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## Understanding the Healthcare / Medical System Crisis

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### Abstract:

An important driving force for healthcare problems is the mismatch of large but simple financial flows and complex treatments of individual patients by individual doctors. The problem of allocating resources leads to poor quality of care and high medical error rates. The solution to this problem requires two parallel but linked systems: (a) a high efficiency system that performs diagnostic screening tests inoculations and generic healthcare, and (b) a high complexity system that treats medical problems of individual patients.

An understanding of complex systems, and particularly the dynamics of turbulence, provides direct insight into concerns about healthcare quality and medical errors. The existing system can be represented by a diagram representing the flow of information and treatments between patients and doctors, and the flow of money, largely from employers to healthcare insurers and thence to healthcare provider systems and individual physicians (see Figures 1). As in turbulent flow of a fluid, the process of breakup of a large scale flow into many fine scale flows naturally involves flows (eddies or whirls) on all intermediate scales. In fluid turbulence, the dissipation of large scale flows into microscopic thermal motion is ultimately responsible for turbulence. In the healthcare system, the process of allocation of financial flows to individual doctors treating individual patients for individual problems is responsible for rapid changes in management practices resulting in the current turmoil/turbulence.

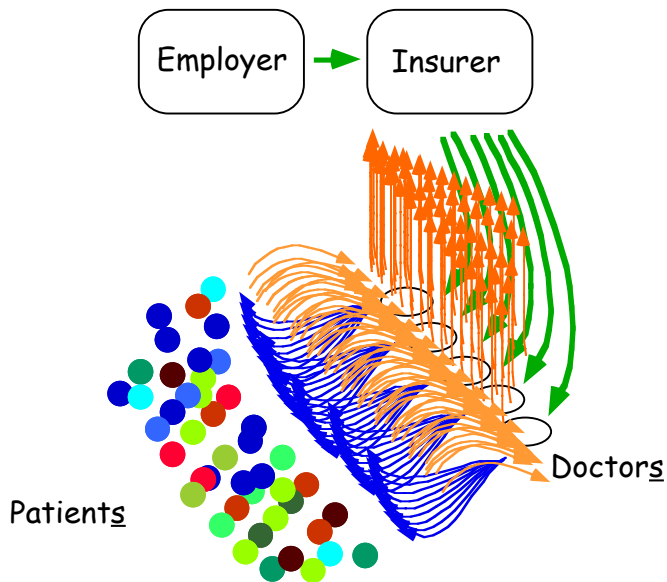


Figure 2: The healthcare system today as illustrated by flows of information (brown), care (blue) and money (green). The stresses in the system arise primarily at the interface between the large simple flows of funds (top) and the multiple smaller flows involving individual patients and doctors (bottom).

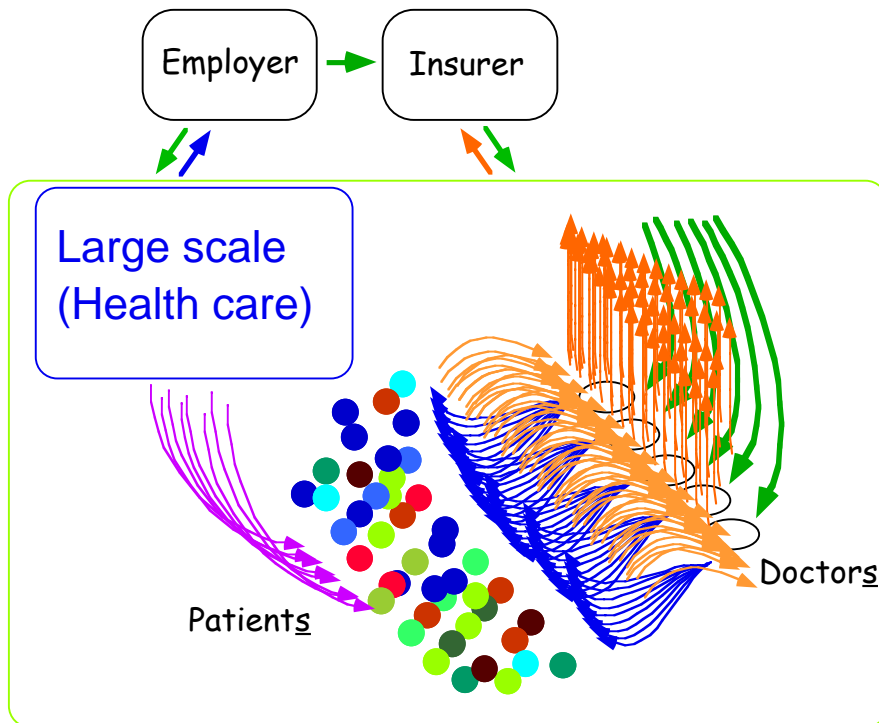


Figure 2: Recommended change in the system involving a large scale system primarily for public health aspects that can be performed efficiently, in parallel with the medical care system. The two primary systems should not be confounded because aspects of healthcare can be made highly efficient while many aspects of medical care cannot.

