EDITORIAL

Academic-industrial relationships

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THE MOST FUNDAMENTAL question facing the health care system in the next decade is the funding of patient care, teaching, and research. The importance of the question cannot be overemphasized in light of the steady and seemingly inexorable growth in the percentage of our gross national product allocated to health care. Although the causes are many, each explicable in its own right, the total amount of money being spent for health care has attracted the concern of all elements of our society — government, labor, business, and consumer. Truly, the cost of health care has become an ongoing national concern and a national priority in terms of bringing it under control.

The current environment. In examining the past, it is clear that the growth of entitlement programs and the explosion of medical knowledge and technology have been the major reasons for the rising cost of health care. This is clearly reflected by figure 1, which depicts the human welfare surge between 1965 and 1976 through the surrogate of growth of governmental responsibilities. That growth, while continuing between 1977 and 1995, will not increase at the same rate, and indeed, the current attitude of nongovernmental insurers and the government itself is adequate testimony to a commitment to control this rate of growth. Thus resources will be constrained. Concomitantly and contrary to the conventional wisdom of the late 1960s and 1970s, there will be a steadily increasing supply of physicians competing for this limited pool of resources, both in the general and the specialty fields (figure 2).

Moreover, if history can be our guide in terms of scientific inquiry, there will be a similar increase in the supply of various technologies as science makes further discoveries in terms of both curing and palliating the effects of disease. With more technologies available it can only follow logically that there will be greater utilization of these technologies. At the same time, our population is steadily growing older. The number of hospitalized patients over 65 in 1980 reached a little over 9 million and is projected to be over 12 million in 1995. The accuracy of these numbers is not the major point; the implications of this demographic trend are. The demand for care for an increasingly elderly population in the hospital setting is unavoidable. A particular concern is the well-recognized fact that per capita expenditures for the elderly in the past have been double those for people under age 65 and as much as eight times that for people under age 18. More illuminating and disturbing, however, is the observation that while only 10.9% of the population in 1978 could be classified as elderly, this group consumed nearly one-third of the nation’s health care resources.* Thus, as the elderly population increases, it will consume an even more disproportionate share of health care resources.

The result. Measures to influence the rising health care bill have until now involved imposition of regulation in one form or another — rate regulation in certain states, various contractual arrangements based on capitation, or more recently, diagnostic related groups (DRGs) and prospective rate determination. The easiest and most finite target for regulation, of course, is the hospital. This setting has been and will continue to be the major focus of regulation, since hospital expenditures account for more than 40% of the nation’s health care bill. However, with increasing limitation on an institution’s ability to generate revenues, teaching hospitals in particular will have increasing difficulty in maintaining their financial integrity. Because they are tertiary and high technology in their orientation and hence very expensive, they will continue to attract those patients most critically ill and whose cost of illness is therefore the greatest. In this time of DRGs when reimbursement is finite for most hospitals, there will be a greater tendency for the nonteaching hospitals to refer the most seriously ill patients to tertiary care hospitals, which then will necessarily bear the heavy financial burden for their care. To the extent that teaching hospitals are already tertiary, such behavior in other parts of the delivery system will make them even

more so with the passage of time, an effect driven almost exclusively by economic forces.

Of great concern in this milieu is the fact that teaching hospitals have traditionally been the haven for the poor and for the well-to-do. There has been essentially an "open door policy" reflected by these hospitals accepting patients for care regardless of ability to pay. In the new setting of DRGs, these hospitals, in an effort to maintain their fiscal integrity to survive, may rethink this policy and those patients who cannot pay for medical care or whose medical insurance is limited may not receive the care they require.

Furthermore, it would not be surprising to see a number of hospitals closing. Admissions projected for the nation's hospitals in the years 1983 to 1995 show a steady decrease during this interval, rendering a number of hospitals unnecessary and fiscally nonviable.

