

Directions for Research In the Academic Health Center

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Despite extraordinary advances in medicine and in biological science, our society is today confronted with health problems, many of which appear far more formidable than those of a quarter of a century ago. Indeed, as measured by age-specific death rates, the health of American males has been worsening in the past decade. Access to health care remains difficult for large sectors of our population and unavailable to some. Costs for all mount steadily. Surely, these realities help explain why the public and the Congress on occasion seem unimpressed with the performance of those of us in academic medicine.

Many past successes in medical research are ascribable to the strengths of the partnership that has developed between medicine and the biological sciences. However, similar bridges have not been built with other disciplines within and outside the university, and the nature of many of today's principal health problems reflects in part this failure. Approaches to these problems and the evolution of the medical school into the academic health center require such bridges and, therefore, a considerable broadening

not only of teaching and service functions but also of research activities.

I shall consider certain recent research accomplishments and weigh the health benefits of some. I shall then attempt to identify areas of neglect in the past and some research objectives worthy of major effort in the decade ahead. I shall point out that the research to be done requires involvement of many disciplines in addition to the biological sciences, that development as well as research must have our attention, and that new institutional arrangements will be required. Finally, we must ensure a continuing dialogue with the public and their representatives so that society can set intelligent priorities based on reasonable expectations rather than on hope. Our failure to do so may lead to a continued diversion of major intellectual and financial resources into areas that differ sharply from those that most of us consider to be in greatest need of attention and most likely to bring benefits.

Achievements of Research Programs

In the past two decades total support for biomedical research in the United States has increased from \$160 million to almost 2.7 billion annually and federal support from \$75 million to \$1.65 billion. The returns on this investment by any standard have been extraordinary. To cite

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but a few examples, poliomyelitis and measles, among the infectious diseases, and hemolytic disease of the newborn can be prevented; a start has been made in the drug treatment of viral illness; excessive and inadequate function of most endocrine glands can now be recognized and managed relatively simply; transplanted kidneys can be made to survive in most recipients, and the information learned about tissue rejection will have great importance in our approach to many other diseases, very likely including cancer; major advances in our understanding of the circulation, in anesthesia, in technical aspects of surgery and radiology, and in blood transfusion help make possible reconstruction of critical parts of the heart and blood vessels.

In virtually every medical specialty, important achievements have taken place and patient benefit has ensued. There is probably no better example than research on antibiotics. Progress in this sphere reflects one remarkable triumph after another. The immediate benefits are visible almost everywhere—most bacterial infections can now be readily managed. Further, the effects of these drugs on health extend far beyond their tremendous impact on bacterial disease. Their role in promoting our understanding of the synthesis of protein and nucleic acids, of other metabolic pathways, and of genetics, to cite but a few examples, is already providing profoundly important insights into the mechanisms of many diseases.

Perhaps as important as its contributions to knowledge have been the rigor and the discipline that biological science has engendered in medicine. Biomedical research has helped provide a solid base of scientific critique to medical education and medical care.

Deficiencies of Research Program

With this record of biomedical research and the translation of the products of our research into medical care and medical education, one may reasonably ask what has gone wrong in our health care system. Why, for example, has the slope of death rates over time turned from negative to positive for American males and from negative to zero for females? Why do so many of our citizens have inadequate health care? Why have costs of all care been rising so rapidly? The reasons are clearly many and complicated and beyond simplistic (or even complicated) exposition. In the context of this talk, the first and most obvious is that, however many and effective, the results of medical research are but one of many factors that affect health. However, this surely does not excuse those of us who have been responsible for directions in research from a share in the responsibility for the present state of the nation's health. Indeed, I do think that we have not always fully perceived the effect of nonmedical factors on health and communicated this perception and its implications to the public. Further, we are responsible for setting the boundaries to our research, and, in general, we have kept outside these boundaries research on the quality or effectiveness of patient care. Finally, we have, in general, not considered development—that is, the translation of our present knowledge into effective operating systems—to be among our responsibilities. Like others in the university, we have tended to believe that our task included conceptualization and research but that application would follow automatically. In fact, that has not always been the case, and a part of our present difficulty stems from this defect.

