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# COST CONTAINMENT AND INCENTIVES FOR TECHNOLOGY

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**Prologue:** *Medical technology is seemingly never far from the center of the health policy debate. Under the cost-based reimbursement approach that has been the mainstay of financing health services for decades, the development and diffusion of technology flourished because its costs were passed through to third-party payers. With the reversal of economic incentives that ensued with the introduction of Medicare's prospective payment system, the future of medical technology has been cast in some doubt. Economists Louis Garrison and Gail Wilensky of Project HOPE's Center for Health Affairs discuss this issue and its implications for technology. They set out a number of options that could ameliorate the impact of prospective payment on the appropriate development and diffusion of technology. Garrison, who holds a doctorate in economics from Stanford University, is knowledgeable about medical technology as a consequence of his work at the Battelle Institute. At Battelle, Garrison devoted much of his time to its massive study on heart transplantation, which was funded by the Health Care Financing Administration. Since joining Project HOPE two years ago, Garrison has performed studies for the Prospective Payment Assessment Commission assessing the impact of hospital payment by diagnosis-related groups. Wilensky is director of HOPE's Center for Health Affairs. A nationally recognized health services researcher and policy analyst, Wilensky holds a doctorate in economics from the University of Michigan. She was instrumental in the design and management of the National Medical Care Expenditures Survey while she worked (1975-83) at the National Center for Health Services Research.*

Over the past decade, medical technology has alternately been called the culprit and the benefactor—responsible for both rising medical care expenditures and for increasing health status and improvements in life expectancy. That health care costs have increased at a rapid and sustained rate is undisputed: real per capita health expenditures grew at an average annual rate of 3.1 percent between 1965 and 1984.<sup>1</sup> While most of the increase has been attributed to the general level of inflation, 40 percent of the increase has been attributed to such factors as inflation in the medical care sector, increased utilization, increased intensity of services, and aging of the population. Technology has been implicated in all but the latter.

Specific estimates about the role of technology and increasing costs have varied substantially. A Sun Valley Conference in the late 1970s indicated that as much as 20-40 percent of the incremental hospital care costs during 1966-76 might be attributable to technology. More recently, Showstack and colleagues reported a distinct shift in the types of technologies associated with cost increases.<sup>2</sup> Both found that the increases in costs in the 1960s and early 1970s were associated with “little ticket” technologies such as laboratory tests, diagnostic x-rays, and electrocardiograms. In contrast, both found that the increases in the 1970s were associated with new and expensive “big ticket” technologies such as new modes of treatment for breast cancer and myocardial infarction and the increased performance of cesarean deliveries. Both of these studies, however, were based on very limited samples.

While the specific increases attributable to technology have been in dispute, the incentives associated with the reimbursement system have not. In the past, all incentives were to use any new, apparently safe technology that was likely to be medically beneficial. This reflected an interest by providers in giving patients the best care possible, concerns about the potential for medical malpractice, a technologically oriented environment, and a conducive third-party reimbursement system. Many believe that the high cost and rapid rates of increase associated with this type of system have been the seeds of its own undoing. The Medicare Prospective Payment System (PPS) and other cost-containment measures of the 1980s were introduced to limit further expenditure increases.

The adoption of prospective hospital payment and other health care cost-containment strategies can have a powerful impact on both the diffusion of new technology and on its development. The purpose of this article is to review the incentives associated with various reimbursement systems and to consider a series of policy modifications within prospective payment and alternatives which may have less negative implications for technology.

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## Defining Appropriate Technology

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The term “medical technology” can be defined as devices, drugs, and associated medical procedures. A broader definition used by the congressional Office of Technology Assessment (OTA) includes drugs, devices, and procedures as well as the organizational and support systems within which medical care is provided, which accords with the usual economic concept of a technology. We, however, will use the term in the narrower sense.

A technological innovation, therefore, is any “new” device, drug, or associated medical procedure. While “new” may mean an entirely different entity than one which has occurred before, most innovations are general modifications and improvements of similar existing devices, that is, *incremental* changes. Intraocular lenses, hip prostheses, and cardiac pacemakers are examples of devices that have gradually evolved over time to their current form and are continuing to evolve. This fact of incremental change, rather than fundamental change, is an important feature to be considered with respect to the incentives of a reimbursement system regarding the adoption and diffusion of technologies.