As hospitals experience increasing financial pressure they will place greater emphasis on delivering more care in such settings as the ambulatory clinic and the home. Alternative delivery systems will provide competitive choices: health maintenance organizations, preferred provider organizations, and independent practice associations to name three. Various projections suggest that as much as 25% of the population will receive care from such organizations in 1995.* Different sites of practice, such as emergency centers, ambulatory surgery centers, outpatient dialysis programs, and outpatient alcohol-abuse programs will become the order of the day. Figure 3 illustrates the anticipated range of alternatives.†

Such an environment will elicit from hospitals and physicians a response of intense interest in and commitment to generating as much revenue as possible. The reimbursement system reflected by DRGs in par-

†Goldsmith, p 17.
ticular will effectively limit the potential for institutions and practitioners to generate more revenue and will require increased efficiency to break even financially. While there is some opportunity to obtain revenue surplus through more efficient handling of cases with DRGs, that opportunity is greatest in the community hospital, not in the tertiary care hospitals where the patients are sickest. Indeed, as pointed out before, the tertiary care hospital is the institution at greatest risk under a strict prospective payment system. To ensure survival, the tertiary care hospitals must become more than referral centers. Fortunately, these organizations have been the sites of much innovation. They will now be compelled to develop their own active marketing programs designed to attract less seriously ill patients. Ambulatory programs operating under contractual relationships will be emphasized as a means to ensure a steady patient referral base. Opportunities for investment outside the field of health care will be explored by institutions lacking prior experience. In fact, throughout the United States examples exists of hospitals that have invested in shopping centers, real estate, and other forms of business that are at best only distantly related to delivery of health care. In essence, the character and face of hospitals is changing and will continue to change as they necessarily become more revenue conscious, more oriented toward expense control, and more fiscally driven than at any previous time.

All of this is not necessarily bad. Greater attention to the way in which hospitals are managed as operating entities should result in some improvements. Manage-

ment capacity will be expanded, costs more closely identified, and greater emphasis will be placed on daily control of operational expense. The most successful hospitals will be those in which the physicians are brought into the management process, for the physician must, does, and will control the way the greatest portion of the hospital dollar is spent. Therefore, to obtain the most effective system of expense control and revenue generation, the physician must become a prime participant in the management process. Until recently that role has been relatively foreign to physicians, but in the next decade the successful organizations will be those whose physicians are cognizant of the problem and participate in deriving and implementing the solutions.

A significant indicator of future success will be found in the effectiveness of decisions concerning adoption and utilization of technology. Such decisions will have increasing impact as technologies become more expensive and the array of options more extensive. With reimbursement limitations, the adoption of new technologies will become very selective. Furthermore, hospitals will have to engage in greater sharing of expensive technologies. Institutional sharing of service delivery often has been considered in the hospital world but has been carried out infrequently. That pattern will have to change. A single organization will no longer be able to sustain a technology simply because it is more convenient to deliver a service on-site. Reasonable compromises can be made by sharing technologies through off-site mechanisms, such as van transport of patients or even transporting the technology to the patient. More technology will migrate from the hospital to the ambulatory care areas. Physicians will develop entrepreneurial systems to provide specialty care through group networks and contracting to hospitals or to corporations for their services. Given the innovative spirit that physicians possess, it is impossible to predict how imaginative those approaches to delivering health care may become and how many will ultimately prove acceptable to the population.

**Medical technology of the future.** Without question, as patterns of practice respond to fiscal constraints, the major impetus in developing new and expanded technology for the future will be toward the ambulatory care area. These technologies will emphasize noninvasive diagnostic procedures such as ultrasound, digital radiography, and nuclear magnetic resonance. Fiberoptic endoscopy and cardiac catheterization will be provided routinely in the ambulatory setting. Furthermore, there will be greater utilization of ambulatory surgical facilities aided by relatively nontraumatic
technologies employing endoscopes, lasers, and electrocautery.

There will still be abundant reason for hospitals to increase and better their technologies, but such adoption will be selective and based not only on how a technology fits into the health care mission of the hospital, but also on its associated costs remaining within the required expense controls. Technologies subject to rigorous analysis and selective adoption will include organ transplantation, new techniques of therapy for the individual patient (e.g., monoclonal antibodies) and the "big ticket" technologies such as nuclear magnetic resonance, positron emission tomography, and lithotriptor therapy.

The role of industry. The future role of industry will be determined by the direction in which the health care system is moving. Industry will respond to the changing needs of that system. Thus it is not surprising that even now industry is placing increased emphasis on technologies to be used in the ambulatory care setting. The new "big ticket" technologies mentioned earlier are being developed by those companies capable of mounting the large capital intensive research effort required to produce and service technologies in the setting in which they can be used most effectively, namely the hospitals. It is important to understand that industry, much like the hospitals, has to define its business and thus to be more selective in its developmental efforts because of the rising expense for research and development. Indeed, in the pharmaceutical industry it is not unusual to spend $50 to $100 million to bring a major new product to market. Not surprisingly, corporate research and development costs are determined and apportioned in a manner similar to that seen in the health care setting. Thus those industries that know both the business they are in and then redefine that business correctly in terms of the trends evident in the health care marketplace will be the most successful. Revenue generation and expense control are no less important to the executive leaders of corporations than to the trustees and executives of hospitals.

