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"We must assume some responsibility for the social contract that emerges from the systems that we design and implement (Mason, 1986)."

Presently, two existing technologies are the focus of many studies for developing a national medical record system. One is the smart card and the other is the network. These two systems favor different social contracts. Social contracts are the answers to ethical questions concerning privacy, property, access, and accuracy that form from the implementation of a system (Mason, 1986). While smart cards favor privacy and property, networks favor access and accuracy.

The purpose of the medical record is to provide access and accuracy without impairing privacy and property. Health care professionals need medical information to support their decision making. At the same time, patients must feel confident that their medical history is secure (Gostin, 1993). In the current paper record system, neither of these issues have been satisfactorily addressed.

When Dr. Donald Miller of Taylors, South Carolina, closed his family practice in 1991, he auctioned off his 10,000 patient records to an auto junkyard dealer for $4000. Photocopies of these records were sold for $25 each until all of the records were resold for $6000 to a new doctor in town (Betts, August 1993). Although this occurrence seems extreme, a Harris-Equifax poll stated that
27% of Americans reported having their medical information improperly disclosed (Betts, November 1993).

Unfortunately, medical record privacy breaches are not the only problem with the current system. Almost daily society hears of instances where individuals have died because emergency room medical personnel did not know that a patient was allergic to a certain drug.

These failures in the current system have lead us to study alternatives. Although both alternatives have definite advantages, especially over the current system, their advantages oppose one another. Before the decision is made to implement one system or the other, the ethical dilemma of privacy and property versus accessibility and accuracy must be addressed. Implementation should be based largely on this decision.

**SMART CARDS**

Smart cards are credit-card-size pieces of plastic with embedded electronic memory chips (Kindel, 1993). Presently, each card can store up to 120 kilobytes of data, or 120,000 text characters. Moreover, this data can be stored in as many as 120 distinct files. Although this is not enough memory to contain an individual's whole medical history as is documented in the current medical record system (Dutton, 1993), people must remember "the medical chart contains data beyond the wildest dreams of the most compulsive diagnostician (Gostin, 1992)."
Reading from and writing to the smart card has been performed in the medical industry by two pieces of equipment, card readers and computers. In Midwest City, Oklahoma, six area hospitals and the city's ambulance service utilized both card readers and computer when they employed the smart card for emergency treatment in their city. The computers were placed in the emergency rooms of the participating hospitals, while the card readers were placed in the ambulances. Using computers, health care providers have the ability to read, add, modify, and delete the data contained in the cards. However, medical personnel may only view data using the card reader technology (Betts, December 1993).

The idea of utilizing the smart card in the U.S. medical industry originated in the mid 1980's. Doug Becker, then 19, approached Blue Cross/Blue Shield after reading about the cards in computer magazines (Steele, 1985). To this day, there are only a few cases where the technology has been employed in the U.S. medical community. And in these cases, the smart card has only been used for select processes such as emergency room treatment.

REGIONAL NETWORKS

The hub of the regional network in the medical industry is the computerized patient record (CPR). CPRs have been in existence for the past twenty years, yet many doctors have chosen not to use them (Bergman, 1993). CPRs may contain essentially an infinite amount of data. Additionally, the files containing the CPRs may hold essentially an infinite number of them.
Reading and writing, or rather accessing, these records in the regional network system is done by means of computers. Computers in the regional system are linked to one another by way of cables, or transmission media. Fiber optic, twisted pair, and coaxial are the different transmission media used. Cables allow data to flow from one computer to another (Burch, 1992). Thus, to have access to a patient’s records, a physician just needs to have access to a computer which is part of the regional network.

A server, a computer used to manage the network system, processes the users requests. For example, if a doctor wants access to patient 489-92-2836’s record, the server directs that information to the doctor. Thus, all of the access requests are managed by the server (Burch, 1992). The regional system would link all regional health care providers through this type of network. Thus, all medical personnel will have access to the CPRs of each member of the community (Mehler, 1993).

Although the network has been used rather extensively in other industries, the medical industry has been slow to respond to its potentials. Some clinics and hospitals take advantage of its benefits, but generally only for administrative functions such as payroll processing and inventory. It is also important to note that the networks currently utilized are organizational as opposed to industry wide. The regional network would require health care providers to form a shared resource with their competitors (Mehler, 1993).
TIME CONSTRAINTS AND THE SYSTEMS

Although it is estimated to take a decade before either the smart card or the network system could be employed, time is not a critical factor. The current medical record system is not meeting the needs of the users or the patients. Thus, the system should be replaced. Despite the fact that it would be beneficial to implement as soon as possible, a new system needs to be installed some time in the future no matter when it is done.

STANDARDS

Agreements for data, communication, and access standards will require many hours of work to complete. Estimates ranging from 1 to 2.5 billion dollars have been given for the cost of developing standards for the systems (Dutton, 1993). Yet these standards are vital for development and use of the system. Without the standards, communication will be limited or non-existent. Additionally, software development relies on the structure of data present in the system (Bowry, 1993).

