CLINICAL INFORMATICS

Digital Alchemy: Turning Information into Knowledge

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Given today's intense pressures to turn raw data into accessible information, professionals in the IT business don't always have time to see the big picture. They forget that information is only an intermediate product. The true value of information lies in its end use, not in its existence.

Consequently, the ultimate concern of IT should be turning information into knowledge, which means getting valid (i.e., meaningful) and reliable (i.e., accurate) information to decision makers when and where they need it. To borrow a metaphor from alchemy, information by itself is like lead. Turning information into a wise, informed decision — the measure of knowledge — is like creating gold.

The fundamental importance of looking beyond data and information to knowledge is reinforced by articles in this JHIM issue focused on the next generation of tools for clinical decision support. IT-based clinical decision support systems (CDSSs) are the catalysts that will transform growing volumes of organized data into the "gold standards" for judging performance of the healthcare delivery system: higher quality, lower cost, and better access.

The relationship between CDSS and quality has become quite clear over the past few years. A growing body of literature consistently shows that clinicians are able to make better decisions when they have all the information at their fingertips — or literally in the palm of their hands in the form of a computerized practitioner order entry (CPOE) device. For example, the current generation of decision support tools is already producing dramatic reductions in adverse drug events and improving the appropriateness of prescribing. The next generation of CDSS devices will be wireless handheld units with greater bandwidth, better displays, and built-in voice recognition. The number of clinicians who use these devices will grow dramatically as the hardware and software become more user-friendly.

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CPOE has attracted considerable attention for its contribution to decisions that affect the quality of healthcare, but it is not currently seen as a tool to reduce cost or improve access. (Indeed, the perception of high cost is probably the primary reason for relatively slow adoption of CPOE.) The next generation of decision support systems will have at least as much impact on cost and access as CPOE is having on quality, but these systems have received far less publicity. They offer great potential and deserve serious attention.

The comparable trend in cost reduction is the "democratization" of clinical research made possible by networked computers and digital devices to record patient data. Clinical inquiry has been controlled for decades by large institutions, predominantly academic medical centers, because they brought together patient populations and researchers. Today, telemedicine is creating more opportunities to do research in the virtual world, that is, outside the ivory tower.

The evolution of decision support tools will allow research to be organized around community-based medical practices and non-academic provider organizations (e.g., clinics, community hospitals). Physicians and nurses without academic affiliations will be able to join web-based networks that pool data from patients in many clinical settings. CDSS tools will help organize every step of the research process, from recruitment of subjects to analysis of data and reporting of results.

Before long (within five years, in this futurist's view), most clinicians in private practice will participate in research networks with embedded CDSS tools that provide real-time analysis of data from large samples of patients being treated by peers throughout the country. Costs of care will be reduced as networked CDSS helps these clinicians move quickly to the most efficient (i.e., least expensive) therapies for their individual patients. They will no longer be dependent on the lengthy process of waiting for academic studies to be published in medical journals. Physicians, nurses, and pharmacists will be able to learn directly and quickly by dynamic analysis of data from research samples that include their own patients. Lots of time and money should be saved as a result.

The next generation of CDSS will

also improve the general population's access to medical care. Early signs of what is to come are already evident in the growing number of patients who conduct their own web searches to explore links between symptoms, possible diagnoses, and alternative therapies. Many of these patients would not have received care in the past because they did not have the time or resources to be seen by a caregiver. In addition, many individuals who were able to "access" a harried clinician did not receive the in-depth attention that they can now provide for themselves through a good online search.

With the coming availability of CDSS tools on web sites full of health information, more people will be able to diagnose their medical problems and select appropriate therapies. This "do it yourself" form of medical care will be opposed by many health practitioners and their professional organizations — ultimately to little or no avail in our free-market economic system. Indeed, the digital transformation of healthcare will erode the long-standing professional monopoly on medical knowledge. Direct patient access to web-based medical information, complemented with other resources like direct-to-consumer advertising of pharmaceuticals and medical devices, will allow more patients to get care without ever seeing a clinician. Access to healthcare will no longer be defined, as it was throughout the 20th century, by a face-to-face encounter between a patient and a physician. Access will be changed by the web, telemedicine, and CDSS.

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Lower cost and expanded access made possible by IT and CDSS will not necessarily make us better off. Harm will be done if the resulting clinical decisions are based on bad information. The next generation of decision support tools, no matter how elegant, cannot create wise decisions from inaccurate or misleading "facts." Real progress requires high expectations regarding the quality of data and information that anyone, clinician or self-treating patient, turns into knowledge.

IT is positioned to make valuable contributions to the future of healthcare, but it must be driven by the same fundamental principle that is taught in medical school: do no harm. IT professionals have the tools to transform data and information into knowledge, but less desirable outcomes are also possible. With proper vision, the opportunities are golden.

About the Author

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