You Can't Drink and Whistle at the Same Time*

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*Where is the life we have lost in living?
Where is the wisdom we have lost in knowledge?
Where is the knowledge we have lost in information?
—T. S. Eliot
Choruses from "The Rock"*

The United States and many other high-technology societies are said to be entering the "information age." But a more appropriate diagnosis might be that we are suffering from a cultural psychosis known as "information anxiety." Nowhere are the symptoms of this malady more visible than in medicine. Treatment for this condition is the use of information systems to lift us above the cacophony of data into the atmosphere of knowledge and the stratosphere of wisdom. But this use must itself be knowledgeable and wise. Otherwise, the treatment will simply exacerbate the symptoms rather than cure the patient.

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INFORMATION is everywhere. We are inundated by it. In the last decade there has been an explosion in information. Nowhere is this explosion more obvious—or oppressive—than in medicine. And it keeps expanding. We are not even close to saturating our capacity to produce information. However, we may be approaching our ability to assimilate it. We may, in fact, have exceeded our ability. We may be in a condition of information overload.

Try this experiment. Select a seminal article in a recent issue of a general medical journal. Good places to look are the *New England Journal of Medicine*, the *Journal of the American Medical Association*, or *Perspectives in Medicine and Biology*. Then ask your colleagues if they have read it. If they answer yes, ask them to describe the article and its conclusions. After trying this a few times, you may begin to think that your associates are peculiarly uninformed. Uninformed they may be; peculiar they probably are not.

This is a problem of major proportions. Journals continue to proliferate, and more and more articles are written each year. In the United States alone, approximately 10,000 periodicals

were published last year, and the number will be significantly greater this year.

But who is reading these journals? Who can possibly keep up? As Peter Large points out in his book *The Micro Revolution Revisited*,

More new information has been produced in the last 30 years than in the previous 5,000. About 1,000 books are published internationally every day, and the total of all printed knowledge doubles every eight years.¹

Similar problems of information overload exist in the operation of hospitals and clinics, in the billing for reimbursement of medical services, in personnel actions, and in virtually every other administrative process you can name. We are overwhelmed at work by data—data about procedures, budgets, productivity, and how well we are functioning as caregivers. We even have data to evaluate our production and use of data. We receive data about virtually every calculable parameter connected with our work. Just because something can be computed and disseminated on a computer printout does not necessarily make it useful or worthwhile. Someone ought to mention that to the accounting office.

But the problem does not stop there. We often fall prey to the same seduction in providing care to patients. So long as we are collecting information about the patient, we can delay making a decision about why the patient is seeking help in the first place. While we are operating in the data acquisition mode, we obviously cannot be functioning in the operational mode, can we? It is elementary—at least if we use the computer as a

*Italian proverb.

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metaphor for human behavior. And we do that increasingly. Think about the terminology I have already used in this report to characterize our behavior: productivity, collecting information, acquisition mode, operational mode, etc.

In *The Cult of Information*, Theodore Roszak distinguishes between information and knowledge. Often they are quite the opposite. Roszak says:

Information is not knowledge. You can mass-produce raw data and incredible quantities of facts and figures. You cannot mass produce knowledge, which is created by individual minds, drawing on individual experience, separating the significant from the irrelevant, making value judgments, etc.²

How many people do you know who collect facts like a sponge, yet could not synthesize their information into a reasonable, extended thought if their lives depended on it? How often have you heard that we are moving from an industrial into an information age? That probably is an accurate description. But I wish it were an age of knowledge instead or, even better, an age of wisdom. What a relief it would be to rise above the cacophony of information into the enlightenment of knowledge and wisdom. How few of us are really able to do it!

In the near future many of us will probably make the transition from collecting information to acting out of knowledge and maybe even wisdom. Not out of choice, perhaps, but out of necessity. Otherwise we are going to drown in a sea of information. Those of us in healthcare may be the first to go, because we are in deep water even now. We have a lot to gain by trying to solve this problem—like survival—at least in terms of the quality of healthcare as we know it today.