The data included in medical records is very similar from doctor to doctor, however exact definitions of the data and an exact structure for the data in the records is lacking. Even the subjective notes a doctor includes in the current record system will be questionable if the records become a totally shared resource. Standards must be implemented for the computerized record or the smart card if these technologies are ever to be implemented (Daniele, 1991).
As is detailed in the discussion of the smart card and the regional network, both systems require much of the same hardware for implementation. The costs of this hardware in combination with the expenses which would follow the development of standards and the price of developing the system will result in a very heavy initial outlay of money. Yet it is believed that the cost saving derived from either proposed system will quickly offset the initial expenditure (Fox, 1992).

Several cost savings are expected to result from the implementation of either of the proposed systems. Although it is impossible to precisely define the savings, studies have shown that certain savings will exist. In Britain, a trial run of the smart card resulted in three main savings. Each of these savings would also be felt from utilization of the regional network. For one, many paperwork inefficiencies would be eliminated. Secondly, redundant testing is presumed to greatly diminish. And lastly, the cost of repeat treatments, those treatments which occur because doctors make incorrect analyses due to their medical professional's inability to gain access to proper information, should fall (Fox, 1992). Most of this will occur because doctors will have the information available to them that they need when making decisions. The cost savings of these systems should quickly pay for the initial cost of the system.
Privacy can be summarized by the conditions and safeguards under which a person must reveal information about one's self to others. Property addresses who owns the data and decides who has access to it (Mason, 1986). These two ethical issues are affected very differently by the smart card and the network technologies.

Using the smart card technology, patients would have control of their medical records for the first time ever (Fox, 1992). Patients would carry and provide medical personnel with their cards as needed. Additionally, since the card can store data in different files, the cards can limit user access to specified data. The user could decide who could see the data under their own determination.

Unfortunately, this level of security is not feasible in the regional network (Gostin, 1993). Under this system, all medical records would be controlled by the system, or rather the medical industry since the industry would design and use the system. Once the record is entered into the system, the patient would have no control over who could access that data. The medical industry would own and disseminate the information.

ACCESSIBILITY, ACCURACY AND THE TECHNOLOGIES

The conditions under which a person or organization has a right to obtain information is accessibility. The authenticity of the information is accuracy. Once again, the two technologies under study would address these ethical issues on different ends of the spectrum.
As was mentioned before, any doctor needing a patient’s medical record could technically get access to it as soon as is needed under the regional network system. If the doctor has access to a computer linked to the regional network, that doctor can access the patient’s records. Additionally, the database containing the CPRs on the computer system could provide many measures of ensuring the data in the record is accurate. Thus, information could get to the doctor in a very timely and accurate manner.

Smart cards would provide the same access as the regional network, but only while the patient is carrying the card. If emergency situation arise and patients do not have their medical cards, doctors would be left in the same predicament as they currently are with the present system. Additionally, even if the smart card is available, the information stored on it may not be as accurate as it could if it were stored on a regional network. A regional network would control not only the data in the system, but also the software manipulating it. Thus, validity checks could be ensured. In contrast, the smart card can have data validity checks also, but the degree to which they are implemented would depend more upon the doctor or clinical setting.

THE ETHICAL DILEMMA

With each system having very different ethical results, the decision to employ one or the other will be monumental for the medical industry. Privacy and property could reign at some cost to
accessibility and accuracy or vice-versa. This ethical decision should be made before the system decision is determined rather than having the ethical issues be a consequence of implementation.

Currently society is very concerned about privacy and property. Public attention to privacy has been in a constant upward swing in the past decade (Miller, 1991). Overall, privacy is a concern to 80% of the American public (Gostin, 1993). An even higher 95% of Americans have been reported as being concerned about security in their medical records (Betts, October 1993).

Medical records information is likely to be "the most intimate, personal, and sensitive of any information maintained about an individual (Gostin, 1993)." The medical record contains data regarding anything from diagnosis to religious preferences. Thus, it is understandable that society is concerned about its security. But, does this mean society wants protection to be granted at the potential cost of accessibility and better accuracy for doctors?

CONCLUSION

Although there may have been other issues that have not been addressed in this article for the medical record system alternatives, these are the most critical ones at this time. Both the smart card and the regional network technologies are feasible with respect to cost and technology. However, the implementation of each one means something very ethically different from the other. If a decision is made to employ either system, it should be
made only after society decides whether privacy and property or accessibility and accuracy is more important.

Making an ethical decision will not be an easy task, yet it must be done. Someday another technology or system may develop which is superior in all ethical dimensions, it may even be an enhancement to one of the technologies presently being discussed. However, that other technology may also never arise. After all, privacy and protection is often naturally in conflict with accessibility and accuracy (Essin, 1993). Thus, since both of these systems have advantages over the current medical record system, not taking advantage of these technologies is probably senseless. Either system should improve the present status of medical records.
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