Baumol's Curse on Medicine

Eric G. Neilson

Editor-in-Chief, *Journal of the American Society of Nephrology*

A national press worrying everyone over rising health care costs or the inflation-adjusted decline of our science budget is persistent and beleaguering. Government planners are diligently chipping away at growth rates of Medicare and Medicaid while imploring small businesses to expand private insurance—anything to avoid raising taxes. Why budget planners are also shrinking support for the National Institutes of Health is particularly mysterious. Apparently there is feeling in such circles that we do enough science already or that medical science offers no hedge on the future rise of health care costs. Either way, we are charting a course for serious underinvestment in a research enterprise that is intrinsic to our national health.[1,2]

Narratives documenting the growing costs of health care are all true. As the population expands and ages, much of this rising cost will multiply. In other developed countries where medicine is practiced differently, costs are going up, too, suggesting that choosing different models for delivering health care is not a simple answer to cost containment.[3,4] The theses I lay out here are two: First, health care in many respects is a major contributor to the economy and its growth for that reason alone is desirable. Second, the process for choosing or delivering medical therapy as well as discovering truly better therapy, particularly curative therapy, requires more science. Medical research is an authentic response to the recurrent expense of chronic disease. It makes lives better and, not surprising, also helps the economy.

The delivery of health care in America is expanding in response to increased public and private consumption. Although the rate of spending has slowed slightly in the past few years,[5] part of the reason *per capita* costs in America are higher than in other countries is because the price of labor and medical services is greater. The contribution of health care to the economy is now north of 16% of the gross domestic product and likely to grow,[6] particularly as the population enlarges and rightly demands more access to physicians. One simple and perhaps only short-term answer to more access is to build or modernize more hospitals and clinics and increase the number of physicians. Current evidence suggests both are happening.[7–9] Of course, it is unlikely that growth in numbers of physicians by itself will lead to better access to primary care. Much of the graduating physician workforce is already attracted to the subspecialties of medicine for all kinds of reasons that have nothing to do with improving general medical services. In our deep-rooted, fee-for-service culture, no one wants roadblocks obstructing access to subspecialists and, consequently, these specialized niches of applied technology continue to enlarge. Supply creates its own demand, but I wonder whether this feed-forward growth is really so terrible.[10,11]

Health care is now firmly entrenched in the national economy and employs a large segment of the open workforce for good purpose.[6,12] The March 2008 jobs report from the Bureau of Labor Statistics indicated the number of health care jobs rose by 23,000 for a 12-mo gain of 363,000 jobs in this sector, 44% of the total new jobs created in the past year.[13] Health care is booming in hospitals and clinics, and the wages from those jobs is fueling growth in disposable and tax spending in the economy. As Richard Cooper of the Leonard Davis Institute for Health Economics (University of Pennsylvania, 2008) recently pointed out to me, "Americans want jobs and they want health care, and the latter begets the former."[12] What economic benefit could possibly come to millions of health care–related workers if the brakes were applied to this enterprise? From medicinal and device manufacturing, clinical facilities construction, acute care labor, nursing home expansion, process improvement, information technology, insurance madness in all its various forms, and administrative compliance, the many ramifications of providing health care are and will be a fundamental feature of our mainstream economy for the foreseeable future.[6]

Clinical demands for nephrology, as an example, are in keeping with this growth. Incidence and prevalence of early and late kidney disease are on the rise,[14–16] as is its inevitable expense. But why do the real costs of this work rise unabatedly? We reuse dialyzers,[17] tightly manage labor by consolidating salary and products within the dialysis industry,[17] apply new drugs to reduce progression of disease,[18,19] focus on clinical guidelines to attenuate practice variability,[20] and transplant to

Published online ahead of print. Publication date available at www.jasn.org.

Correspondence: Dr. Eric G. Neilson, Hugh Jackson Morgan Professor of Medicine and Cell and Developmental Biology, Chairman, Department of Medicine, D-3100 MCN, Vanderbilt University School of Medicine, Nashville, TN 37232-2358. Phone: 615-322-3146; Fax: 615-343-9391; E-mail: eric.neilson@vanderbilt.edu

the extent the public will donate organs,[21] yet everything costs more.