To illustrate this problem we can consider the effects of changing the flow at the source, by increasing (or decreasing, though practically speaking the former is more likely) the flow by a certain percentage (e.g. 3%) as is typically done on an annual basis. The consequence of this increase must be manifest in decisions about care of individual patients by individual doctors about what medical tests and treatments to do. Such decisions must be based upon tradeoffs in health and care that compare treatments that involve millions of dollars, and those that involve tens of dollars.

Recognizing the complexity of the allocation problem, it should not be surprising that the institutions' intermediate between the insurers and the doctors --- the managed care industry, hospital and healthcare provider networks --- have been undergoing dramatic changes in management structure and in patterns of delivery of care. Moreover, the decisions that are made for cost control are being made in a way that affects large numbers of cases rather than individuals. The imposition of restrictions on medical treatments using decisions that are relatively simple, such as limiting diagnostic tests, and limiting the doctors who are available to patients, affect large numbers of patients in coarse ways. These decisions are not based upon the optimal care of individual patients.

A fundamental solution to the healthcare problem requires a recognition that controlling (limiting) costs through efficiency requires an efficient mass production approach that is incompatible with the high complexity of medical care of individual patients. Applying such methods can only result in poor quality and high error rates. While medical errors often arise from communication problems, e.g. in drug prescription and delivery, ultimately errors arise because efficient systems cannot differentiate sufficiently between treatments of different individuals. The resolution of this paradox is to distinguish between those aspects of healthcare that can be treated with highly efficient processes and separate them from those aspects that require individual attention. Once the processes that can be treated efficiently are separated from the highly complex tasks, the resulting two systems will be designed in different ways. The first for efficiency to achieve cost control, the second for effective and error-free care.

In general, the aspects of healthcare that can be treated in the most efficient way include public health: screening using diagnostic tests and inoculations --- preventative care and testing.<sup>1</sup> Highly efficient, rapid and cost effective, performance of tests and inoculations would lead to an improved efficiency and relieve the financial pressure on the medical treatment of individual patients.

In recent years, there has been much debate about the effectiveness of screening for medical problems. Some of the concerns are medical, others are fiscal related to the

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<sup>1</sup> There is an analogy between preventative care and equipment maintenance in factories pointed out by J. Sterman. Preventative maintenance leads to lowered costs. Poor maintenance leads the system to be caught in a vicious cycle of failed equipment and overtaxed maintenance crews performing interventions in a crisis context.

financial effectiveness of such screenings. It should be recognized, however, that the knowledge of how to detect and perform early treatment of medical problems is being developed and will increase rapidly. Moreover, the primary financial benefit from early detection arises from large scale and efficient application of such tests. As long as these tests are performed by the existing system, they cannot be treated with high efficiency.

What does the high efficiency healthcare system look like? It is analogous to a traditional mass production factory model. There are some features of such a system that may seem disconcerting: it should be largely impersonal, it should not be appointment based, and not doctor based. The objective is large scale efficiency. By making this system efficient, however, once a problem is identified, care for the sick can be highly personal and effective. An example would be a mobile screening program where test equipment is brought to a workplace by the healthcare organization. Tests are administered by technicians and test results are used solely for referral to a physician.

#### Summary:

The healthcare system in the U.S. has been characterized as “in crisis” for almost two decades since the rapid growth of managed care in the face of rapidly rising costs of healthcare. The current system has been characterized as providing a very poor return on investment compared to the care in other countries. It also has a notorious medical error rate, and low quality of care. Why is this happening despite the high level of training of doctors, technology and increasing medical knowledge? The answer lies in the basic financial structure of the healthcare system that is driving the system toward efficiencies that are counter to providing effective medical care. The solution to this problem involves separating those aspects of the system that can be made efficient on a large scale and treating them very differently than the aspects that involve detailed decisions by highly knowledgeable physicians. Relieving physicians of tasks that can be addressed with higher efficiency would enable them to focus their attention on the tasks for which they are uniquely suited.

In general, the aspects of the system that lend themselves to highly efficient processes are public and preventative healthcare. Screening tests and inoculations can be performed on large populations without individual decision making. Once individual problems are identified, the treatment of the individual may then require detailed and careful decisions performed by highly trained doctors.