Introduction of Handheld Computing to a Family Practice Residency Program

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Background: **Handheld computers are valuable practice tools. It is important for residency programs to introduce their trainees and faculty to this technology. This article describes a formal strategy to introduce handheld computing to a family practice residency program.**

Methods: **Objectives were selected for the handheld computer training program that reflected skills physicians would find useful in practice. TRGpro handheld computers preloaded with a suite of medical reference programs, a medical calculator, and a database program were supplied to participants. Training consisted of four 1-hour modules each with a written evaluation quiz. Participants completed a self-assessment questionnaire after the program to determine their ability to meet each objective.**

Results: **Sixty of the 62 participants successfully completed the training program. The mean composite score on quizzes was 36 of 40 (90%), with no significant differences by level of residency training. The mean self-ratings of participants across all objectives was 3.31 of 4.00. Third-year residents had higher mean self-ratings than others (mean of group, 3.62). Participants were very comfortable with practical skills, such as using drug reference software, and less comfortable with theory, such as knowing the different types of handheld computers available.**

Conclusion: **Structured training is a successful strategy for introducing handheld computing to a residency program. (J Am Board Fam Pract 2002;15:118–22.)**

Information technology is becoming increasingly important in the practice of medicine, and physicians continue to embrace such applications as the Internet[1] in growing numbers. Handheld computers have received a particularly warm reception in the medical community.[2] These devices can store large amounts of useful information, such as addresses and telephone numbers, drug-prescribing information, databases of laboratory or other patient data, and clinical reference data. Unlike larger computers, handheld computers by definition are small and portable and can therefore be used in different practice settings. Because these devices are fast becoming valuable practice tools, it is important for residency programs to prepare their trainees for this future.

Handheld computers are easy to use, but the familiarity, interest, and proficiency of physicians with these and other technology devices vary widely. Most physicians are not likely to utilize all capabilities of a handheld computer without specific training. Whereas there is literature to support the usefulness of handheld devices in assisting family practice residents to document procedure experience[3] and in encouraging use of guidelines for asthma among practicing pediatricians,[4] no formal training program in handheld computing has been previously described.

The goal of the University of Pittsburgh Medical Center–St. Margaret Handheld Computing Initiative was to systematically introduce handheld computing to the residents, fellows, and faculty of a large family practice residency program by providing not only the devices but also structured training. This strategy was developed to ensure that all participants acquired a valuable set of skills they could use in practice or teach to other physicians.

Methods

Setting

The UPMC–St. Margaret is home to a large family practice residency program of 35 residents, as well as fellowship programs in geriatrics, sports medicine, and faculty development. A group of faculty, fellows, and residents with a special interest in handheld computing met initially to establish specific objectives for the program and to decide which handheld computer and software applications would be provided as standard equipment for all

Submitted, revised 27 June 001.

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participants. Funding was secured through the capital budget of the hospital.

All 62 physicians affiliated with the residency or fellowship programs, including 35 residents, 7 fellows, and 20 faculty members (including 4 nonphysician members), participated in the handheld computing initiative. Thirteen participants already owned or had used a handheld computer, although none had used the TRGpro.

Hardware and Software

The TRGpro (HandEra, Des Moines, Iowa), which uses the Palm OS (Palm, Santa Clara, Calif), was selected for this initiative. This device is similar to other handheld computers but has a compact flash memory expansion slot that accommodates memory cards manufactured by a number of different companies. Each TRGpro was equipped with a 32-MB compact flash card (Kingston Technologies, Fountain Valley, Calif), raising the total memory of the handheld to 40 MB.

The handheld devices were preloaded with a suite of programs purchased from Skyscape (www.skyscape.com). This suite of programs included a handheld version of the reference text *Griffith's 5 Minute Clinical Consult* (Lippincott Williams & Wilkins, Philadelphia), the drug database Lexidrugs (Skyscape, Hudson, Mass) and the drug interactions program Interact (Skyscape, Hudson, Mass).

Additional software included MedCalc (MedCalc Software, Mariakerke, Belgium), a calculator program with many common formulas, and HanDBase (DDH Software, Lake Worth, Fla), a program that allows users to create and maintain their own simple databases on their handheld computer. The total cost of all software and hardware for all participants was approximately $30,000. Neither the author nor the hospital nor the residency program had or now have any financial interest in the companies manufacturing the hardware or software.

