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Handheld computers in medicine: The future is not here yet

SOME PROBLEMS need to be overcome before handheld computers become essential equipment in every physician's pocket, along with our stethoscopes and dog-eared copies of the *Washington Manual*.

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In this issue of the *Cleveland Clinic Journal of Medicine*, Dr. Peter Embi describes the many ways that handheld computers can help us in practicing medicine.[1] But until a number of problems are resolved, handheld computers are not the answer to everything. The future is not here yet.

Problems must be overcome before handhelds become essential equipment

WHAT DETERMINES HOW FAST NEW TECHNOLOGY IS ADOPTED?

Scholars have rigorously studied how new medical technologies such as computed tomography and magnetic resonance imaging diffuse into clinical practice.[2] From these studies, we know that several factors influence how fast a new medical technology is adopted:

- The new technology's importance in diagnostic and therapeutic decision-making
- Its effect on revenue
- Whether it is promoted in medical training programs and continuing medical education.

Information technology has not been as rigorously studied as medical technology, but similarities exist. Information technology is important in clinical decision-making: physicians need information to make clinical decisions, and we need it in "real time," when the patient is right in front of us on the hospital ward or in our office or clinic.[3] For example, when prescribing a drug, we want to know if it has any interactions with other drugs the patient is taking, what laboratory monitoring is necessary, any allergies the patient may have, and whether any alerts have been issued for the drug in question. And for the institution, information technology is valuable if it leads to demonstrable improvements in clinical outcomes or if it saves money.

WHAT ARE HANDHELD COMPUTERS GOOD FOR?

As Dr. Embi points out, handheld computers hold promise because they are mobile and portable. A host of applications exist for them, the best of which are as portable medical references and medical calculators. With a handheld computer you can carry around the electronic versions of the *Merck Manual*, the *PDR*, and many more books, right in your pocket, neatly indexed. Medical calculators and algorithms are available for everything from coronary risk to creatinine clearance.

Being so accessible, portable, and easy to use, handheld computers will likely become the model for accessing medical references and clinical calculation algorithms. In fact, every student entering Stanford University Medical School this year will be given one along with drug reference software.

WHAT ARE THEY NOT SO GOOD FOR?

On the other hand, these devices are not as good as we would like in several areas.

Connectivity is limited

To get information into most handheld computers, you have to place the device in a cradle attached to your own desktop computer

(and *only* your own desktop computer, not someone else's) and push the "hotsynch" button. This semi-tethered mechanism constrains the mobility of a handheld computer when you need clinical data right away.

Wireless networks might do the job, but the infrastructure for providing reliable real-time access via a handheld device is lagging significantly behind the technology for handheld computers overall. New wireless networking standards such as Bluetooth and others are several years away from general availability.[4–6]

Cellular communications is the most common mechanism for connectivity outside of hospitals and other institutions today. This wide-area connectivity strategy is primarily limited by the speed of connection and coverage area.

Without true wireless capability throughout healthcare institutions, the value of handheld computers in patient care will be limited.

Patient care software needs work

Patient care software to prescribe a drug or order a laboratory test has generated a lot of interest but has not been as successful as reference and calculator applications. Although patient care applications are exciting, before purchasing one we should address some practical issues, such as how the program will affect work flow and how it can be integrated into existing computer systems.

Wireless networks might do the job, but are not here yet

Programs to date have lacked the patient-specific interfaces with hospital or physician computer systems needed to reduce the amount of data entry into the application.[7] In addition, most of these programs allow you to receive data from the institutional computer system, but not to enter data into the same systems via your handheld computer. Yet analysis of the work flow for physicians has demonstrated that order entry and clinical documentation take up a significant portion of the physician's time in the hospital. It would be useful if, for example, you could order laboratory tests for a patient by tapping squares on your handheld computer, push the "send" button, and it would be done. But such systems are not generally available yet.

As Dr. Embi points out, programs for prescription-writing and for billing and coding are available as integrated solutions today. In most cases, however, these are offered by distinct vendors, and they are difficult to integrate into the hospital's or the physician's computer system without duplication. In some cases, physicians have to carry multiple handheld computers.

Security needs to be tightened

If we are going to keep patient data on our handheld computers, we need to assure the privacy, security, and confidentiality of these data as mandated by the time-honored tradition of medical practice. We will need to implement technology, policies, and procedures to tighten security, especially in view of the common problem of losing one's handheld computer.

SUMMING UP

Adoption of handheld computers will be facilitated by their characteristics of mobility and accessibility and by the availability of a wide spectrum of medical references and medical calculators. Factors that will slow or inhibit their use are problems in integrating them into existing information systems and in setting up security systems.

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