For those of you who have been working for a couple of decades, ask yourself this question: Is your job as interesting and as much fun as it was 10 years ago? No? Then perhaps what Orrin Klapp says in his book, *Overload and Boredom: Essays on the Quality of Life In the Information Society*, applies to you. Klapp says:

While we tend to think of boredom as arising from a deficit of stimuli (information underload), it also (and, in fact, more commonly) arises from excessive stimulation (information overload). Information, like energy, tends to degrade into entropy—into noise redundancy and banality—as the fast horse of information outstrips the slow horse of meaning.³

Why are we having this problem of information overload in medicine? Why now? Probably because things are out of synchrony; the technology for producing information has gotten ahead of our ability to manage it. At the moment we know more about how to generate information than how to use it effectively to make better and wiser decisions about patient care. Our technology is well into the information age. But we, the potential beneficiaries of the technology, are not—at least most of us are not. The technology made the transition, but most of us did not or have not. Most of us probably still are reading hard copy printouts, requesting procedures on printed forms, and in general behaving as if little has happened. But something has happened, and it has been dramatic. And we had all better get with the program, in both a literal and figurative sense, if we hope to survive and continue to provide quality healthcare in a reasonably cost-effective manner.

By the way, this problem is not unique to medicine. Think about these applications of information systems, including computers and all that goes with them. We still do not know how to use computers in our schools. We talk a lot about computer literacy, but I have not found two educators who define this expression in the same way. A computer is not an effective substitute for a good teacher who can respond to a young student with a correction, an inspiring comment, encouragement, and redirection. A computer can be an effective tool for problem solving, but it has to accommodate to the student's needs—and not the other way around. Computer literacy does not mean learning to think in the linear, simplistic way most software programs demand. I worry that we are going to suppress originality, ingenuity, and intuition in young people by an overdependence on computers and computerized teaching in our schools. And what about personal computers in the home? How many people really use them as the information systems they are hyped up to be? My guess is that kids use them, mainly as word processors for their schoolwork, and that a lot of computer games get played on them. Probably not much else happens in most homes, in spite of what you read.

To solve this problem of information overload in medicine we are going to have to tackle some

difficult problems. Foremost among them is the challenge of commitment to making information systems work for us, rather than us for them. We need to separate the substance of new technologies from their seductiveness—the guts from the glitter—and develop a real working strategy on how to make the transition into electronic communication of medical images and information meaningful, effective, and cost effective. Let us begin by recognizing that just because something can be done does not necessarily mean that it should be. Just because data can be produced and communicated does not mean that they necessarily aid our decisions about patient care. Let us decide what should be done first, then figure out how to do it. Serendipity is fine when we have the luxuries of time and resources to afford it. In terms of information handling (or virtually anything else) in medicine today, these luxuries are in short supply.

My self-diagnosis indicates I am suffering from a malady that Richard Wurman calls “information anxiety.”² Wurman defines information anxiety as the condition produced

by the ever-widening gap between what we understand and what we think we should understand. It is the black hole between data and knowledge and it happens when information doesn't tell us what we want or need to know.⁴

There is only one treatment for information anxiety—to rise above the compulsion to collect more and more information, more and more facts—and instead to synthesize and act on the information we have collected. The remedy for the paralysis of thinking and acting that information anxiety causes lies in learning how to use information thoughtfully and productively in making decisions and in having access to systems that facilitate this use.

Here are some examples of why we have a problem today in the use of information in medicine. In the first place, information systems should facilitate decision making. They should permit better decisions in a more timely fashion. So let us look at a simple example. A few institutions are studying the effect of computer-based medical records on the efficiency and quality of healthcare. They have found that computerized records do improve the availability of information. But they also can slow down the

movement of patients through the healthcare system. In one recent study, for example, patients with computerized records spent significantly more time in the outpatient clinic than did patients with paper records.⁵ This extra time was explained as more time spent on preventive care and problem definition. This could have represented better healthcare, although there is no direct proof that this occurred. But third-party carriers usually do not pay for preventive services and improved problem definition. So my guess is that the computerized medical records ended up costing the institution twice—the costs of purchase, installation, and training for the records systems and the costs associated with the extra time patients spent in the clinic.