Many of us regarded the now departed Lewis Thomas as a clever observer of medical culture from his perch at New York University. He neatly and presciently laid out the problem 37 yr ago in his "Notes of a Biology Watcher" published in the *New England Journal of Medicine*.[22] Cost of health care, he argued, is a function of the level of technology. In his examples, *high technology* is hormone replacement, antibiotics, and the polio or smallpox vaccines, a relatively small expense in labor and product that eliminates disease. *Halfway technology* comprises a large group of temporizing interventions such as dialysis, transplantation, intensive care monitoring, chemotherapy, and coronary artery procedures, all large expenses for labor, facilities, and pharmaceuticals that prolong life to varying degrees. *Nontechnology* Thomas considers the most expensive and most desirable by patients. Embedded in this large category is the enormous cost of the doctor–patient relationship: The pleasant visit to the office, taking a history and performing a physical examination, providing preventive intervention, evaluating diagnostic tests, counseling and education, and the laying on of hands, something most of us would recognize as core outputs of the clinical experience. In scanning for interconnections among these three categories, one might recognize the movement from nontechnology to high technology is one proper function of medical research. Every medical advance starts with an original investigation, and without strong basic and applied science, there is no hope for more affordable high technology, technology that has real expense but is applied less often *per capita*.

Although modern, fundamental research continues to illuminate the biochemistry of life and disease, only a small fraction has yet reached the level of cost-effectiveness we regard as high technology. Recent examples are the vaccine for human papillomavirus, the antibiotic elimination of *Helicobacter pylori*–induced peptic ulcer disease, and the all-trans retinoic acid cure of promyelocytic leukemia, each one a wonderful advance. Evidence of this work reflects interdisciplinary effort by many investigators on important, low-incident problems. No high-incident, high-cost chronic disease has yet been cured, but if science has taught us anything, it is that understanding complex illness is like peeling an onion: It has many layers and takes much time. Comroe and Dripps suggested the peak lag between discovery and clinical application can be 20 yr.[23,24] Educated curiosity is also required for meritorious investigation in pursuit of high technology or more efficient use of current technology. The training and support of such individuals cannot falter without serious risk for losing them from the workforce. There is no injured-reserve list for good scientists. Public enthusiasm for more and better research still remains strong for two reasons. First, there is reasonable hope of relieving human suffering through clever science[25] and, second, predictive models suggest that increasing publicly funded research substantially enhances economic productivity and return on investment.[1]

Economic benefit analyses by Murphy and Topel[26] also reinforce some good news for halfway technology. Modern, expensive, halfway technology creates chronic disease out of previous life-threatening disease and has redeeming economic value when examined from the perspective of producing longer life, particularly if longer life provides more useful days of work in the marketplace. The gains from medical progress on more life-years and days worked *per capita* between 1970 and 1998 was $73 trillion at a cost of $27 trillion for health care and approximately $0.3 trillion of taxpayer-supported research. The net benefit to the economy of 45.7 trillion dollars is quite staggering. Good arguments can be made, therefore, for additional research expenditures, particularly if return on investment means more productive longevity. Murphy and Topel estimated $4 trillion gained in the economy for each 10% reduction in heart disease and $0.4 trillion gained for each 1% reduction in cancer deaths.[26] More and more people are also working beyond the social security retirement age.[27] This aging workforce is still engaged because there is declining disability in people over 65, probably as a result of modern medical intervention.[28,29] Although not all agree,[12] better health for continued work in advancing years retains value in the economy by discounting the high cost of health care in aging subpopulations who are truly disabled.[29,30] It now seems, for some of us, the longer you live well, the less your health care costs because you have likely dodged a chronic disease.[31]

Now we come to the really expensive issue of nontechnology in health care and Baumol's curse. William Baumol, the laureate of cultural economics at New York University, and William Bowen, the former president of Princeton University, wrote a book in 1966 outlining reasons that economic productivity is obviated by persistent rising costs in the performing arts.[32] Their observation is startlingly simple: Not all parts of the general economy can be productive. In many parts of the economy, productivity and wages rise against costs, whereas in other parts, such as the performing arts, productivity remains sluggish. Productivity is generally defined as the amount of output per unit of input; however, there are many different measures of productivity. Productivity in the manufacturing sector might be measured on the basis of the number of widgets produced by one employee or the number of hours it takes to make something. In the economy's service sector or handicraft industry, such as performing arts, productivity is based on revenues generated by labor relative to salary. Productive industries change from era to era on the basis of technology and demand, but stagnant industries remain sluggish across eras because they are largely steeped in handicraft—so called Baumol's curse.

