

## High and Rising Health Care Costs. Part 2: Technologic Innovation

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Technologic innovation, in combination with weak cost-containment measures, is a major factor in high and rising health care costs. Evidence suggests that improved health care technologies generally increase rather than reduce health care expenditures. Greater availability of such technologies as magnetic resonance imaging, computed tomography, coronary artery bypass graft, angioplasty, cardiac and neonatal intensive care units, positron emission tomography, and radiation oncology facilities is associated with greater per capita use and higher spending on these services. Because the spread of new technologies is relatively unrestrained

in the United States, many of these technologies are used to a greater extent than in other nations, and the United States thereby incurs higher health care costs. Nations with a greater degree of health system integration have relied on expenditure controls and global budgets to control costs. Although diffusion of technology takes place more slowly in more tightly budgeted systems, the use of innovative technologies in those systems tends to catch up over time.

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Article 1 in this series reviewed 3 perspectives on high and rising costs, presenting arguments on whether the cost of health care is a serious problem, citing evidence showing that demographic factors do not explain the trajectory of health care costs, and exploring the debate over whether a more competitive health care market with increased cost sharing by patients would result in cost containment (1). This article looks at 3 further perspectives on health care costs—the role of technologic innovation, the costs of administering the health care system, and the absence of strong cost-containment measures. Looking ahead, article 3 will examine the impact of health care provider behavior on high and rising costs (Table).

### PERSPECTIVE 4: INNOVATION IS THE DRIVER OF HEALTH EXPENDITURE GROWTH

Most, if not all, economists and policy analysts believe that technologic advance is a key driver of health expenditure growth (2–7). The example of acute myocardial infarction illustrates how medical innovation is associated with increased costs. Treatment has been transformed from 1 week of bed rest in the coronary care unit—with pharmacologic interventions to control cardiogenic shock, pulmonary edema, and arrhythmias—to thrombolytic therapy, angiography, angioplasty, or coronary bypass surgery. The innovations require more capital (cardiac catheterization laboratories), more labor (the time of physicians, nurses, and other caregivers), and more expenses associated with spread of knowledge (fellowships in interventional cardiology)—all of which cost money that was not spent 30 years ago (2).

Technologic advances are generally associated with increased rather than reduced costs. As the economist Henry Aaron points out, “Rapid scientific advance always raises expenditures, even as it lowers prices. Those who think otherwise need only turn their historical eyes to automobiles, airplanes, television, and computers. In each case, massive technological advance drove down the price of services, but total outlays soared” (8).

Laparoscopic cholecystectomy provides a medical example of this phenomenon. Whereas the price of a laparoscopic procedure may be 25% less than the price of open cholecystectomy, the rate of both types of cholecystectomy has increased by 60% (6, 9). The growth in quantity of services dwarfs the impact of per unit reductions in price.

Baker and colleagues (10) studied the availability, use, and costs of magnetic resonance imaging, computed tomography, coronary artery bypass graft, angioplasty, cardiac intensive care units, neonatal intensive care units, positron emission tomography, and radiation oncology facilities from 1998 to 2001. Greater availability is associated with greater per capita use and higher spending on these services. Increases in the number of cardiac facilities corresponds with an increase in the rate of use and the costs of coronary angiography, angioplasty, and cardiac intensive care. Although one might think that increased use of angioplasty would reduce the number of coronary bypass surgeries, greater availability of angioplasty is in fact associated with more bypass surgeries per population among people older than 65 years of age—a surprising finding that Baker and colleagues did not explain. Similarly, the availability of more magnetic resonance imaging units does not reduce the number of computed tomography scans performed (10).

Innovation has spread more widely and has commanded higher prices per unit of service in the United States compared with most other developed nations (2, 11). For example, the United States has about twice the number of magnetic resonance imaging scanners per capita compared with most developed nations. According to data collected during the second half of the 1990s, the United States had almost 3 times more cardiac surgery units and

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catheterization laboratories than Canada, Germany, and most other developed nations. In 1997, the number of coronary artery bypass surgeries per capita was about twice as high in the United States as in 15 other developed nations. For angioplasties, other nations have been gradually catching up with U.S. rates. In 1998, the rate of total revascularizations was more than twice as high in the United States as in most developed nations (2, 11).