In another recent study, charting time in the intensive care unit increased by 5% when notes were entered into a computer rather than a paper chart.⁶ These results are paradoxical if computerized records systems are supposed to improve efficiency and clinical decision making. My guess is that these are not limitations intrinsic to information systems. Instead, they probably reflect difficulties at the human-machine interface. That is, there may have been significant discomfort at the stage of entering patient data into the computerized medical record and uncertainty about using such data in making clinical decisions about patients. These can be overcome by increased training and experience of the users of computerized information. But this training and familiarity are not going to occur automatically. So the question is, What can be done to facilitate this training? What can be done to reduce the discomfort and intimidation people feel when interfacing with computerized systems? Today the technology of information systems in medicine is awesome. It is the interface with people that is the weak link. And it is this interface that needs attention.

Recently, the question of the accuracy of teleradiology for radiologic consultation in a family practice setting was reviewed by investigators at the University of Iowa.⁷ They compared direct readings with teleradiologic image readings in terms of the accuracy of interpretation and the influence of each on physician confidence, physician decision making, and patient convenience. Although radiologic consultation

affected the physician's diagnosis in only 3.5% of cases, it significantly influenced both physician confidence and patient convenience. The accuracy of interpretation was essentially similar for direct and teleradiologically viewed images.

The investigators in the Iowa study cautioned that subtle abnormalities such as linear fractures, subtle pneumonia, and interstitial lung disease might be less visible in teleradiologic images. They concluded that for most applications teleradiology yielded results similar to those for direct film readings. But this conclusion was not very impressive because the radiologic examination was important in only 3% to 5% of those cases for which examinations were requested. It is the last bit of data that is most interesting. Why were the other 95% to 97% of the examinations performed in the first place?

Many physicians have personal computers in their offices, where they are used primarily for billing and office management. In most cases, these systems are used by an office manager; the physician probably has not taken time to learn the system and feel comfortable with it. With a personal computer, the physician can access a whole spectrum of medically useful databases and programs. The American Medical Association's AMA/NET (American Medical Computing, Ltd, Chicago, IL) is an example of an inventory of computerized databases accessible by personal computer and telephone modem. Recently the association waived all initiation charges for a defined period, and provided free access time in a get-acquainted offer from AMA/NET. The response was excellent. Today almost 34,000 physicians theoretically can access the AMA/NET system. Products available include electronic mail and online access to the MEDLINE bibliographic database of the National Library of Medicine (Bethesda, MD) through PaperChase (Beth Israel Hospital, Boston, MA) and GRATEFUL MED (National Library of Medicine). A guide to differential diagnosis is available through DxPlain (American Medical Computing), a software program developed by Barnett at Harvard University. Access to news services, including the Associated Press and FEDNET (American Medical Association, Chicago, IL), is possible through AMA/NET, as are various databases dealing with adverse drug reactions, case simulations, and clinical protocols. The

response to the American Medical Association's offer of initiation of service at no charge has been excellent. But signing up is not equivalent to using the service, and the actual physician usage of AMA/NET has been a bit of a disappointment so far.

A recent compendium listed more than 900 computer products for medicine, most of which are designed for personal computers.⁸ Catalog entries have been growing at a rate of about 20% per year and show no signs of tapering off. The area of highest growth is information available on computer disk read-only memory (CD-ROM). At least eight companies are producing CD-ROM versions of the MEDLINE database.⁹ In addition, an increasing number of specific databases are available on CD-ROM.

One of the major issues facing us today is the need for standards for intercommunication among independent information systems, and for interfacing between these systems and equipment for producing images and analyzing patient samples. The American Society for Testing of Materials (ASTM) has been particularly active in this area, and the National Electrical Manufacturers Association and the American College of Radiology have been collaborating on the production of standards for interfacing information systems with imaging equipment.¹⁰ The Institute of Electrical and Electronic Engineers (IEEE) has also been involved in standards setting. These are all very important activities, and we need to get on with them.¹¹

These issues are the fodder for our future deliberations. They are not unique to the United States. Our colleagues in other countries are facing the same concerns and problems, sometimes with fewer resources and more centralized control than we have here.

The opportunities of image and information management and communications systems are almost endless. But the challenges they present are as great as the opportunities. Probably if they were less, we would be less interested in them.

It is possible, possible, possible. It must be possible. It must be that in time the real will from its crude compoundings come. . .

—Wallace Stevens
"Notes Toward a Supreme Fiction"

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