It is important to realize that Baumol and Bowen's analyses focus on the real rates of increasing costs and not their actual levels; neither are these costs limited to ordinary price inflation: The costs in handicraft industries typically rise much faster than inflation because the availability of essential handcrafters is rate limiting.[4,11,32] Computer manufacturing as an example of a productive industry can eliminate the typewriter,

robotically assemble units that weigh less and have fewer parts of greater function requiring less service, and the productivity and wages of a smaller labor force rise while costs go down. Performing arts is another matter. A string quartet in the early 19th century had two violinists, a cellist, and a violist playing a charming piece of Mozart scored for 30 min.[3,32] Reducing the quantity or quality of musicians or changing the tempo of the music would not improve productivity because no one would come to hear such a thing; however, musicians in 2008 expect a better wage than paid in 1808; hence, live production costs have and will always rise to hear Mozart. Occasionally, organizations such as the Metropolitan Opera Company can market performances to movie theaters to improve productivity, but most industry performers do not have that caché. Digital recordings also reduce costs by replacing packaged media, but once this discount is in place, the cost of live performances continues to rise. Performing arts continually battle their costs because of this uneven opportunity to transform productivity.

Baumol next expanded his theory of productivity to the "children" of the performing arts: Academicians and health care providers.[3,33] To teach a seminar on Kierkegaard, it is the same thing. It still takes a small group of students, a professor, and some fixed unit of time together. Our philosophy departments could use teaching assistants, try to entice more students into such seminars (if that is possible), or skim-coat the curriculum, but each adjustment to lower labor costs would shortchange students. Good teaching at the end of the day is handicraft, and productivity improvement is limited by relatively fixed labor costs.

The practice of medicine finds itself in the same quandary. Physicians have been trained the same way for a long time to take a history, perform a physical examination, interpret test results, and spend time discussing their findings with patients. The handicraft of medical care values competency and expression of personal concern, not ever-higher throughput from a shrinking workforce. Although physicians can speed up the office visit slightly, work longer hours, or substitute advanced nurse practitioners to reduce labor costs, there are limits to this productivity because patients do not want to be shortchanged in their perception of care. Some have even argued this visit compression causes more indiscriminate testing and referral.[34] In this regard, it is interesting that the competitive intent to raise productivity and lower costs through managed care had no long-term effect,[10] particularly as practice groups and hospitals consolidated to strengthen their bargaining position for sustainable reimbursement.[34] The dimensions of the nominal doctor–patient visit have not changed very much, but the cost of physicians and their clinic operations has. There is little room for automating personal interaction. Because the practice of medicine is not open to any willing provider and there is a perceived shortage of physicians and nurses,[9,35] the growing cost of labor will continue to plague health care services. These expenditures are the subject of much political torment[36] given the looming necessity of wage tax expansion to support the uninsured. Nevertheless, the earned wages from this growth also fuel the economy.[11,37] In our current health care market, one person's cost is another person's income.

Labor is not the only cost to consider in health care. Another cost is the ancillary expense we create on behalf of patients, and this category of expense greatly impairs our economic productivity. There are a myriad of reasons why medicine struggles with its productivity: In nearly all sectors of health care there is general resistance to standardization,[3] particularly as it relates to reducing practice variability[38]; the belief that quality is related to labor content[3]; widespread, thoughtless application of expensive halfway technology in the setting of medical uncertainty or futility[39]; failure to embrace the hospice movement for end-of-life care[40]; wasteful administration that goes into contracting and managing the many vagaries of insurance reimbursement[34,41]; the unwillingness to address the profit motive in practicing as a learned profession[34,42]; and the failure to operate the delivery of health care as a well-run business, providing good quality at a lower cost.[43] Fixing some of these problems would soften the slope of rising expense and create a relative affordability in accommodating the needs of future patients. In this regard, there is role for more health services research to help physicians evaluate, modulate, or discard their use of halfway technologies that cannot advance in the technology chain. Cost-effective practice is a key interim solution while we await the appearance of more affordable high technology.