The effects of nonmedical factors on health can be demonstrated in both a positive and a negative sense. The positive

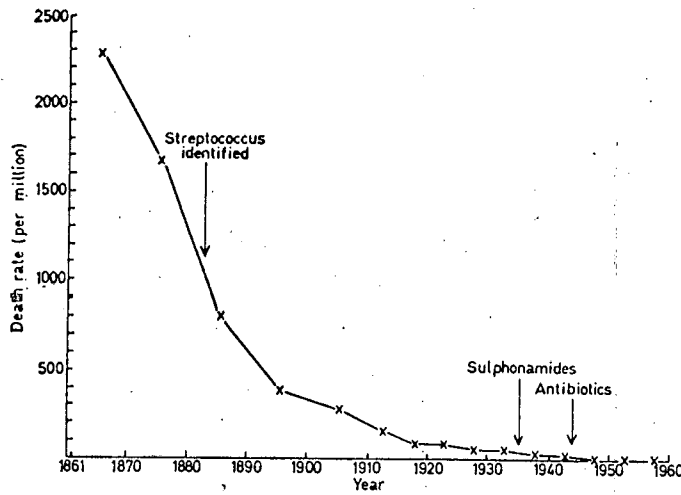


FIGURE 1
Scarlet fever mean annual death rate in children under 15: England and Wales. Reprinted with permission (1)

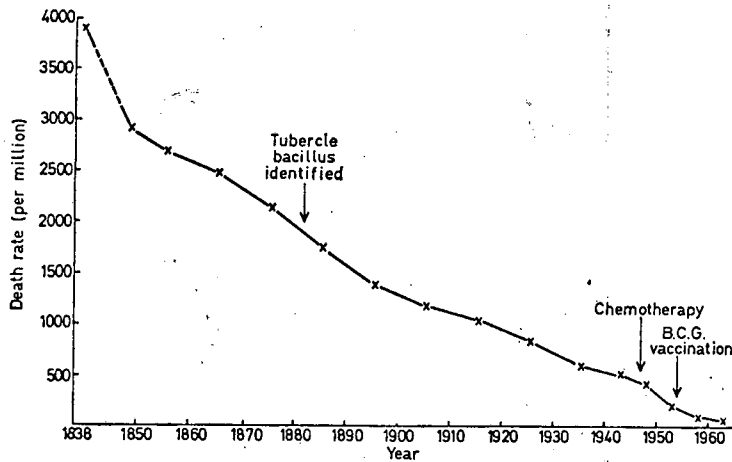


FIGURE 2
Respiratory tuberculosis mean annual death rate: England and Wales. Reprinted with permission (1)

effects of nonmedical factors are easily seen if one seeks the basis for the profound increases in life expectancy in this and many other countries in the past two centuries.

While the improvements were largely the result of control of bacterial diseases, major changes in death rates from these

conditions occurred long before antibiotics were available (Figures 1 and 2). The explanation is not altogether clear, but there is much reason to believe that the fall in the incidence of and mortality from communicable disease that began in the eighteenth century was ascribable to a rising standard of living and particularly

to better nutrition (1). The decrease in communicable disease and, consequently, in mortality, continued in the nineteenth century, largely because of hygienic measures such as improved water supply and sewage disposal. In addition, limitation of family size seen at about this time worked toward the same end. Save for smallpox vaccination, effective prophylaxis and treatment in individual patients were not available until the second quarter of this century. While of great significance, they have had far less effect on health than have other major influences.

In a negative sense, improved medical measures often have negligible effects on health in the absence of improvement in nonmedical factors. For example, in the Many Farms study recently carried out by McDermott, Deuschle, and Barnett (2), a medical team equipped to deliver good ambulatory care was introduced into a rural Indian community beset by illness and poverty. Medical care alone, in the absence of other social change, was found to have had very limited effect on a variety of health parameters, including infant mortality. This observation has been shared in urban settings as well by many physicians who have delivered medical care in the ghetto. They have found to their great frustration the limited efficacy of medical measures in a population beset by profoundly distressing environmental problems, which, however easily identifiable, could not be altered by the physician.

These considerations are not, of course, cited to denigrate the enormous value of medical measures. The crucial value of antibacterial drugs, for example, is beyond dispute, and their comparatively small overall effect on epidemiologic tables, particularly those measuring trends over decades or longer, is of limited interest to the individual physician at the moment he is confronted with the patient with

subacute bacterial endocarditis or with tuberculous meningitis.

However, their contributions to health in a global sense are orders of magnitude less striking than the effects of environmental factors that alter susceptibility or response to infectious disease. This perspective is worthy of emphasis, for we are perhaps in the best position to appreciate and to promote public awareness of the potential effects on health of social as well as medical advances.

The costs of our reluctance to undertake research on the efficacy of medical care have been considerable. For example, a number of diagnostic and therapeutic procedures have been widely adopted before they were subjected to validation, some at considerable human and economic risk. Cytologic examination of the secretions of the uterine cervix, the use of coronary care units, and the present widespread adoption of coronary artery bypass surgery are a few examples of very expensive undertakings whose benefits have yet to be firmly established. If such procedures are not subjected to randomized controlled trial at the time of their introduction (3), many become part of our practice without ever having been validated.