Defining the appropriate rate of technological change is easy in the abstract, is somewhat more difficult in specific markets, and is particularly difficult in the medical care market. For the most part, resource allocation decisions in the United States are made in a consumer-oriented market economy. New products or technologies entering the market, whether they be new stereos or new foods, face a market test; if consumers find that their marginal value exceeds their marginal costs, then they will survive as products. The “appropriate” rate of product change or product innovation is the one indicated by the willingness of consumers to accept the changes as evidenced by their dollar votes.

When it comes to medical care, however, there is a general consensus that the medical care market is or should be different, although there is considerable dispute about just how different. The need and demand for medical care by consumers is very uncertain—depending on illness—and the production technology is complex. The consumer frequently lacks sufficient information to make knowledgeable choices about medical care use without the help of a physician or other agent. These differences between medical care and typical products have given rise not only to insurance but also to the web of regulation that surrounds the provision of medical care, particularly for quality assurance through professional regulation.

The most significant difference, however, relates to the widespread involvement of insurance and other third-party payers. The primary function of insurance is to spread risk of high medical expenditures. In practice, however, it has also taken on an important function of prepay-

ment. These two functions together have had a major impact in terms of subsidizing the use of medical care at the margin and have increased expenditures on health care over what they would be in the absence of insurance.

Another aspect of technological innovation that complicates the application of normal market tests is the problem of new information as an economic product. Economists are fond of pointing out that an unfettered market system would result in too little investment in new knowledge production because the benefits of that knowledge are not appropriable; that is, they would not be limited to the individual generating the new knowledge. The development of the patent system is a recognition of the fact that inventors are less inclined to develop new ideas and technologies and to share these ideas and technologies if they cannot be certain of some reward for their effort. Thus, innovators are granted temporary monopolies called patents as a subsidy to produce and disseminate products based on new ideas.

Although the patent system exists to encourage the growth of knowledge and technological innovation, it alone does not ensure that the appropriate amount of innovation will occur. Rather, innovation depends on the signals received from the market for final products. For products where the market works relatively well, and even where it works less well, the same general strategy applies: appropriate technology is that technology for which the value to members of society is at least equal to the cost to society. Determining that value, as evidenced by willingness to pay, becomes very complicated in an area as complex as medical care. The potential for medical insurance under a fee-for-service system to create excessive innovation should be apparent, especially when consumers do not face the full cost of health insurance premiums either because of tax subsidies or direct government subsidy.

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### **Incentives Under Different Payment Systems**

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A variety of reimbursement systems could be used to pay for inpatient hospital services and physician services. This article focuses on the incentives associated with the prospective payment system introduced in 1983 to pay for inpatient hospital services under Medicare. The incentives under PPS are compared first to the incentives under the cost-based, retrospective reimbursement system, which characterized the pre-1983 period and which is still used for most health services outside of the hospital and some inpatient services outside of Medicare.

Under cost-based third-party reimbursement systems, there was a general willingness to pay whatever the hospital and physician thought was necessary for the proper care of the patient, regardless of the cost. Some constraints were introduced in terms of coverage decisions. The coverage

process itself represents a complicated interaction among various individuals, agencies, and institutions rather than a straightforward, structured process. Drugs and devices (but not surgical procedures per se) are subject to regulation for safety and efficacy by the Food and Drug Administration (FDA). Once new technologies meet these standards and are competing for adoption in medical practice, the coverage decision can occur in one of three ways. First, a physician or hospital can simply substitute the new product for the old one. If it is not a significant departure from past practice, especially with regard to costs, it is unlikely to be reviewed by the insurance intermediary or carrier. Alternatively, the use of the new drug or device might be identified through an audit. A judgment would then be made as to whether it was "reasonable and necessary." The judgment might be made by the intermediary on its own, or the intermediary may request that the Health Care Financing Administration (HCFA) make a decision. HCFA in turn may make the decision on its own or seek opinions from other government agencies about the reasonableness and necessity of care. Under cost-based reimbursement, however, once a decision regarding coverage was made, coverage determined that reimbursement would occur.

