Does increased physician supply affect quality of care?
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Prologue: One unsettling question facing the U.S. health care system today is whether, amidst the flurry of cost cutting, the quality of medical care is beginning to suffer. There is no real consensus about what good care is, but various organizations are actively striving to find out. A crucial question in this determination of quality is how the growing number of physicians will affect it; since physicians are the basic building block for medical care, how they respond to changes around them is important. Do more physicians mean that they will provide better care because they are more accessible, have more time, and must compete more aggressively? Or do more physicians mean extra lab tests, unnecessary surgery, and too many office visits for the patient? James Perrin and Joseph Valvona attempt to answer these questions through a review of past research and a new analysis of their own. They assert that simply increasing the number of physicians will not improve the quality of health care. While doing so may enhance overall access to care or provide a safety net for potential medical disasters such as AIDS, improving quality should be achieved through other means, the authors say. James Perrin, a pediatrician educated at Case Western Reserve University and at the University of Rochester, is director of Ambulatory Care Programs and General Pediatrics for the Children’s Service at Massachusetts General Hospital in Boston. Previously, he resided at Vanderbilt University where he ran the Primary Care Center. Joseph Valvona, a research associate at the Vanderbilt Health Policy Center, holds a master of science degree in genetics from the University of Arizona and a master’s degree in business from Vanderbilt. Perrin and Valvona have worked on a number of studies together including one on the diffusion of surgical technologies. This article is drawn from a paper presented at a Vanderbilt University Health Policy Symposium on graduate medical education.
How does changing the supply of physicians affect health status or the quality of health services? Do more physicians improve the quality of patient care through easier access, more time for careful consideration of patients’ problems, or better testing and procedures? Or does increased supply adversely affect health status through excessive use of ancillaries or unnecessary surgery?

Broadly, quality of health care might improve by greater adherence to standards of care (assuming that adherence to standards improves health) or by broadening the scope of services provided. If quality improves as the number of practicing physicians increases, then there is an argument for maintaining or increasing the supply of physicians, as Harris suggests. If increased supply does not noticeably improve quality, then the case for increasing numbers of physicians is less clear.

Previous research, as well as data reported here, suggests that (1) there is a definite, albeit small, increase in quality with increasing physician supply or medical expenditures; (2) other factors (such as cigarette use and diet) are better predictors of health status than is medical care use; and (3) sizable gaps in quality remain, whether based on adherence to standards or on broadened scope of services.

We suggest in this paper, therefore, that meeting an agenda of improved quality through increased supply will require substantially greater numbers of physicians than currently projected. The additional direct and indirect costs of this vastly greater supply are indicated by Sloan and Valvona in the Fall 1986 Health Affairs and in other papers in this volume. Rather than following greater supply, improvements in quality will likely come from targeted approaches to changing physicians’ behavior through education or new financial incentives.

Physician Supply Projections And Quality Of Care

Harris and Sloan and Valvona offer options for projecting the supply of physicians needed reflecting either an assessment of medical care need or current levels of demand for services. Either approach assumes that current quality of service is adequate or that services can be defined explicitly enough that no difference in quality is measurable. Both approaches assume that the boundaries of medical need are well defined and leave little room for adding services, based on technological advances or changing definitions of what constitutes appropriate health services.

One may define a curve relating health quality (output) and medical care resources or costs (input). As medical care resources increase, so does quality initially, although at some point increased resources bring little if any new benefit, and the curve flattens. Thereafter, additional medical care resources may decrease quality through the excessive use of...
unnecessary or potentially harmful technology, leading to large amounts of induced illness. Physician density, a measure of one type of medical resource, likely fits a similar curve. Quality may increase with increasing physician density if the point on the curve is somewhat to the left, or quality may decrease with increasing density if employment is already at the saturation level. Surgery, for example, might be performed on less appropriate candidates, resulting in more complications and less benefit to patients.

Furthermore, the scope of medical services could change with a changing physician supply. Certain areas of medicine are typically considered undertaught in medical school and underprovided in the community. Such types of practice include behavioral medicine, geriatric medicine, long-term care of chronic illness, or health promotion. Conceivably, increasing the supply of physicians might be associated with greater attention to these areas of medicine. In turn, because of this greater attention, health status may improve or patients may be more satisfied with care they receive. On the other hand, some have argued that it may be inappropriate to expand the boundaries of medical care into these newer areas, assuming instead that medical treatment should be limited to “traditional” illnesses and that physicians are not necessarily the best professionals (from a cost or quality basis) to provide these services.