The validation of a procedure should be necessary but not sufficient for its adoption. We must help create mechanisms to examine not only what a new treatment will cost but also, in a world of limited resources, whether it is worth more than what we must give up in its place. If, for example, the coronary care unit should be shown to help some patients with cardiac disease, how do its costs and benefits compare with those of activities that have been displaced? The very areas of startling technical success in medicine such as renal dialysis and cardiac surgery have been the dramatic provoca-

tions that underscore the problems of limited resources.

An even more vexing dilemma has been posed by the recent demonstration of a seemingly clear-cut correlation between large-dose diethyl-stilbestrol administration to pregnant women and subsequent appearance of vaginal cancer in their daughters in a small number of instances. As a result, the Delaney amendment makes mandatory banning the hormone from animal feed. If the consequences of such a ban were to increase meat prices by an amount such as to limit further the already inadequate protein intake by large sectors of our population, is the incidence of cancer such as to justify the ban?

As I shall point out subsequently, these are questions that must be answered ultimately by society as a whole, and the information required for intelligent decision involves far more than cardiology, epidemiology, or oncology. It is clear, however, that the physician must help provide some of the information required for such decisions and participate in their resolution.

Another crucial area of patient care research that has been neglected is an examination of the function of the physician and others involved in health care delivery. For example, had we in clinical departments begun 20 years earlier to examine in detail the role of the physician, we might by now have encouraged considerable change in the mode of medical practice. As a result, we might now be in a far more secure position to predict whether our nation's health problems would be significantly improved by increased numbers of physicians. The Carnegie Commission proposal (4) for an increase in 50,000 physicians might then still have been put forward, but on a much sounder basis. In my view, however,

it is probable that we would have concluded that an increase in physicians would not likely help significantly the principal problems in health care delivery that confront us.

In summary, we have seen major achievements in medical research in recent years. The deficiencies have been largely of omission: the absence of any overall health research policy; inadequate evaluation of the benefits and costs of clinical procedures; failure to appreciate and to communicate to society the effects of social factors on health; reluctance to become involved in patient care research and in development. A key question is not whether but how the academic health center can take on these responsibilities without neglecting its continuing critical role in biologic investigations.

Future Directions of Research

The process of increasing our responsibilities to new areas of research and to development may prove less difficult than would appear at first blush, for there is already widespread recognition of our need to do so. For example, in preparation for this talk I asked several medical school professors, all of whose research concerns either categorical disease or fundamental biologic phenomena, to list for me the five most pressing unsolved health problems now confronting academic health institutions and society. The problems listed by most were the following: mental disorders—etiology and management; behavioral aspects of health maintenance (tobacco, diet, alcohol, drugs, accidents); geriatric and other chronic illness; population control—quantitative and qualitative (genetic and environmental) aspects; difficulties in access to health care; effects of poverty and other environmental factors on health. A glance at this list suggests that there is a great

disparity between the problems identified by these leaders in American medicine as crucial, on the one hand, and the research problems commanding principal attention in the institutions with which they are associated, on the other.

One factor common to several problems on the list is that little information exists concerning their underlying biologic bases. Any comprehensive research program designed to help us deal with mental illness to or alter human behavior must give major attention to the need for a great increase in our understanding of the nervous system. Work on cell physiology must continue to receive heavy emphasis if we hope ever to unravel the intricacies of congenital and geriatric diseases. Thus, these and other areas of fundamental science must be protected and encouraged in the academic health center of the future.

It is equally clear, however, that significant progress in dealing with the problems listed cannot await an understanding of their biologic basis. One of our major mistakes in recent decades has been the assumption that our responsibilities began and ended with biologic research and its application to individual patients. However, it was—and is—unreasonable to expect that health professionals, as they have been educated in the past, could apply the breadth of expertise required by complex health problems. On the other hand, with rare exceptions, members of other disciplines were not in a position to take leadership in applying their knowledge to the health fields. The neglect that has resulted explains in part our current difficulties in the health sphere.

One might ask whether in fact all the problems listed are properly within the realm of responsibility of an academic health center. I believe they are, and the remarks that follow are predicated on that

view. However, if the center should decide otherwise, I am persuaded that our minimal obligation and that of the center is to ensure that some groups in our society do regard these problems as within their bailiwick.

The potential role of epidemiology in the prevention of a disease, even in the absence of complete understanding of its biology, has long been clear. Great benefits in disease prevention or management may also emerge as a result of input from a wide variety of other disciplines, including economics, public policy, sociology, business management, statistics, decision theory, education, engineering, law, and ethics.