The elephant in the room, of course, is the role of private insurance in commercializing health care.[34] Physicians have been particularly clever at maximizing revenues from the arcane ways we are paid for our work. Although the conscience of the profession still speaks for the patient, someone else largely pays for it, and this introduces into the doctor–patient relationship not-so-subtle business interests that can be blamed only on the allure of money.[44] The silence or apathy of physicians in these matters encourages the perception of their role in keeping health care costs high. Consequently, the temptation to police price, access, referral, or ownership against perceived opportunism is overwhelming. Such a regressive approach, however, would likely dampen this large sector of the economy and worsen public and private access, level of service, clinical quality, and the general health of the nation.[3,45] An answer to all of this ancillary expense is needed soon, and it is not as simple as putting a hex on Baumol's curse. It is not the number of physicians but their professional spending habits that will increasingly take center stage in whatever happens next.[36]

What is the long-term outlook for society regarding the affordability of health care? Spending by the clinical enterprise continues to hamper productivity, and recent analyses confirm this view in various well-developed economies, including our own.[3,6] Baumol argues, however, that these rising costs would be absolutely true, but not relatively true, if other areas of the economy productively grow more gross domestic product.[3] That is to say, as economies expand, the costs of many goods and services decrease, making less productive sectors such as health care relatively more affordable, even as prevalent costs

for medical services go up. Getting people to believe they can afford—or not resent—spending more on medical care because other goods and services are relatively cheaper hinges on public willingness to assign more disposable income for health care in what economists call the benefit of "unbalanced growth." Several estimates suggest escalation to as much as 30% of the gross domestic product for health care over the next several decades would be affordable with nominal wage growth in an unbalanced economy.[3,4,6,37] Maintaining reasonable definitions of full employment during such expansion should not deplete jobs from other sectors of the national economy.[10] Today, aging of the population and their proximity to death are likely drivers of continued willingness to spend differentially disposable income and wage taxes on medical services.[4,46] It remains to be seen whether this growing employee base or its legislators will feel equally generous toward the uninsured or those low-income families already priced out of the market.[10]

Up to this point, I have said nothing about the poor or uninsured and the affordability of their health care.[47] This is a terrible problem and ought to be fixed. What would happen if we did? Consider this: Gross national product is a measure of consumption of both private and government spending. To be on parity with most of the insured, the uninsured or underinsured will need some form of government-sponsored insurance or government-subsidized private insurance, largely provided by new taxes. Estimates today based on calculations made a few years ago[48] suggest universal health coverage would acutely increase health care spending by 3 to 6%, the gross national product by approximately 1%, and federal taxes by more than $100 billion annually. This overall estimate seems a little soft, because it is hard to tell who would opt out of private insurance for new government-paid premiums discounted by the plethora of indigent-related subsidies in Medicare and Medicaid that would go away. Such changes will certainly require expansion of the workforce[49] because many of these uninsured do not use routine medical services the way the rest of us do.[50] Some of the just-in-time cost in caring for the uninsured today should go down with more routine preventive care, but net costs will likely go up because there will be more demand for general medical services in a market unprepared for such escalation.

From the observations here, there are many reasons to expect continued growth in the cost of health care. Nevertheless, its role as a driver of our national economy remains evident as we await the appearance of more cost-effective solutions. Halfway technology is everywhere. We can use halfway technology more appropriately, but we cannot rid ourselves of it completely without other measures saving us in the long run. These other measures are more and better science. We know enough today to say research is a valuable commodity that benefits the human condition as well as our economic success. Baumol and Thomas probably knew each other from their days at New York University. It is a pity they never found a way to triangulate their thinking around the problem of advancing productivity in medicine by making strong investments in research, to create incentives for transforming technology that are truly more affordable because they are decisive.[2,22] This failure is increasingly a political issue today, one we can view as a perverse form of thoughtlessness that has wasted many years in its nibbling away at publicly supported research. The one immediate thing we can do now is maintaining our link to science. It is the discovery ground for future advances in high technology. As a hedge against growing health care costs, the funding of science is priceless.