### Previous Research

Several studies have examined the relationship between increased medical resources, including physician supply, and health quality. Yet a recent review of geographical variations in health services by Brook and colleagues notes that information is all but nonexistent to answer the question of whether geographic regions with higher rates of use have more or less appropriate use of services, and whether health is improved by higher procedure rates. Sloan and Schwartz conclude that a 10 percent increase in physician-to-population ratio leads to a 4 percent increase in expenditures for physicians’ services. How do these increasing expenditures affect health?

**Medical resource use and mortality.** Using cross-sectional data from 1970, Hadley found that, on average, a 10 percent increase in medical care expenditures accounted for a reduction in adult mortality rates by about 1.5 percent. Deaths from external causes and cancers were less clearly affected by medical care use than were deaths from strokes and other cardiovascular causes. A 10 percent reduction in cigarette consumption outranked a 10 percent increase in medical care expenditures in lowering mortality rates.

Auster, Leveson, and Sarachek indicate that a 10 percent increase in
health expenditures reduced mortality by 0.66 percent. They also note that environmental factors predict mortality better than does the quantity of medical services. Higher levels of education had a negative impact on mortality, and cigarette smoking increased mortality.

For perinatal mortality rates, a 10 percent increase in medical care expenditures was associated with a reduction in mortality by 1.5 to 2 percent. A 10 percent increase in the number of obstetricians and pediatricians reduced mortality by 0.6 to 0.8 percent. For all children, however, the weight at birth was the most important determinant of mortality. Reducing the frequency of low birth weight will have a greater impact on mortality than will providing more medical services to infants with a low birth weight.

To what degree do observed changes in mortality or morbidity rates reflect changes in physician supply or increased availability of medical care? Pell and Fayerweather attribute a decline in the incidence of heart attacks to changes in lifestyle, especially exercise, diet, and cigarette smoking. There was a smaller decline in fatality rates among persons with first heart attacks, which was attributed to improving medical care. In sum, Pell and Fayerweather attribute most of the improvements in mortality and morbidity to lifestyle changes, rather than to changes in physician supply or other medical care.

Newhouse and Friedlander examined physiologic measures such as blood pressure, serum cholesterol, varicose veins, and a periodontal index, and their relationship to the quantity of medical resources available. Using data mainly from the late 1950s and early 1960s, their study demonstrated that the only major effect was a beneficial impact of additional hospital beds on the prevalence of varicose veins. No effect of increasing physician density was demonstrated. A report from the Rand health insurance study found only limited health benefits from easier access to services and greater utilization. In lower socioeconomic groups, improved visual acuity and blood pressure control were demonstrated. No impact on weight, serum cholesterol, or physical functioning was observed.

Medical care resources and the process of care. Numerous studies have investigated the relationship between what takes place in the provision of medical care and the size of the physician population. In classic studies, Wennberg notes major differences in the performance of certain surgical procedures that could not be explained by characteristics of the population or its need for medical services. One measure of quality of care that has received much attention in the literature is the amount of time the physician spends with a patient. Kehrer and colleagues report mean visit lengths of 18.0 minutes in nonmetropolitan areas and 21.8 minutes in large standard metropolitan statistical areas (SMSAs) in 1979. Using 1973 data, Sloan and Lorant
find a mean physician visit of 18.6 minutes. They also find that the physician-to-population ratio has a significantly positive relationship to length of visit. An increase in the physician-to-population ratio from 2.5 to 35 per 10,000 led to an increase in visit length of four minutes. Additional evidence of increasing visit times with increases in the number of physicians in an area is reported by Sloan and the U.S. Department of Health and Human Services.

Specialist physicians tend to practice in or near major urban centers where physician-to-population ratios are relatively high. General and family practitioners are more likely to be in smaller communities and rural areas where the ratio of physicians to population, or physician density, is relatively low. If specialists provide a quality of care different from that of general physicians, then the different geographical distribution of general and specialist physicians might indicate changes in quality of care with changing physician density. Thus, if specialists provide better care than generalists, and if specialists practice more in areas of higher physician density, then increasing physician density will be associated with higher quality.

Aiken and colleagues indicate that specialists provide much primary (or principal) care (approximately 20 percent) for people in the United States. Do specialists provide better quality of care? Rhee and colleagues indicate that specialists provided better quality of care while practicing within their own specialty domain than did general practitioners or specialists when practicing outside their own specialty. A study of midwestern physicians had similar findings and further indicates that younger physicians scored better on these process criteria.

