

Family Physicians' Preferences for Computerized Decision-Support Hardware and Software

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BACKGROUND. While computers are now widely used by family physicians for billing and patient registration purposes, their use as decision-support tools is still quite limited. The purpose of this study was to determine the current use of computer hardware and software by family physicians, and the characteristics these physicians desire in computerized decision-support hardware and software.

METHODS. A cross-sectional survey of a random sample of 250 Michigan family physicians was undertaken in mid-1995. These physicians were asked about their current use of a variety of computer hardware and software. They were also asked to rate the value of different kinds of decision-support information potentially available by computer. The survey instrument also gathered the family physicians' preferences for design factors (both hardware and software), such as the size of a computer, the time needed to access information, and the frequency of updates.

RESULTS. Word processing on desktop computers and hospital information systems are the most widely used computer applications by family physicians. Physicians are most interested in computer-based information on drugs, storage and generation of patient education materials, and accessing treatment recommendations. Most feel that semiannual or annual updates of information are adequate, and would like a uniform interface. A high percentage of physicians (84.5% of all physicians and 94.1% of younger physicians) stated that they would consider carrying a handheld computer.

CONCLUSIONS. There is significant interest in several types of clinical decision-support software. Based on the results of this study, such software should have following characteristics: (1) be available for handheld as well as networked and desktop computers, (2) include drug information (particularly warnings, interactions, and side effects), (3) include overviews of treatment recommendations, (4) include patient education materials, and (5) have a uniform user interface and be updated at least annually.

KEY WORDS. Physicians, family; attitude to computers; software; decision-support systems; medical informatics. (*J Fam Pract* 1997; 45:137-141)

While computers are now widely used by family physicians for billing and patient registration purposes, as well as to track laboratory and imaging data in the hospital, their use as clinical decision-support tools is still quite limited. This is despite evidence that computers can improve the process of care by providing automat-

ed prompts or reminders, treatment planning assistance, and interactive patient education.¹ Computers can also help bridge the gap between research and clinical practice by providing the physician with more rapid access to well-organized and easily searched evidence-based information.²

A previous survey of the use of computers by family physicians found that approximately one half of family physicians used a computer in some way in their practice in 1988.³ Few of these family physicians, however, used medical-record or decision-support software. Possible barriers to the use of computers in the clinical setting include an inability to type, concern that computers would interfere with the physician-patient relationship, the learning curve associated with developing computer skills,

Submitted, revised, May 7, 1997.

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and cost.⁴

Previous studies of the information needs of family physicians have focused on the types of clinical questions (such as drug doses and treatment recommendations) generated by physicians during the course of their care of patients. These studies found that while performing patient care, primary care physicians had about two questions for every three patients seen, but that 70% of these questions remained unanswered.^{5,6} It would appear that the ability to have more of these questions answered through increased access to information would be beneficial.

The goals of the current study were to: (1) establish the current extent of computer use by family physicians in Michigan, (2) identify the perceived need for a variety of clinical decision-support tools, (3) determine the desired design characteristics for medical software and hardware, and (4) determine expectations regarding speed of access to medical information. It is hoped that this information will help guide future research in primary care informatics and the development of decision-support tools for family physicians.

METHODS

A random sample of 250 members of the Michigan Academy of Family Physicians was identified. Each physician in the sample was initially mailed a 6-page survey questionnaire in May 1995. Two follow-up questionnaires were sent to nonresponders approximately 1 and 2 months later, respectively.

The survey instrument began by explaining the purpose of the study, and defining the following terms: *handheld computer*, *tablet computer*, and *desktop computer*. Physicians were then asked for demographic information and their current computer hardware and software use. They were also asked for their level of interest in different types of clinical decision-support software and

preferred design characteristics for computerized decision-support hardware and software. Data analysis consisted primarily of descriptive statistics. Where two groups were compared, the chi-square statistic was used.

RESULTS

A total of 137 (55%) family physicians returned the survey questionnaire, with 132 (51%) providing usable responses. The mean age was 43.6 (SD,10.0), with a range of 29 to 71 years; two physicians did not give their age. The majority of respondents were in private practice (75.9%), and the remainder in academic practice (13.9%) or other (10.2%), which included industrial, emergency medicine, and urgent

TABLE 1

Computer Hardware Use by Family Physicians, Based on Responses to the Question: "I currently use the following computers either at home, in the office, in my clinical care of patients, or for any other use (check all that apply)."