ACKNOWLEDGMENTS

I thank Harry Jacobson, David Asch, Daniel Foster, Larry Churchill, Richard Cooper, Daniel Beauchamp, Robert Dittus, Gregg Tarquinio, Stanley Goldfarb, Vivian Siegel, John Sergent, and Ray Harris for comments on earlier versions of this article.

DISCLOSURES

None.

REFERENCES

1. Grens K: An economic gamble. *Scientist* July: 28–34, 2007
2. Pardes H, Manton KG, Lander ES, Tolley HD, Ullian AD, Palmer H: Effects of medical research on health care and economy. *Science* 283: 36–37, 1999
3. Baumol WJ: Children of performing arts, the economic dilemma: The climbing costs of health care and teaching. *J Cultural Econ* 20: 183–206, 1996
4. Hartwig J: What drives health care expenditure? Baumol's model of 'unbalanced growth' revisited. *J Health Econ* 2008, in press
5. Catlin A, Cowan C, Hartman M, Heffler S: National health spending in 2006: A year of change for prescription drugs. *Health Aff (Millwood)* 27: 14–29, 2008
6. Hall RE, Jones CI: The value of life and the rise in health spending. *Q J Econ* February: 39–72, 2007
7. Bazzoli GJ, Gerland A, May J: Construction activity in U.S. hospitals. *Health Aff (Millwood)* 25: 783–791, 2006
8. Cooper RA, Getzen TE, McKee HJ, Laud P: Economic and demographic trends signal an impending physician shortage. *Health Aff (Millwood)* 21: 140–154, 2002
9. Mallon WT: Medical school expansion: Déjà vu all over again? *Acad Med* 82: 1121–1125, 2007
10. Reinhardt UE, Hussey PS, Anderson GF: U.S. health care spending in an international context. *Health Aff (Millwood)* 23: 10–25, 2004
11. Cooper RA: Weighing the evidence for expanding physician supply. *Ann Intern Med* 141: 705–714, 2004
12. Cutler DM, Rosen AB, Vijan S: The value of medical spending in the United States, 1960–2000. *N Engl J Med* 355: 920–927, 2006
13. Bureau of Labor Statistics: Employment Situation Summary. Available at: http://www.bls.gov/news.release/empsit.nr0.htm. Accessed April 5, 2008
14. Foley RN, Collins AJ: End-stage renal disease in the United States: An update from the United States Renal Data System. *J Am Soc Nephrol* 18: 2644–2648, 2007
15. Himmelfarb J, Pereira BJ, Wesson DE, Smedberg PC, Henrich WL: Payment for quality in end-stage renal disease. *J Am Soc Nephrol* 15: 3263–3269, 2004

