

Viewpoint ■

Then and Now and When

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Abstract Since the 1970s, it has been clear that the health community needs to develop a health care system that matches a person's needs with the expertise and technology to address those needs. The logical solution is a multi-tiered system. In such a system, physicians would provide second- and third-tier services and other health professionals would provide first- and second-tier services. Medical informatics should take on the challenge of supporting the decision to triage patients from one tier of service to another. Triage decisions are different from other decisions in health sciences because they take place early in the life of a problem, when little information is available, and can be made safely if adjusted to tolerate erring on the side of referral.

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While it is relatively easy to posit various paradigms for health care delivery, for health education of practitioners and the public, and even for research directions, it is much more difficult to say how they will become manifest in the next decade. Indeed, it is unlikely that any of the possible paradigms for health care delivery could actually be implemented in such a short period of time. I will, therefore, try to identify a paradigm applicable to the questions of interest and, having described it, guess where in the next decade we might head in its pursuit.

The death knell for the solo, entrepreneurial practice of medicine had already sounded by the end of World War II. However, it took nearly half a century before the death was certified. To paint the picture from the point of view of the internist, we were confronted with the necessity of abandoning our position of therapeutic nihilism ("First do no harm") and of becoming therapeutic activists. The advent of antibiotics and the marked expansion of basic knowledge that began with the Manhattan project were altering the whole face of medicine away from the treatment of acute infectious diseases, on the one hand, toward increased specialization on the other. The growth, development, and research support of the National Institutes of

Health turned the latter into a stampede. When making a living increasingly depended on intervening, even the internist changed from a patient advocate to a therapeutics advocate, especially of those therapies in which he or she could claim expertise. The many centuries of medicine as a descriptive discipline were over, and the scientific era had begun.

The logical paradigm for dealing with this revolution in medicine from the point of view of health care delivery was clear. With increasing knowledge, therapeutic weapons, and specialization, it was crucial to devise a system of health care that would match patients' needs with the expertise and technology required to address them. Since, even after the wide availability of antibiotics, at least 50 percent of initial patient encounters did not profit from having a doctor present, it was clear that others should replace the doctor in such situations. The concept was simple, straightforward, and logically compelling. In the early 1970s several authors, including Collen et al.,¹ described approaches to this paradigm, which was perhaps best codified by Rutstein.²

Rutstein envisioned a three-tiered health care delivery system. On the first tier, patients would make their initial contact, not with physicians but with a new type of health professional, one whose training included hand holding, immunizations, application of general diagnostic screening tests where called for, and most importantly, initial triage. If any uncertainty existed about appropriate management, the patient would be sent to the second tier, staffed largely by physicians and somewhat resembling current outpatient facilities. Here most patient management would be handled. If nothing significant were required, the

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patient would be reassured and sent back to the first tier if appropriate. If continuing care were indicated, it would be conducted at this second tier. Secondary triage would also be done at this tier, to identify those diagnostic or therapeutic problems requiring high-technology resources. These would be referred to the third-tier, tertiary care institutions.

According to this model of health care, fewer physicians would be needed, since other health professionals would provide care at the first tier. In practice, Silver et al.,³ in Colorado, employed nurse well-baby caregivers who had been trained through Ford's nurse practitioner program. Stead⁴ trained physician assistants, as did many others, in variations of all sorts. As for the projected need for fewer doctors, the presidentially created Commission on Health Manpower had as early as 1967 concluded the opposite. This conclusion was quickly endorsed by a joint AMA/AAMC statement in 1968 calling for increased enrollment in medical schools to meet the "crisis" in manpower. This was indeed followed not only by an increase in the size of medical school classes but also by the creation of a number of new medical schools.

Many things happened in the following 25 years that finally forced the economic collapse of the solo entrepreneurial practice of medicine. But the logical consequence of the paradigm is that, while fewer physicians will be needed, the vast majority of them will work only in high-technology tertiary-care institutions and therefore need to be specialists. The popular response to the economic crisis in health care was in the opposite direction, to say that we should train many more primary care doctors and even pay teaching hospitals not to train specialists. By the early 1990s, when health care reform legislation was being debated, it was clear that something was going to change. It was equally clear that it was impossible to get to where the paradigm would take us from where we were at this time. Thus, the importance of the health reform movement could not be in what it did but rather in the fact that it existed. That is not to say that what is done won't have consequences that are incompatible with the paradigm.

Extrapolating from the three-tiered model into the next decade, there are at least three conclusions that seem fairly obvious. First, initial patient contact will increasingly be made by two-way communication directly to the patient's home. Exactly who or what will be on the health care end—person, machine, or both—is not quite clear. Certainly, technology already exists to support such communication, and it will only improve dramatically in the next ten years. In addition, advancing knowledge will produce more and

more pathognomonic tests and highly specific therapies. There is an old therapeutic adage that if there is more than one treatment, there is no cure. Thus, it is reasonable to assume that an increasing number of initial patient complaints will be managed with certainty at the first tier. When a diagnosis can be made by some pathognomonic test, and when there is one specific response indicated, no human intervention may be necessary. Whether this will occur within the next decade is speculative. However, it will surely be true that, at some time in that decade, the person on the health care end of communication with patients will not be a physician.

Second, it is equally clear that some initial encounters will result in uncertainty. Triage decisions will be required. The triage will have a number of dimensions—e.g., social services, home care, or advanced diagnostic procedures. But to reduce the dimensionality, let's lump them into referral to bring additional resources to bear. The availability of a patient record, or at least access to answers from the patient record to specific questions, will be indispensable at this point. Still, the consequences of error due to moving the patient to a higher tier of care when it is really not required are not great, and a rather large error in that direction can be tolerated, especially if we abandon the three-tiered model and interpose as many screens as we choose. For unambiguous situations, protocols will specify acceptable immediate next steps.

Third, from the Symposium notes it is clear that two important issues for the medical informatics community are the searchable electronic record and decision making in the face of uncertainty. Fortunately, these are two areas in which the community can claim great expertise. However, the pressing decision problem is triage to the appropriate tier of service, and that has not been worked on to any great extent. Triage is difficult, because it may be done very early in the development of a decision problem, when information is sparse and probably nonspecific. Triage is made simpler, however, when approached as a discriminant function problem, in which the error structure can be adjusted to fit the circumstances and the costs of each type of error and the tolerance for error is usually overwhelmingly greater in one direction than the other.

A final word about "health care delivery systems": We have never had one in this country. What we have had is a sick care delivery system with elements of health care introduced over the years in the form of periodic health exams and various screens and recommendations based on so-called risk factors. Doctors know very little about health care and practice it even less. But as our knowledge increases, health care

will become an increasingly important focus of expenditure of resources. This change will also create a different manpower requirement. While some of that requirement may be met by retraining physicians, in the long run physicians are too expensive to be used extensively in this regard. The consequences of all this change on the education of health professionals will be enormous, but there is no indication that health professional schools are considering these consequences as they attempt to train people for the future.

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