Type of Computer Hardware	No.(%) Using Hardware
IBM-compatible desktop computer	95 (72.0)
Hospital-based computer system (laboratory results, test results, admission data, etc)	47 (35.6)
IBM-compatible laptop computer	18 (13.6)
Apple Macintosh computer (desktop or laptop)	9 (6.9)
HP 95, HP100 or HP200 handheld computer	3 (2.3)
Sharp Wizard or Casio BOSS organizer	3 (2.3)
Pen-based tablet computer	3 (2.3)
Franklin Pocket Physicians' Desk Reference	3 (2.3)
Apple PowerMac	2 (1.5)
Apple Newton MessagePad handheld computer	1 (0.8)
Psion handheld computer	1 (0.8)
Sony MagicLink handheld computer	0 (0.0)

care. Fully 94.9% of respondents were board certified in family medicine. The respondents were from a variety of geographic settings: 28.5% from a rural area or small town, 20.4% from a small or medium-sized city, 13.9% from a small metropolitan area, 29.9% from the suburb of a large metropolitan area, and 7.3% from an urban area.

The use of computer hardware by this sample of family physicians is summarized in Table 1. Only 14 physicians (10.6%) responding to this survey did not use computers at all. Use of computer software is summarized in Table 2. Physician ratings of the usefulness of different kinds of computer-based decision support are summarized in Table 3, and their preferences for different design characteristics of hardware and software for the clinical setting are shown in Table 4.

Regarding the speed of access to drug information by computer, most physicians felt that it should be accessible within 30 seconds (34.4%) to 60 seconds (32.0%) to be useful. Drug interactions and warnings were felt to be the most important information to include in a drug information system. This was followed in importance by the trade name, generic name, and side effects, and finally by information about cost, indications, alternative drugs, and a dosing calculator.

Physicians felt that medical information should be updated every 6 months (44.0%) to 1 year (39.0%); only 13.6% felt that more frequent updates were necessary. When asked if they would consider carrying a handheld computer (5 × 8 × 1 in. and weighing 1 lb), 85.1% said they would, while 51.2% would consider carrying a larger, tablet-sized computer (8 × 2 × 1½ in. and weighing 2 to 3 lb). Physicians younger than 40 years of age were significantly more likely to consider carrying a handheld computer (94.1% vs 78.6%, $P = .018$) than their older colleagues, but there was a trend for younger physi-

cians to be less willing to carry a tablet-sized computer (46.3% vs 55.1%, $P = .334$). There was no significant difference between older and younger physicians regarding their interest in computer decision-support software for diagnosis and treatment.

DISCUSSION

Contrary to popular belief, family physicians appear to be a fairly computer-literate group; only 10% did not use computers in some way. The most common

TABLE 2

Computer Software Use by Family Physicians, Based on Responses to the Question: "I currently use computers for the following tasks (check all that apply)."

Type of Computer Software	No.(%) Using Software
Word processing	87 (65.9)
Games	65 (49.2)
Accessing hospital laboratory or x-ray reports	55 (41.7)
Personal/home finances	51 (38.6)
Spreadsheets	43 (32.6)
Drug information	27 (20.5)
Electronic medical references on CD-ROM	21 (15.9)
Computerized medical records (outpatient)	21 (15.9)
Accessing online databases such as the National Library of Medicine	20 (15.2)
Clinical decision support (medical calculators, differential diagnosis, prognosis, test interpretation)	16 (12.1)
Online services	
America Online	14 (10.6)
Internet	8 (6.1)
CompuServe	8 (6.1)
Bulletin Board Services	6 (4.5)
Delphi	0
E-world	1 (0.8)
Any other use	32 (24.2)

TABLE 3

Physician Ratings of the Usefulness of Different Kinds of Computer-Based Decision Support

Type of Computer-Based Decision Support	Usefulness Rating (SD) Scale 1 to 5*
Drug information	
Access to drug information	3.7 (1.1)
Calculate dosage of medications based on renal or hepatic function	3.4 (1.1)
Being able to search for drug information by:	
Trade name	4.3 (0.8)
Generic name	3.9 (1.0)
Indication or problem	3.4 (1.1)
Patient education	
Being able to print patient education materials	4.1 (1.1)
Being able to print customized patient education materials	4.0 (1.0)
Being able to display diagrams, animations, and photos on a computer to explain common medical problems to patients	3.2 (1.1)
Diagnosis and treatment	
Overview of current treatment recommendations	3.7 (1.2)
Access to a collection of your own "clinical pearls"	3.5 (1.2)
Decision rules	3.4 (1.1)
Ability to search the database of the National Library of Medicine	3.4 (1.2)
Interpretation of test results using prevalence data and test sensitivity and specificity	3.1 (1.2)
Calculation of common clinical variables such as creatinine clearance, osmolar gap, and so on	3.0 (1.0)