In order to ensure participation of these disciplines in a comprehensive approach to health problems, new kinds of people must be trained, and new institutional arrangements will be required. One approach would be to try to set up a mini-university within the center with departments in each of the specialties that we shall need. Some of the disciplines, of course, already find natural homes in the center, but my reaction is strongly negative to the establishment of departments in all the required disciplines. The best scholars want strong ties with colleagues in their own disciplines, and many want to be housed with them. Therefore, even if we could find the financial resources to create many new departments, we would find that, with many notable exceptions, the outstanding people in several fields would resist relocating in the health centers. The problems are so complex and important that it would be shortsighted to restrict the list of possible candidates. Further, these health problems will in the future require new kinds of professionals and are presently attracting some of our brightest young people. Many of the latter group are seeking in-

terdisciplinary backgrounds and require and deserve access to our best teachers. Thus, we must try new institutional mechanisms, including joint appointments and joint degree programs to build strong and constantly used bridges between the health center and other parts of the university.

The creation of new institutional mechanisms and, where advantageous, new departments should be accompanied by continuing scrutiny, modification, and phasing out of old ones where indicated. Many of the biological research problems that were fundamental to medicine 30 or 20 years ago were developed in pre-clinical departments and have matured into knowledge that is widely applied in clinical departments. The derivative questions of today can most effectively and properly be asked in those clinical departments. For example, research in and teaching of the workings of the heart were carried out in animals in physiology and pharmacology departments 25 years ago. Now such work can be assumed by departments of medicine and surgery and often appropriately in patients. Simultaneously, we must define today's biological questions that are basic to the medicine of the next decades and structure our preclinical science departments so these questions can be the focus of their research and teaching activities. We shall surely find that some problems are better dealt with in the science departments of the parent university. Again, our challenge is to meet the needs for coordination rather than duplication and for sufficient flexibility to permit quality rather than convenience to determine where a given research activity will be carried out.

Development, Community Involvement

In addition to its conventional units, the academic health center must also turn to the community as a place to carry out

patient care research. If we are to help in the design, modification, and function of community health facilities and in the training of personnel for them, we must be directly involved. Note that I am not suggesting the center take on major service functions. Indeed, if it were to do so, its essential role as an instrument for research and education could easily be subverted. Activity in such facilities is probably more akin to development than to research. Development has not, in general, been considered worthy of recognition by the university. As a result, in the medical school as well as in other parts of the university, the application of new knowledge has frequently been neglected or relegated to mechanisms often found wanting. Another challenge before us now is to create new institutional mechanisms or new institutions to deal with this important problem. Such new organizations might serve the additional important function of making readily available to federal, state, and local governments some of the intellectual strength of the university.

Public Education

The research directions of the academic health center must to a large extent be in accord with priorities established by society on the basis of a continuing informed and objective assessment of national needs and existing opportunities. For this purpose there must be ongoing dialogue between the faculties of the centers, on the one hand, and society and its elected representatives, on the other. We have often neglected this area in the past, and as a result federal legislation and patterns of federal research funding have occasionally deviated from what many in the health field consider to be in the national interest. Consider, for example, the debate concerning increased support for cancer

research. It is true that a great increase has occurred in our understanding of the basic aspects of cancer, and important progress has occurred in the management of patients with certain kinds of cancer. More cancer research may well be desirable, and important epidemiologic, clinical, and laboratory observations must be pursued. However, we must be certain that the public is fully aware of where we now stand in cancer research and in other fields that might be neglected if emphasis on cancer research is increased. For example, it is probably not widely known that overall cancer survival figures have not changed perceptibly in the past 15 years. (The widely discussed improvement in five-year cancer survival figures from fewer than one in five in 1936 to one in three at present occurred before the mid-fifties.) Many of the ablest scientists in and out of the cancer field are firm in the belief that the present huge gaps in our knowledge make highly unlikely the conquest of cancer in the next decade or two. If this had been fully discussed in public forums and if there had been careful consideration of possible returns on alternative ways of spending research money, the Congress might still have appropriated the \$1.6 billions of federal funds recently assigned to cancer research for the next three years. However, under those circumstances there might be much less prospect of disillusionment if five, 10, or 20 years hence, when however much solid achievement could be measured, no dramatic breakthrough would have occurred. Surely, a part of the equation, too, is a consideration of the consequences in our society of not giving adequate attention and funding to the pressing health problems listed above.

Conclusion

The unsolved health problems confronting society are complex and challenging, and their solutions will require involvement by representatives of many disciplines. A major achievement of medical schools in the era just past was the building of bridges with the biological sciences. A major challenge for the academic health center in the era now begun is the construction of multiple bridges between the health sciences as they now exist and a variety of other groups—the social, mathematical, and engineering sciences, ethics, law, business administration, education, and many others, including the public. The directions of research for the academic health center must be directions of research for broad segments of the university, and the extent to which we can incorporate the ablest scholars from many disciplines will determine the pace of our progress.

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