week, and at a higher cost.

CGR reviewed three research studies that investigated how hospitals could substitute other medical personnel for residents. By applying actual current URMC wage rates, CGR determined that the estimated cost to replace residents ranges from $29.7 million to $42.9 million per year. A study by Pisetsky and colleagues, which did not provide enough information to utilize URMC wage data showed that replacing 731 residents would cost $37.3 million/year, which falls within of the estimated range.

Caveat 1: Efficiency of Substituted Staff

The studies used in this analysis did not include estimates of how much more efficient other medical staff might be in completing tasks compared to residents. For the purpose of comparison, CGR estimated the cost of replacing residents if all substituted personnel were able to complete tasks in two-thirds the time it takes residents, or even in one-half the time. If substituted replacements were 33% more efficient than residents, the range of costs of substitution drops to between $19.6 and $28.3 million. If the replacements were twice as fast as residents, estimated costs of substitution would still be high, at an estimated $14.9 to $21.5 million.

A summary of the five "bottom line results" from the substitution analysis under the three different assumptions about replacement staff efficiency are shown in Table 10.

Table 10: Net Cost of Replacing URMC Medical Residents			
Model	Cost of Substitution	Cost of Substitution if Replacements are 33% More Efficient Than Residents	Cost of Substitution if Replacements are 50% More Efficient Than Residents
Knickman Traditional	$42,948,395	$28,345,941	$21,474,198
Pisetsky	$37,300,000	$24,618,000	$18,650,000
Knickman Midlevel Practitioner	$36,325,245	$23,974,662	$18,162,623
Lurie Traditional	$35,888,417	$23,686,355	$17,944,209
Lurie Midlevel Practitioner	$29,701,265	$19,602,835	$14,850,633

Caveat 2: Impact of Nursing Shortage?

A second caveat to the substitution study is the issue of the current nursing shortage. CGR used current nursing salaries at URMC in the substitution calculations. However, it is possible that the increased demand on nurses and midlevel practitioners could drive nursing salaries up. If this were true, CGR's estimates as presented above would be an underestimate of the true net costs of substitution.

While the studies examined here have limitations, they nonetheless are consistent in their conclusions that substitution of medical residents with other medical personnel and staff would increase net cost for a hospital.

Health Status Impact of GME

Teaching hospitals, particularly academic medical centers, provide care to patients who require a sophisticated level of care. If the capacity to provide this level of medical care does not exist within the community, these services would likely be provided elsewhere. Strong Memorial Hospital has identified more than $80 million in patient care revenue (more than 5,000 discharges) in quaternary and complex tertiary care services including transplant surgery, comprehensive care for epilepsy and pediatric sub-specialties from oncology to gastroenterology.[22]

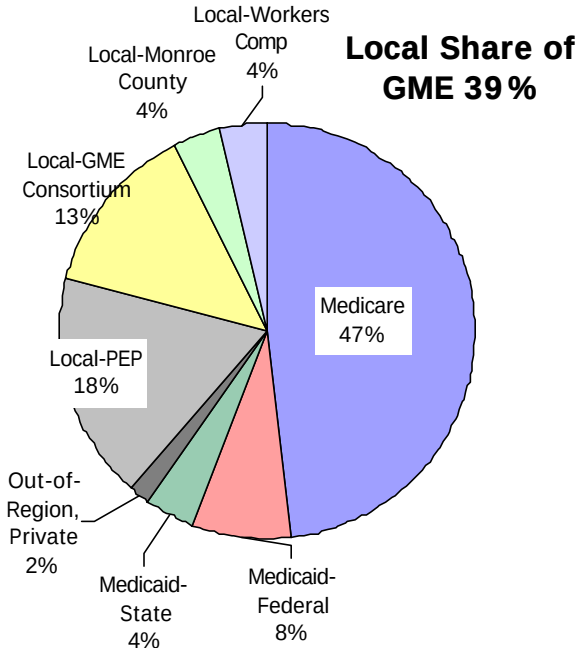
[22] The list of programs is culled from the group of programs listed only on the Strong Memorial Hospital operating certificate—not that of any other Rochester hospital.

Economic Impact of Medical Center on Rochester

While the residency programs benefit ViaHealth and Unity Health System, clearly the magnitude of the impact of their elimination would be greatest at URMC.

It is impossible to disentangle the residency program from other aspects of the University of Rochester Medical Center's initiatives. Certainly the residency program supports high quality clinical care and the University's biomedical research program. The elimination of the GME program in Rochester would have spillover impacts on the viability of other URMC programs, although it is impossible to quantify these impacts. CGR will soon complete a study of the aggregate economic impact of the University Medical Center on Rochester. The impact of the residency program will be embedded in this analysis.

CONCLUSIONS



Graduate Medical Education makes an important contribution to health care in the United States, New York State and Rochester. Ongoing debate in Washington and Albany will likely have a substantial impact on GME funding streams, but under the present system of reimbursement the financial benefits of GME to a community the size of Rochester are undeniable.

The elimination of medical residents would, on balance, cost the Rochester community about $34 million in net reimbursement plus an additional cost forced by the replacing of residents with other health care professionals that could range from $15 million to as much as $43 million.

Were the loss of residents to threaten the viability of the University of Rochester Medical Center, the impact on the community's health system and economy would also be substantial.

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