Other studies demonstrate increased complexity of services, as measured by time per encounter, use of diagnostic tests, and treatment procedures (especially in ambulatory care) for the same diagnosis when provided by subspecialists.

Current Analysis

We examined the impact of physician density on quality of care among six groups of physicians: pediatricians, internal medicine specialists, general practitioners, family practitioners, obstetricians, and general surgeons.

Methods. Using data from the University of Southern California (USC) surveys of physician practice from 1976 to 1978, we first examined whether increasing physician supply is associated with greater number of encounters for reasons other than illness, such as health maintenance or well-person visits or visits for psychosocial causes. Second, we chose high-frequency diagnoses from each of the physician groups and determined the number of ancillaries performed and proce-
dures instituted for each diagnosis, across measures of physician density. Third, using standards of care from previous studies, we examined the appropriate and inappropriate use of ancillary tests and treatments for each diagnosis. Examples of inappropriate testing included the use of multiple chemistry panels in the diagnosis of tonsillitis-pharyngitis or the use of x-rays to diagnose middle ear infections. Density, defined by physician-to-population ratios, was determined from the March 1983 Area Resource File and linked with the physician practice data. In all analyses, the density of both the specific physician group and all physicians was utilized. Visits in the USC survey were classified according to type of visit and the etiology of the patient’s problem.

Results. The impact of physician supply on type or etiology of visit varied according to specialty. For all specialties, an emotional or psychological focus for the patient visit was uncommon, representing less than 1 percent of total visits. Sick care as a proportion of general practice visits increased slightly (from 85 percent to 90 percent) with increasing density of general practitioners, but decreased (87 percent to 82 percent) with increasing physician density in general (Exhibit 1). General and family practitioners, at least in the 1970s, were likely to practice in rural areas; other types of physicians studied were more likely to be in urban settings. The specialty-specific density for general and family practitioners, therefore, is likely to be high when total physician density is low. No distinct patterns emerged for family practitioners. Internists demonstrated a minimal increase in health maintenance visits with increasing physician density, as did pediatricians. Although several of these distributions are statistically significant, the actual rise in amount of well-person care is small.

The percentage of general practitioners, family practitioners, and pediatricians ordering two or more tests for health maintenance visits was twice as high for physicians in high total physician density areas.

### Exhibit 1
Type Of Visits By Specialty And Physician Density (Percent)

<table>
<thead>
<tr>
<th>Specialty</th>
<th>Type of visit</th>
<th>Specialty-specific density</th>
<th>Total physician density</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Low</td>
<td>Medium</td>
</tr>
<tr>
<td>General practice</td>
<td>Well-psychosocial</td>
<td>14.6</td>
<td>14.9</td>
</tr>
<tr>
<td></td>
<td>Sick</td>
<td>85.4</td>
<td>85.1</td>
</tr>
<tr>
<td>Family practice</td>
<td>Well-psychosocial</td>
<td>12.8</td>
<td>10.8</td>
</tr>
<tr>
<td></td>
<td>Sick</td>
<td>87.2</td>
<td>89.2</td>
</tr>
<tr>
<td>Internal medicine</td>
<td>Well-psychosocial</td>
<td>93.1</td>
<td>93.2</td>
</tr>
<tr>
<td></td>
<td>Sick</td>
<td>7.9</td>
<td>7.8</td>
</tr>
<tr>
<td>Pediatrics</td>
<td>Well-psychosocial</td>
<td>27.0</td>
<td>26.8</td>
</tr>
<tr>
<td></td>
<td>Sick</td>
<td>73.0</td>
<td>73.2</td>
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</table>
compared to low density areas (Exhibit 2). Internists showed only slight
differences in the percentage ordering two or more tests by total physi-
cian density. Specialty-specific physician density had less effect on the
number of tests ordered. For pediatrics, the percentage ordering two or
more tests increased threefold from 0.7 to 2.4 percent for high versus low
density areas.

For all diagnoses, the number of tests ordered was consistently low. The
number of tests ordered or procedures performed varied only slightly with changing physician density, and variations were not consist-
tent from one physician group to another. For each condition, we
classified tests and procedures as expected (appropriate), discretionary,
and inappropriate. In general, little inappropriate testing was done; by
our classification scheme, about 5 percent of tests or procedures were
considered inappropriate. About 40 percent were classified as discretion-
ary, and in a few instances discretionary testing increased with increasing
physician supply.