The result of this cost-based third-party reimbursement policy probably was a near-maximum growth rate in the demand for new technologies to treat the elderly. Although there has been some general theoretical discussion about whether insurance per se necessarily has a bias toward the adoption and development of cost-increasing as opposed to cost-decreasing technology, it seems clear that hospitals, doctors, and patients had every incentive to adopt cost-increasing technologies.<sup>3</sup> The almost two decades of rapid increases in Medicare expenditures led to the adoption of the PPS as a cost-containment strategy.

At the heart of the new system of reimbursement adopted by HCFA for inpatient hospital services is prospective payment based on 470 diagnosis-related groups (DRGs). The hospital receives a fixed payment for each Medicare patient and each DRG based on the expected cost of resources used in that DRG. The original relative weights of the DRGs were based on the estimated average costs to Medicare of patients treated in the various DRGs in 1981. A slight adjustment was made to these weights for fiscal year 1985, and a total reestimation of the relative resource costs used in the DRGs—a "recalibration"—was adopted for fiscal year 1986, based on relative charges for all Medicare patients in 1984. Thus, the original system reflected the technology in use in 1981, the so-called "recalibration lag," or time difference between when the resource costs are estimated and the time period for which they are used, has been shortened by the use of 1984 data.

In implementing this system, Congress gave only general guidelines on such issues as the recalibration lag and adjustments over time, leaving

many of the operational details to regulations under HCFA's authority. Congress did, however, appoint an independent body called the Prospective Payment Assessment Commission (ProPAC) in 1983 to perform a watchdog or oversight function. ProPAC's most important activity is to make recommendations to the Department of Health and Human Services regarding DRG classification and relative weights and to recommend the appropriate annual percentage change in payments for inpatient hospital care.

The switch from cost-based, retrospective reimbursement to prospective payment has resulted in a major change in the incentives hospitals face regarding the practice of medicine in general and the adoption of new technologies in particular. Under cost-based reimbursement, all of the major players—hospitals, patients, and physicians—were largely unconstrained in their use of resources. Prospective payment, however, creates two well-recognized incentives: minimizing per admission treatment costs for patients and expanding the number of admissions (at least in DRGs for which the payment exceeds the expected average cost). It should be noted that the incentive to minimize costs is only directed toward short-run treatment costs, that is, cost per admission, irrespective of the effects on long-run costs. There are also a variety of incentives to “game” the system through coding alterations, movement of treatment to an outpatient setting, patient readmission for later treatments, and so forth.

The incentives to minimize costs per admission represent the direct and intended incentives under the PPS. The incentives regarding technology are no less direct, though some of the effects may not be anticipated. Under PPS, hospitals have an incentive to adopt cost-saving technologies even if it adversely affects outcomes or quality of care, especially if the effect is not noticeable or measurable.

The major economic factor countering these incentives to minimize costs is the competition among hospitals and doctors to secure patients by providing high quality care. Thus, for competitive reasons, the hospital may be willing to acquire cost-increasing technologies that are also “quality-enhancing.” In addition, of course, professional ethics and liability for malpractice are also countervailing forces.

There are at least two other incentives related to technology that can be considered as unintended or indirect effects of PPS. First, there is an implicit incentive to target cost-increasing, quality-increasing innovations and even some existing accepted technologies into the noncontrolled settings, for example, outpatient departments and other ambulatory settings. The movement of cataract surgery from primarily an inpatient setting to primarily an outpatient setting is one example where the shift may result in higher expenditures rather than lower expenditures. Whether this shift occurred as the result of peer review organization

requirements or as a result of the financial incentives associated with the PPS is unclear.

A second indirect incentive is to purchase any technology that lowers operating costs even if the capital costs of the technology are higher than the capital costs of competing technologies. This will remain true as long as there is a capital pass-through, but it is not inherently part of a prospective payment system. A proposal for incorporating capital payments into PPS is currently under consideration.