Acceptance of new technologies by the medical profession is a major determinant of their rate of diffusion. Physicians in the United States expand the number of patients deemed eligible for new procedures more rapidly than do physicians in other nations, in part because the fee-for-service payments made to physicians and hospitals that use new diagnostic and therapeutic procedures are relatively generous (6, 12). Moreover, the rate of technology spread is related to the number of specialists in an area or in a nation, in part because specialists receive income from new technologies and insist that hospitals invest in facilities to support these technologies (6). Conversely, a hospital that is constructing innovative facilities may attract specialists to the community.

Is the rapid spread of medical innovation fueled by physicians, hospitals, and technology manufacturers or by patient demand? A recent survey found that people in the United States and Canada had greater knowledge and expectations of new medical discoveries than did people in Western European nations (13). It is likely that public attitudes are influenced by medical providers and suppliers that advertise new technologies through the mass media; the success of direct-to-consumer pharmaceutical advertising is an example (14). Given that public thirst for new technologies is similar in the United States and Canada (13), the far greater technology diffusion in the United States compared with Canada (2) suggests that the lack of regulatory constraints in the United States may be more significant than public demand as a key factor in rapid diffusion of innovation.

#### Are the Increased Costs of New Technology Justified?

Cutler and McClellan (15) argue that even though “technological change has accounted for the bulk of medical care cost increases over time,” the medical advances have proved to be worth far more than their costs. These investigators compare the change in treatment costs resulting from medical innovations with the human benefits (measured in added quality-adjusted life-years) for 5 conditions: myocardial infarction, low birth weight, depression, cataracts, and breast cancer. They conclude that the benefits outweigh the costs for the first 4 conditions and are roughly equal for breast cancer.

An alternative viewpoint holds that although new technologies represent medical advances, they are prone to overuse and thereby excess cost. The work of Wennberg (16) and other researchers (17, 18) has shown persuasively that variation exists in care delivered by different physi-

**Table. Synopsis of This 4-Part Series on Health Care Costs**

#### Questions addressed

- Are high and rising expenditures a serious problem?
- Why are expenditures higher in the United States than in other countries?
- Why are expenditures growing so fast?
- What strategies are available to slow their rate of growth?
- Do strategies exist that enable physicians to reduce costs while improving or protecting quality?

#### 7 perspectives concerning health care costs

- High and rising costs are not such a serious problem (Part 1)
- High and rising costs are a problem, but they are created by factors external to the health care system (Part 1)
- High and rising costs are caused by the absence of a free market; the remedy is to give patients more responsibility for costs of care and to encourage competition among health insurers and providers (Part 1)
- High and rising costs are the result of medical technologies creating innovation in the diagnosis and treatment of illness (Part 2)
- High and rising costs result in part from excessive costs of administering the health care system (Part 2)
- High and rising costs are explained by the absence of strong cost-containment measures (Part 2)
- High and rising costs are the result of the market power of health care providers (Part 3)

cians and in different regions of the country. Wennberg has said, “Lurking behind the variation in patterns of care are often huge hospital investments in expensive technologies that are directly tied to their economic stability” (19). This viewpoint does not deny that the benefits of new technologies may outweigh the costs but rather shifts the emphasis to the problem of inappropriate overuse of medical innovation. The cost problem, according to this perspective, is not a matter of technology but of technology diffusion.

#### Limiting the Spread of New Technologies

A corollary to the theory that technologic innovation is the primary driver of health expenditure growth is that cost containment requires some limits on diffusion of technology (20). The ideal criteria for promoting diffusion of technology are based on scientific evidence: Do the health benefits of the new technology outweigh its potential harms, and do they improve on existing technologies? Another set of criteria are related to cost: Is the new technology cost-effective when compared with existing technologies? Health technology assessment is the process of evaluating the benefits, harms, and cost-effectiveness of a new technology (21). Health technology assessment can influence whether a technologic innovation for diagnosis or treatment will spread widely or wither away, because payers, whether Medicare, Medicaid, or private health plans, may deny payment for innovations that are deemed to be ineffective or minimally effective.

Many developed nations have agencies to conduct health technology assessment. Their work is shared internationally through the International Network of Agencies for Health Technology Assessment (22). The United States has no nationally coordinated policy on health technology assessment (21), a situation that reflects the diversity of

public and private organizations with an interest in controlling costs. Assessments are conducted by several entities, including the Veterans Affairs hospital system, the Technology Evaluation Center of the Blue Cross/Blue Shield Association, and the Medicare Coverage Advisory Committee (23). In addition, professional organizations perform technology assessment as part of their efforts to create clinical practice guidelines; examples include the Clinical Efficacy Assessment Project of the American College of Physicians, the Joint Guidelines of the American College of Cardiology and American Heart Association, and the Committees on Gynecologic and Obstetric Practice of the American College of Obstetrics and Gynecology.