*A Likert-type scale was used, where 1 = not useful (would not use), 3 = somewhat useful (would use occasionally), and 5 = very useful (would use daily).

all physicians, as well as 94.1% of younger physicians) stated that they would consider carrying a handheld computer. The low rate of actual use of such computers by the physicians surveyed may reflect lack of information about availability of such hardware, inertia in changing older styles of practice, cost barriers, and lack of useful software. This is a rapidly changing field in the computer industry, and several handheld computers with compatible medical software have recently been released.⁷ These units turn on instantly, weigh a pound or less, and many use a pen for input. Access to this type of handheld computer could result in more questions being answered during the course of a patient-physician encounter.⁷

Home computer use, as evidenced by the use of word processors (65.9%), games (49.2%), and home finance software (38.6%), was quite high, but this high rate did not translate into use of computers in the outpatient clinical setting. Only 15.9% of physicians used electronic medical records; a similar number used CD-ROM medical references; and even fewer used clinical decision-support software or accessed the databases of the National Library of Medicine.

Among types of clinical decision-support software, physicians expressed the greatest interest in patient education materials, drug information, and overviews of treatment recommendations. Regarding drug information, physicians not surprisingly preferred the trade name to the generic name as an identifier, and were especially interested in quick access to information about drug

hardware platform was IBM-compatible desktop systems (72%), with the next most common being hospital information systems (35.6%).

Although few physicians reported use of handheld computers such as the Newton MessagePad or Hewlett Packard 200LX, a high percentage (84.5% of

interactions, warnings, and side effects.

It is important to note that each of the types of decision-support software described was rated as at least "somewhat useful." This included tools such as computerized decision rules, a collection of the physician's own clinical "pearls," calculation

TABLE 4

Importance of Different Characteristics of Decision-Support Hardware and Software to Family Physicians

Computer Hardware/Software Characteristic	Importance Rating (SD) Scale 1 to 5*
Ability to easily update any information	4.3 (0.9)
A uniform interface, where multiple programs are accessed in a similar manner	3.7 (0.9)
Ability to customize software to reflect the physician's practice style, patient population, and clinical expertise	3.6 (1.1)
Ability to keep the computer in the pocket of my lab coat (ie, no larger than 5" x 8" x 1" and weighing 1 lb)	3.3 (1.4)
Ability to carry the computer around, even if I can't keep it in my pocket (ie, a size larger than 5" x 8" but no larger than 8" x 11" and weighing no more than 2 - 3 lb)	3.0 (1.1)

*A Likert-type scale was used, where 1 = not important, 3 = somewhat important, and 5 = very important.

of patient-specific drug dosages, searching the National Library of Medicine databases, and software to assist physicians in interpreting test results using Bayes' theorem.

The study has two limitations. Most notable is the relatively low response rate of 52%. While typical for physician questionnaires, it raised the possibility that the respondents were not typical of family physicians as a whole. On the other hand, the demographics of the group appear to be representative in terms of age and community of practice, and the majority were in the private practice of family medicine. Another limitation is that the data were gathered in mid-1995, and it is possible that computer use among family physicians has increased during the past 2 years. Such an increase, however, would not be expected to significantly change the preferred design characteristics for computerized decision-support hardware and software.

CONCLUSIONS

Based on the results of this study, decision-support software should have following characteristics:

- Be available for handheld as well as networked and desktop computers
- Include drug information (particularly warnings, interactions, and side effects)
- Include overviews of treatment recommendations
- Enable the user to print patient education materials
- Have a uniform user interface
- Be updated at least annually.

Rapid access to accurate, up-to-date information using computers has the potential to help family physicians take better and more cost-effective care of their patients. It is hoped that the results of this research will help to both encourage and guide the

development of such medical decision-support software for the primary care setting. Further study is needed of the impact of handheld computers and computerized decision support on the process, quality, and cost of medical care.

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