Two provisions of the PPS are especially likely to affect the adoption of cost-increasing, quality-increasing technology over time. The first is the scientific and technological advancement provision of the Discretionary Adjustment Factor (DAF). This is the overall amount which ProPAC recommends regarding the rate at which Medicare's standardized amount should increase or decrease beyond inflation in the hospital market basket. For fiscal year 1987, for example, ProPAC has recommended an allowance of 0.7 percent for scientific and technological advancement, although the total DAF recommended is  $-0.5$ . The negative factor indicates that, on balance, productivity improvements and substitution in the site of service from inpatient to outpatient settings more than offset the increases attributable to the scientific and technological advancement and the real case-mix change. The second provision affecting the adoption and diffusion of technology over time involves the recalibration process and particularly the lag in recalibrating the DRG weights.

Both the recalibration process itself and the lag associated with it can have negative implications for the adoption of new technologies. Primarily because of data availability, the initial DRGs that went into effect in fiscal year 1984 reflected the medical technology and resource costs used in hospital practice in 1981.

The data requirements are indeed large since the calculation of weights requires information on both inpatient billings for particular services and for audited Medicare Cost Reports by hospitals. The main reason for the lag involves the time required to interpret and code hospitals' Medicare Cost Reports. To reduce the lag time, HCFA recently adopted a recalibration based on hospital charges rather than hospital costs, resulting in DRG weights for fiscal year 1986 based on fiscal 1984 charge data rather than on fiscal 1982 cost data. While the correlation between relative charges and relative costs appears quite high, the use of charges rather than costs will undoubtedly introduce some additional errors and biases.

The fact that the length of the lag used in the recalibration process will affect incentives regarding the adoption of new technology is obvious. What is less obvious is that the recalibration process itself also can have negative implications for the adoption of new technology because of a basic uncertainty that recalibration cannot fully remove: the hospital does not know whether its own adoption of a new technology will be

mirrored in the behavior of other hospitals. A hospital that acquires a cost-increasing, but quality-enhancing technology experiences a rise in its cost per case, reducing its profit margin in the short run. The expectation of the hospital is that in the next recalibration, the relative weight of the DRG will rise to reflect the use of the new technology. But the hospital also knows that if only a small number of hospitals adopt the cost-increasing innovation, thereby losing their surpluses on the given DRG, their losses could continue for a considerable period of time. Since their impact on the national average cost is likely to be minimal, individual hospitals may face considerable risk as leaders in the adoption of a new cost-increasing innovation. The innovating hospital will run the risk of losing money in the short term while other hospitals are gaining at its expense.

There are, however, some mitigating factors that will offset the increased risk facing innovating hospitals. These hospitals may be able to garner economies of scale within the DRG because of increased patient demand, or they may be able to increase their relative share of profitable DRG cases because of their reputation as innovating hospitals.

While it is difficult to measure the impact PPS has had on the adoption of new technologies to date, the concern is that many technologies with high initial costs that were adopted under Medicare prior to PPS would have been threatened under the new reimbursement system. Devices such as hip prostheses, cardiac pacemakers, and intraocular lenses were probably all cost-increasing during their initial phases. Via the process of incremental change, the real costs per unit have probably declined over time. Whether or not the emphasis on short-term, cost-reducing technologies will limit the development of innovations that are more effective in the long run is a concern.

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### Policy Options Under Prospective Payment

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Using the market principle as our guide, our objective is to establish a system that will produce the amount of technology society wants and is willing to pay for. This may be done by either modifying the PPS or using a different approach, such as capitation, that offers better incentives. Within the PPS, there are a number of possible modifications that differ from each other in terms of whether they provide targeted or generalized incentives and whether they are decentralized or centralized in their decision-making processes. These possible modifications give rise to at least five different policy options.

**(1) Shorten the recalibration lag.** The longer the recalibration lag, the longer the time until new technologies are reflected in the DRG payment structure. HCFA has already moved to shorten the time lag considerably by the use of charges rather than costs in the calibration process. While



any additional shortening of the recalibration lag would minimize the disincentives associated with this factor, the basic uncertainty of whether other hospitals will adopt the innovation remains. In addition, at some point the cost of recalibration may be greater than any gains from a more current relative price structure.