16. Xue JL, Daniels F, Star RA, Kimmel PL, Eggers PW, Molitoris BA, Himmelfarb J, Collins AJ: Incidence and mortality of acute renal failure in Medicare beneficiaries, 1992 to 2001. *J Am Soc Nephrol* 17: 1135–1142, 2006
17. Himmelfarb J, Berns A, Szczech L, Wesson D: Cost, quality, and value: The changing political economy of dialysis care. *J Am Soc Nephrol* 18: 2021–2027, 2007
18. Ravera M, Re M, Vettoretti S: Economic evaluation of angiotensin receptor blockers in type 2 diabetes, hypertension, and nephropathy. *J Am Soc Nephrol* 17[Suppl 2]: S44–S48, 2006
19. Lefebvre P, Duh MS, Buteau S, Bookhart B, Mody SH: Medical costs of untreated anemia in elderly patients with predialysis chronic kidney disease. *J Am Soc Nephrol* 17: 3497–3502, 2006
20. DuBose TD Jr: American Society of Nephrology Presidential Address 2006: Chronic kidney disease as a public health threat—New strategy for a growing problem. *J Am Soc Nephrol* 18: 1038–1045, 2007
21. Gill JS, Hussain S, Rose C, Hariharan S, Tonelli M: Access to kidney transplantation among patients insured by the United States Department of Veterans Affairs. *J Am Soc Nephrol* 18: 2592–2599, 2007
22. Thomas L: The technology of medicine. *N Engl J Med* 285: 1366–1368, 1971
23. Comroe JH Jr, Dripps RD: Scientific basis for the support of biomedical science. *Science* 192: 105–111, 1976
24. Comroe JH, Dripps RD: The Top Ten Clinical Advances in Cardiovascular-Pulmonary Medicine and Surgery, 1977. DHEW Publication No. (NIH) 78-1521
25. Thier SO: The social and scientific value of biomedical research. *J R Coll Physicians Lond* 28: 541–543, 1994
26. Murphy K, Topel R: Diminishing returns? The costs and benefits of improving health. *Perspect Biol Med* 46[Suppl]: S108–S128, 2003
27. Quinn JF: Retirement patterns and bridge jobs in the 1990s. *EBRI Issue Brief* 206: 1–22, 1999
28. Manton KG, Corder L, Stallard E: Chronic disability trends in elderly United States populations: 1982–1994. *Proc Natl Acad Sci U S A* 94: 2593–2598, 1997
29. Singer BH, Manton KG: The effects of health changes on projections of health service needs for the elderly population of the United States. *Proc Natl Acad Sci U S A* 95: 15618–15622, 1998
30. Vita AJ, Terry RB, Hubert HB, Fries JF: Aging, health risks, and cumulative disability. *N Engl J Med* 338: 1035–1041, 1998
31. Perls TT: Centenarians prove the compression of morbidity hypothesis, but what about the rest of us who are genetically less fortunate? *Med Hypotheses* 49: 405–407, 1997
32. Baumol WJ, Bowen WG: *Performing Arts: The Economic Dilemma*, New York, The Twentieth Century Fund, 1966
33. Weissmann G: *Galileo's Gout: Science in an Age of Endarkenment*, New York NY, Bellevue Literary Press, 2007
34. Kuttner R: Market-based failure: A second opinion on U.S. health care costs. *N Engl J Med* 358: 549–551, 2008
35. Buerhaus PI, Donelan K, Ulrich BT, Norman L, DesRoches C, Dittus R: Impact of the nurse shortage on hospital patient care: Comparative perspectives. *Health Aff (Millwood)* 26: 853–862, 2007
36. Mongan JJ, Ferris TG, Lee TH: Options for slowing the growth of health care costs. *N Engl J Med* 358: 1509–1514, 2008
37. Chernew ME, Hirth RA, Cutler DM: Increased spending on health care: How much can the United States afford? *Health Aff (Millwood)* 22: 15–25, 2003
38. Keckley PH: Evidence-based medicine in managed care: A survey of current and emerging strategies. *MedGenMed* 6: 56, 2004
39. Ghosh AK: On the challenges of using evidence-based information: The role of clinical uncertainty. *J Lab Clin Med* 144: 60–64, 2004
40. Connor SR, Elwert F, Spence C, Christakis NA: Geographic variation in hospice use in the United States in 2002. *J Pain Symptom Manage* 34: 277–285, 2007
41. Enthoven AC, Fuchs VR: Employment-based health insurance: Past, present, and future. *Health Aff (Millwood)* 25: 1538–1547, 2006
42. Relman AS: Medical professionalism in a commercialized health care market. *JAMA* 298: 2668–2670, 2007
43. Matthews M Jr: Medicine as a business. *Mt Sinai J Med* 71: 225–230, 2004
44. Churchill LR: The hegemony of money: Commercialism and professionalism in American medicine. *Camb Q Healthc Ethics* 16: 407–414, discussion 439–442, 2007
45. Relman AS: Why Johnny can't operate? *New Republic* October 2: 37–43, 2000
46. Zweifel P, Felder S, Meiers M: Ageing of population and health care expenditure: A red herring? *Health Econ* 8: 485–496, 1999
47. Altom LK, Churchill LR: Pay, pride, and public purpose: Why America's doctors should support universal healthcare. *MedGenMed* 9: 40, 2007
48. Hadley J, Holahan J: Covering the uninsured: How much would it cost? *Health Aff (Millwood)* Suppl Web Exclusives: W3–250-265, 2003
49. Ayanian JZ, Weissman JS, Schneider EC, Ginsburg JA, Zaslavsky AM: Unmet health needs of uninsured adults in the United States. *JAMA* 284: 2061–2069, 2000
50. Sack K: In Massachusetts, Universal Coverage Strains Care. Available at: http://www.nytimes.com/2008/04/05/us/05doctors.html?_r=1&hp&oref=slogin. Accessed April 5, 2008