Although technology assessment agencies have produced many high-quality scientific reports, their influence depends on the extent to which payers apply the findings to make decisions about coverage. In the United Kingdom, appraisals conducted by the National Institute for Clinical Excellence are expected to be followed at all levels of the National Health Service (24, 25). In the United States, pressure from specialists and manufacturers of technology competes with evidence-based technology assessment in determining the extent of technology diffusion (21). A study involving interviews with large insurers concluded that physicians who were early adopters of new technologies had considerable clout in influencing the coverage decisions of insurance companies. Manufacturers of innovative devices and equipment were also influential, whereas health care consumers played a minor role (20).

Health maintenance organizations (HMOs), which often require insurer approval of costly procedures, have the potential to reduce the spread of new technologies. Areas of the United States in which HMOs have greater market penetration experienced slower diffusion of magnetic resonance imaging into hospitals between 1983 and 1993, markedly lower rates of use of magnetic resonance imaging (12), and lower rates of coronary angioplasty among Medicare patients in 1984 and 1991 (7). Although the number of coronary revascularization procedures per capita was lower in HMOs than in fee-for-service plans, the rate of growth was equal in the 2 systems (26). These studies suggest that at a given point in time, HMOs have lower rates of use of new technology but that over time, these rates increase as rapidly as those in fee-for-service settings (7).

In summary, technologic advance is a major driver of health care costs. Overall, these advances improve quality but create major increases in expenditures. A technology can be overused if it is offered to patients for whom the innovations provide no benefit.

#### **PERSPECTIVE 5: HIGH COSTS RESULT IN PART FROM EXCESSIVE ADMINISTRATIVE EXPENDITURES**

In 1999, the cost of administration of U.S. health care was 24% of total national expenditures on health care (27). Administrative costs in the United States exceeded those of

Germany by \$360 per capita (11) in 1990 and were \$489 to \$752 (depending on method of analysis) per capita higher than those in Canada (27, 28) in 1999.

In 2002, the administrative costs of the federal Medicare program were 3% of the program's total budget, whereas those of the federal and state Medicaid program were 6.7%. These figures compare with 12.8% of total revenues for private health insurance plans (29). Not only do private health insurance companies spend more on administration than do public insurers, but the multiplicity of insurers, public and private, places a large administrative burden (especially for billing) on hospitals and physicians (27).

One reason for the low administrative costs of Medicare is a lack of advertising and marketing expenses. Moreover, the administrative apparatus of Medicare pays roughly 1 employee per 10 000 beneficiaries, whereas most large private insurers hire 15 or more employees per 10 000 enrollees (27, 30). An organization that is an exception in terms of the relatively high administrative costs of private insurers is the Kaiser Foundation Health Plan. This group-model HMO has self-reported administrative costs of about 4%. The low administrative overhead is related to the plan's financing of its own hospitals and physician groups through global budgets, which avoids expensive fee-for-service billing functions. It appears that more integrated and planned financing and delivery institutions—whether public (Medicare) or private (the Kaiser Foundation Health Plan)—can more successfully reduce administrative costs.

If U.S. administrative costs were suddenly reduced through a major simplification of the insurance system, tens of billions of dollars could be saved. If this simplification contains other cost-control measures, the rate of growth of total health expenditures could be reduced.

#### **PERSPECTIVE 6: COSTS ARE RISING RAPIDLY BECAUSE THE U.S. HEALTH CARE SYSTEM LACKS STRONG COST-CONTAINMENT MEASURES**

Many analysts perceive that spending on health care in the United States is high and rising because the entire system lacks structures to contain costs (31–35). This viewpoint does not negate the importance of technology innovation (see perspective 4) but argues that the lack of control over expenditures means that new technology has a larger impact on cost growth.

Effective cost containment requires that payers of health services adopt expenditure controls: that is, a limitation on the total amount of money available for health care services. Expenditure controls, while highly controversial, are effective. Two mechanisms of expenditure controls are expenditure caps and global budgets.

##### **Expenditure Caps**

In health care systems that pay physicians on a fee-for-service basis, controls on physician fees may cause physi-

icians to increase the volume of services provided, presumably to protect their incomes (36–38). To prevent “volume creep,” Canada and Germany have tied increases in physician fees to the quantity of physician services. Canadian provinces may set expenditure caps for physician services; if physicians increase the number of visits and procedures, the physician fee per visit or procedure is reduced later in the year to prevent physician payments from exceeding the yearly cap (39). In Germany, regional consortia of insurance funds, governments, hospitals, and physician organizations negotiate caps on physician expenditures by using similar formulas (40).