**(2) Increase the allowance for scientific and technological advances.** Each year ProPAC recommends an allowance for scientific and technological advances. Increasing the amount available in the aggregate allows a generalized recognition of the potential for cost-increasing but quality-enhancing technologies. The advantages of this mechanism are that it allows an individual hospital to choose the technologies that it thinks are most appropriate for its patients and its own delivery style. This mechanism, therefore, represents a decentralized decision-making process. The major disadvantage is that it does not target funds toward technologies that have the potential for becoming cost-effective in the long run; in fact, it does not target the additional funds for technological innovations in general. An old adage is that "money mingles," and providing an allowance for technological innovation does not necessarily mean that that is where the additional funds will be used.

**(3) Increase resources for detailed cost-benefit analyses.** A policy option that has gained considerable support in some circles is to increase the resources available for technology assessment and to use the results of the cost-benefit analyses as the basis for coverage decisions. This position has developed not only because of concern about unjustifiable variations in the utilization of some procedures, but also because of a concern about the lack of a systematic procedure used in making coverage decisions.<sup>4</sup>

Even among those who believe that the use of cost-benefit or cost-effectiveness studies would aid in decision making, there is considerable disagreement about who should do the analyses. Some have advocated a governmental unit such as the National Center for Health Care Technology Assessment or an independent scientific body such as the Institute of Medicine. While a variety of government agencies such as ProPAC, the Office of Health Technology Assessment in the Public Health Service, and the National Institutes of Health continue to perform at least limited types of technology assessment, there has been considerable opposition to the creation of a single national medical technology agency with responsibilities for in-depth technology assessment.

Those arguing against the increased use of cost-benefit analyses have pointed to the difficulties of reaching consensus on major new innovations, citing the longstanding arguments over coronary artery surgery as a good example. Attempting to reach consensus is costly, time-consuming, and—many believe—futile since new technologies arise and alter the indications for use of the technology under study. The problem is further

complicated because cost-effectiveness frequently depends on the particular indications of the patient upon whom the technology is applied and the circumstances associated with that application, rather than on the technology per se.

Many are also concerned that the use of a centralized regulatory approach will stifle the adoption of new innovations because of the complexity and rapid evolution of medical technology as well as the large volume of relevant technological innovations. They recognize, however, that unlike the use of the scientific and technological allowance, the use of cost-benefit and cost-effectiveness analyses does target increased funding for specific technological innovations.

**(4) Use decentralized mechanisms to target additional funds for specific technologies.** An option that is more targeted than the use of the allowance for scientific and technological advancement is the use of an exemption or a pass-through system for the marginal cost of new technology. This would be done as a way of providing additional funds for the adoption of a new technology during a trial period. Once the trial period ends, the use of the new technology would be reflected in the recalibration process if it had been adopted by a large number of hospitals; otherwise, it would be deemed inappropriate for further funding unless a centralized decision was made to the contrary.

A bill recently introduced by Sens. David Durenberger (R-MN) and Lloyd Bentsen (D-TX) provides an example of a decentralized, targeted approach. Under their bill, HCFA would grant automatic but temporary coverage to any technology that has been approved by the FDA. Medicare would pay 60 percent of the additional cost incurred as a result of the technology, defined as cost above 110 percent of the DRG payment. Data would be provided during the two-year trial period regarding the technology's efficacy and cost, after which HCFA would decide whether or not to make coverage permanent.

While the Durenberger-Bentsen bill is only one example of a decentralized, targeted subsidy strategy, it illustrates both the advantages and disadvantages of such an approach. The primary advantages of such a system are that it targets increased funding to specific new technologies rather than providing only generalized increased funding. It also operates in a decentralized manner, obviating the need for a centralized, bureaucratic decision-making process prior to the trial period. If put to work in the manner of the Durenberger-Bentsen bill, the trial period will provide data for making cost-effectiveness decisions in the future.

There are, however, at least two major disadvantages to this approach. The first is that it imposes major informational requirements: targeted technologies must be identified, and their costs estimated. Estimating the cost incurred as a result of the new technology so that the hospital could be reimbursed for 60 percent is not an easy or obvious task. The cost of

new technologies depends on the degree of competition within the local hospital market and on the availability of substitutes; the cost is not simply determined by the manufacturer's cost of producing the technology. The second disadvantage is that it may not produce new technologies that "pass the market test." If it is just a matter of whether or not the technology is adopted after the trial period by a majority of hospitals, there is no indication that this represents an increased cost which society is willing to bear. If the outcomes are subject to a cost-effectiveness or cost-benefit analysis, this will provide information as to whether or not the benefits are at least as great as the cost, but will also require the creation of an expert panel either inside or outside the government to decide the issue.