To explain some of the observed changes in test-ordering behavior, we
developed a series of regressions, with the number of tests performed as
the dependent variable for each condition by physician specialty. Often,
the relationship between tests and density was the opposite of that
expected. That is, holding other factors constant, testing was higher in
lower density areas. In most cases, the differences were small, 0.1 tests per
visit or less.

The most striking finding of this analysis is the low frequency of
testing for all conditions, including preventive health services. The
pattern appeared consistent throughout health conditions and physician
specialties, and seemed to characterize both appropriate and inappropri-

<table>
<thead>
<tr>
<th>Specialty</th>
<th>Number of tests</th>
<th>Specialty-specific density</th>
<th>Total physician density</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Low</td>
<td>Medium</td>
</tr>
<tr>
<td>General practice</td>
<td>0</td>
<td>70.5</td>
<td>71.8</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>23.0</td>
<td>16.8</td>
</tr>
<tr>
<td></td>
<td>2 or more</td>
<td>6.5</td>
<td>11.4</td>
</tr>
<tr>
<td>Family practice</td>
<td>0</td>
<td>65.0</td>
<td>63.2</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>25.5</td>
<td>25.9</td>
</tr>
<tr>
<td></td>
<td>2 or more</td>
<td>9.5</td>
<td>10.9</td>
</tr>
<tr>
<td>Internal medicine</td>
<td>0</td>
<td>41.8</td>
<td>33.5</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>24.8</td>
<td>21.9</td>
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<td></td>
<td>2 or more</td>
<td>33.4</td>
<td>44.6</td>
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<td>Pediatrics</td>
<td>0</td>
<td>90.2</td>
<td>86.1</td>
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<td></td>
<td>1</td>
<td>11.3</td>
<td>11.4</td>
</tr>
<tr>
<td></td>
<td>2 or more</td>
<td>0.7</td>
<td>2.6</td>
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</table>
ate tests. In other words, it appears that little testing was done, either of the variety that would be expected for any of these conditions or such that would be considered inappropriate. These findings are consistent with other studies of tracer conditions, which similarly demonstrate little use of ancillaries (as well as lack of clinical attention to abnormal laboratory results).

Some caveats are in order. First, the data may not well reflect what actually occurs in practice. For example, more testing may have been performed but not recorded in the USC data collection. Physicians may provide much well-person or health maintenance care in the context of visits that would be coded as sick visits. Second, these changes may take place in a narrow segment of the health resource-quality curve, mainly on the flat of the curve. Third, these data relate to practice in the mid-1970s; practice patterns may have changed since then with the surge in physician supply and greater competition. Changing incentives may have changed physician practice. Fourth, we could not examine the influence of these practices on health status. And fifth, we studied only relatively common conditions. It may be that differences in quality are manifest mainly through relatively rare or technologically intensive conditions—by their appropriate diagnosis or by their specialized treatment. This analysis (and most similar analyses) would not identify these differences.

Analyses of current practices indicated that little time is spent on such areas as health maintenance and promotion or psychological and behavioral services in practice. With the low level of testing demonstrated here, it would also be hard to assume that the medicine practiced was anywhere but on the rise of the curve relating increasing medical resources to quality. On the other hand, there is little evidence from these data that simply increasing physician supply will increase the level of quality and or the scope of health services provided.

**Conclusion**

Current and previous studies provide little support for the idea that quality is greatly influenced by changing physician density. In theory, increasing physician supply could have a positive effect on the provision of health maintenance, psychological, and behavioral services. On the other hand, one may argue that it is inappropriate for medicine to move into these areas, leaving them to other professionals who may provide more effective care at lower cost. Although quality of care likely merits improvement, it is less clear that simply increasing physician supply will have much effect on quality.

There seems to be a potential for increasing quality. To do so will require a sizable effort in research into therapies and interventions that
improve health status and more focused efforts to improve the services that physicians provide. Rather than increasing physician supply, greater benefits will likely come from this focus on improving adherence to standards and from preventive efforts to diminish personal risk factors (smoking, diet, and exercise).

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NOTES

6. R.H. Brook et al., “Geographic Variations in the Use of Services: Do They Have Any Clinical Significance?” Health Affairs (Summer 1984): 63-73.