The strategy of industry, therefore, is largely reactive to the discoveries and needs of academia and the practicing physicians. To practice this strategy successfully, corporations will develop even closer ties with the academic research community than have existed in the past through a variety of relationships. Table 1 illustrates a likely spectrum. Once a discovery has been made that may have commercial potential, the company affected must not only have patent protection but also must determine through market research whether or not a market exists that is sufficiently large to sustain commercial development. Making a "one of a kind" technology, no matter how beneficial it is to an individual, is not a strategy that a company can follow successfully and perpetuate itself as a sound fiscal entity. In addition to identifying the market, there must be reasonable assurance of adequate and continuing reimbursement to sustain a technology once it is introduced into the medical marketplace. Finally, as technology is developed and tested, industry will become more and more dependent on collaborative research and development efforts with clinical research centers because of their extensive existing capacity, which industry needs and cannot replicate.

The key to successful industrial effort obviously lies in the making of products that are useful to our society. Out of this comes the profits that produce funds for new research and hence new products. Thus, to benefit society in our free enterprise system, research and the profit motive truly go hand in hand.

Adoption of technology. Two factors will be critical to the success of the hospital in the future: the wisdom with which they define what their health care mission is (i.e., their business) and the effectiveness of their decision making process for adoption of technology. Unfortunately the decisions will be fundamentally dollar driven. To make the best decisions will require consensus of the users, namely the physicians. The process bringing about the best decisions must involve some risk sharing on the part of the users. In the past, with constrained reimbursement, the major incentive on the part of the users to participate in the technology adoption process was essentially negative, expressed

**TABLE 1**

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<th>Academic-industrial research relationships</th>
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<tr>
<td>I. Defined by mission of each</td>
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<tr>
<td>II. Academia — major emphasis and strength in basic and clinical research</td>
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<tr>
<td>Industry — major strength in developmental research and commercializing products</td>
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<tr>
<td>Together — high potential</td>
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<tr>
<td>Success depends on the being mutually beneficial</td>
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<tr>
<td>III. Representative opportunities for interaction</td>
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<tr>
<td>Individual consultation to industry</td>
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<tr>
<td>Institutional consultation to industry</td>
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<td>Contractual relationships</td>
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<tr>
<td>Basic research (e.g., Hoechst-MGH, Monsanto-Washington University, Dupont-Harvard)</td>
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<tr>
<td>Applied research: drug testing, equipment evaluation</td>
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<td>Philanthropic support from industrial sources</td>
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<tr>
<td>Entrepreneurial development: formation of new corporations by medical researchers with venture capital support</td>
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by elimination of individual services when there was insufficient revenue generated to continue them. This reactive process did not have a major effect on the broad user population but only on selected groups. Even here the effect may not have been deleterious, since it often led to closing marginal services. However, as resources become more limited, the cuts can have a major impact on the hospital. The most powerful positive modifier to medical behavior would be to link physician reimbursement to the way the hospital is used. Such an approach would provide a powerful incentive for the physician to modify his behavior toward utilization of the hospital. Furthermore, physicians would take a greater interest in the decisions reached to adopt and use specific technologies. Industry's role in this process will be expressed only in the evaluative process for technology adoption, that is, through making information available relative to the utility of specific technologies in a particular health care setting.

The role of the researcher. The role of the medical researcher in the hospital setting has traditionally been that of an innovator and an early user. Now as the impact of technologies becomes of greater significance because of the expense involved, the researcher will function more and more as an evaluator of technology and as a consultant, not only to the hospital, but also to industry. The mission of the researcher is no longer limited, therefore, to acting as an innovator and transfer agent for technology. It will include providing advice regarding the potential utilization of technology and how best to apply technologies to diagnosis and treatment in the most cost-effective manner. Thus the researcher will play an increasingly important and key role in the mission of a hospital as it carries out its mission of health care delivery and maintains its fiscal integrity.

Summary and conclusion. In conclusion, it is obvious that the delivery system for medical care is changing much faster than anticipated. Technology is the agent in this process and economics is both the driving and the limiting force: driving because it is the impetus to change the sites of medical practice, limiting because of the constrained number of dollars to allocate to technology acquisition and operation. As we move into the future, it cannot be emphasized too strongly that hospitals and industry should be complementary in this process. To do so successfully requires an understanding of the mission each seeks to pursue and of what each can do for the other.
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