**(5) Permit hospitals to use a supplemental charge schedule.** Hospitals currently must "accept assignment" for all Medicare patients and are not allowed the option of charging a higher rate—as physicians are permitted to do. It would be possible to allow hospitals to charge additional amounts, either in general or for specific DRGs which incorporate new technology.

There are obvious advantages and disadvantages to the use of supplementation. Under a targeted supplementation approach where hospitals could only charge extra for DRGs using new technologies—the amount of supplementation would be limited but could provide additional funds for quality-increasing, cost-increasing technologies. The decision as to whether the new technology was worth an additional cost would be made by the market: hospitals could charge more and receive more only if they could make a convincing case that the new technology was worth the additional cost. A disadvantage of the targeted supplementation is that it requires more information to determine whether or not a technology is "new" and is therefore cumbersome to implement. The use of supplementation, even in the targeted sense, also raises concern about access to care as well as introducing cost-inflationary incentives.

The use of generalized supplementation, that is, allowing hospitals to charge additional costs for DRGs whether or not they have introduced new technologies, removes the additional information requirements but would exacerbate the cost-inflationary incentives of supplementation and could well reduce access to care. However, only supplementation requires new technology to face a true market test.

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### Policy Options Under Capitation

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While few disagree that the cost incentives under PPS are preferable to those associated with a cost-based, retrospective payment system, there is substantial disagreement as to whether a DRG-based PPS is the desired long-term reimbursement system for U.S. hospitals and other facilities. The major alternative under discussion today is some form of a capitated

system. The ability of Medicare beneficiaries to choose a health maintenance organization (HMO) or a competitive medical plan (CMP) and have that capitated system be paid an amount based on the average cost of "similarly circumstanced" individuals in that area is the first step along the road to capitation. While there are distinct differences in the incentives regarding the adoption of technology under capitation versus PPS, there are several similarities as well.

A capitated system would offer substantially more flexibility for the adoption of technologies that might be cost-increasing in the short run but cost-effective in the long run. That occurs because the payment system is based on an average amount for a longer time period, frequently for a year, rather than an average amount per admission. This would permit a more decentralized system of technology evaluation. The major similarity with the PPS, however, is that under capitation there also is a disincentive to adopt cost-increasing, quality-enhancing technologies. The reason is that the capitated health plan faces a strong incentive to minimize the total cost of care, given the fixed payment amount it is scheduled to receive. However, like hospitals under the PPS, competition among health plans for patients and doctors may lead HMOs and CMPs in competitive market areas to adopt cost-increasing, quality-enhancing technologies to improve their market positions. In markets where plans have either monopolies or strong market positions, however, relying on the effects of competition may be insufficient to offset the monetary disincentives to adopting cost-increasing, quality-enhancing technologies.

As under the PPS, the primary way to subject the adoption of new technology to a market test under capitation is to allow for supplementation. This is less of a radical concept for capitated schemes than it is for prospective payment. Under current rules, HMOs and CMPs can offer Medicare beneficiaries additional benefits, either at the average cost paid by Medicare or for a supplemental amount paid by the beneficiary. Thus, the beneficiary is able to decide whether the additional benefits warrant any additional expenditures.

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## Conclusion

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To summarize, under both capitation and prospective payment, the best direct market test available is to permit supplementation. Permitting hospitals to use supplementary charges, either on a DRG-specific basis or on a more generalized basis, would give them an opportunity to adopt new technologies and put them to a market test, but is likely to alter access to care and to create cost-inflationary incentives. Permitting supplementation under capitation, as we do for Medicare risk-based HMOs and physician care purchased by Medicare beneficiaries, is the most

direct way to allow technological innovation to face a market test. If these approaches are not politically or operationally feasible, the decentralized mechanisms as embodied by the Durenberger-Bentsen bill limit the disincentives associated with cost-increasing, quality-enhancing technologies in the short run and permit a more orderly process of decision making for coverage in the long run. However, the information requirements and need for centralized decision making under such a system should not be minimized.

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#### NOTES

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