The U.S. Medicare program legislated a similar program in 1989, first called volume performance standards and now called the sustainable growth rate mechanism. This program is not a strict expenditure cap but rather a loose expenditure target. Under this program, if actual growth in physician spending exceeds a target amount, future updates to physician fees are reduced by that amount. An oversimplified example is as follows: Suppose that last year’s spending target was a 10% increase, but the actual increase was 15%. If this year’s target were set at a 5% increase, physician fees would not increase this year (41). According to Medicare data, this expenditure target mechanism was associated with a reduced average annual rate of growth of Medicare physician expenditures from 13.9% during the 1980s to 6.7% from 1990 to 1998 (42).

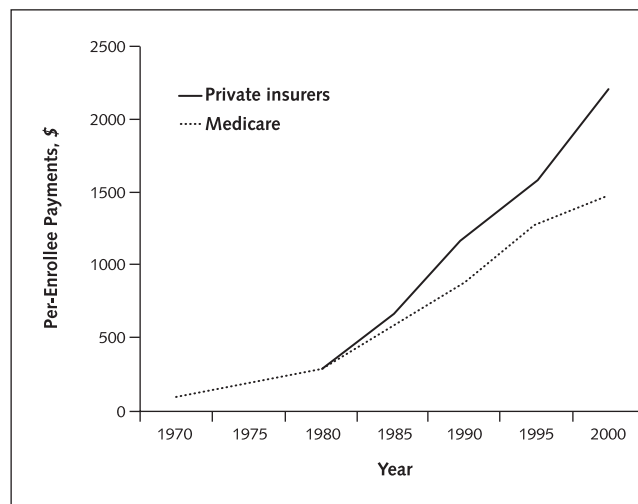
The implementation of Medicare expenditure targets has perpetuated inequities in payment between physicians in different specialties and geographic regions (43). Moreover, physician expenditure targets have little impact on overall national health expenditures because they apply only to Medicare rather than to all physician care and they do not affect hospital, pharmaceutical, and other services (41). These limitations notwithstanding, the ability of the public Medicare program to control costs more successfully than the private insurance sector is demonstrated by the lower cumulative rate of growth of Medicare spending between 1970 and 2000 (Figure) (44).

### Global Budgets

In a globally budgeted system, expenditures for all services within the budget are set in advance. The budgets may set an overall figure or may specify expenditure limits on different components of a health institution or health system. The National Health Service of the United Kingdom is a globally budgeted system. Canada pays hospitals, but not physician services or pharmaceutical products, by global budgets. In the United States, the Veterans Affairs hospitals are paid through global budgets. Although the amount of a global budget could be unilaterally set by payers, most global budgets in Canada and Europe are negotiated between payers and providers (45).

Global budgeting of hospitals in Canada has been associated with slower growth of hospital spending in Canada compared with the United States (41). The National

**Figure. Cumulative growth in per enrollee payments for personal health care, Medicare, and private insurers, 1970 to 2000.\***



\*Reference 44.

Health Service of the United Kingdom has held per capita expenditures very low. Global budgets can control expenditures because unless payers relent and allow a supplemental budget later in the annual cycle, the cost of services may not exceed the budgeted amount. Nations with global budgets may have difficulty controlling expenditure growth because of pressure from health providers and patients. To prevent global budgets from growing inexorably, nations may place limits on hospital bed supply, diffusion of new technologies, capital improvements, and the number of new physicians entering the workforce (45).

Effective global budgets require a single payer of health services or close cooperation among multiple payers, conditions that give payers strong bargaining power vis-à-vis providers. Advantages of globally budgeted systems are that they keep administrative costs low, do not require micromanagement by payers, and may delegate to providers the authority to determine how the budget will be allocated. Disadvantages are that the budget may be too small to allow high-quality accessible care, decisions on which hospitals or physician groupings should receive how much money are complex, and budgets can be politicized by special interests (40, 45). International comparisons demonstrate that new technologies are introduced more slowly in globally budgeted systems but often catch up over time (46).

### CONCLUSION

The first half of this article focused on a potent driver of health care costs—innovative technologies—whereas the second half examined a similarly potent mechanism for controlling costs: limiting the amount of funds available for health care services through expenditure controls or

global budgets. In nations (such as Canada) and systems (such as HMOs) with tight budgetary controls, technologic advance is slower to develop but eventually drives costs upward. The imperative to innovate overcomes the effort to economize.

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