Learning Objectives and Training Modules

The learning objectives were chosen to teach participants to use their handheld computers for storing and retrieving addresses and other contact information, retrieving such reference data as drug-prescribing information, and keeping track of information in a database (such as medical procedures performed or patient laboratory data). In addition, knowledge of the advantages and disadvantages of handheld computers and the different types of devices available were included as objectives (Table 1).

Four training modules were designed based on the set objectives. Each module consisted of an interactive, hands-on presentation and a 10-question multiple-choice quiz on the corresponding material (Figure 1). These modules were taught by faculty and fellows during a 5-month period (September 2000 – January 2001). Each module was offered several times in the evenings, early morning, and weekends, so that every participant's attendance would not interfere with professional responsibilities.

Multiple-Choice Quizzes and Certification

Successful completion of the training program required correctly answering a minimum of 30 of the 40 total questions on the four multiple-choice quizzes corresponding to each module. Instructors reviewed the quizzes with participants after teaching each module. Participants who successfully completed all four modules received a certification card and were permitted to keep their handheld device. Those who did not successfully complete all four modules were asked to return their handheld device immediately, an outcome that served as a powerful incentive for successful participation.

Self-Assessment Survey

On completion of the program, participants were asked to complete a self-assessment questionnaire asking how well they believed they had met the specific objectives of the training program. They were asked to rank their abilities on a four-point scale (4 = very competent, 3 = competent, 2 = slightly competent, 1 = not competent). The average self-rating for each objective was calculated (Table 1). Results across objectives were also combined to produce a mean self-rating for each participant.

Statistical Analysis

The Kruskal-Wallis test was used to determine differences in composite quiz scores and mean self-ratings by level of training and whether participants had used a handheld computer before the program. The association between mean self-ratings and composite scores was determined using a Spearman rank coefficient.

Table 1. Objectives of Training Program by Module and Average Self-Ratings for Each Objective.

Objective	Average Self-Rating
Module 1: Introduction to Handheld Computing	
1. List the advantages handheld computers have over other IT devices	3.28
2. List the functions an operating system performs	2.80
3. List the main operating systems for handhelds computers and their advantages and disadvantages	2.81
4. List at least three medical applications of handheld computers	3.49
5. Describe the evidence for the usefulness of handheld computers in medicine	2.90
Module 2: Introduction to the Palm Operating System	
1. Use the date book, address book, memo pad and to do list functions	3.77
2. Write text using the Graffiti script-writing system	3.79
3. HotSync my handheld computer with a desktop computer	3.62
4. Beam an application of file from my handheld computer to another	3.62
5. Perform a soft or hard reset of my handheld computer	3.07
Module 3: Basic Medical Applications	
1. Use the *Griffith's 5 Minute Clinical Consult* program as a reference	3.77
2. Use the Lexidrugs program to look up specific drug information	3.77
3. Use the Interact program to determine if two or more drugs interact	3.60
4. Use the MedCalc program for specific medical calculations	3.80
5. List the different pregnancy risk categories for drugs and the meaning of each*	3.64
Module 4: Advanced Applications	
1. Store information and run applications from the compact flash card	2.97
2. List the different kinds of databases and their principal attributes	2.70
3. Use the HanDBase program to create a database on my handheld computer	3.11
4. Customize the synchronization process and describe the file link function	2.67
5. List at least two document-related activities that can be performed with a handheld computer	2.91

Note: self-ratings were scored from 1 to 4.
*This objective has nothing to do with handheld computing. One of the most useful features of the Lexidrugs software program is the clearly visible pregnancy risk rating for each drug. A review of the ratings was therefore included in training module 3.

Results

All participants except two faculty members (60 of 62) successfully completed the training program. One lost interest partway through the program, and the other did not achieve a minimum composite score of 30 on the evaluation quizzes. The mean composite score on quizzes was 36 of 40 with a range of 27 to 40. No significant differences in composite score by year or level of training were found ($P = .17$).

The average self-rating score for the participants was a mean of 3.31. Self-rating scores did vary significantly by year of training ($P = .01$), with third-year residents (average self-rating per group, 3.62) rating themselves higher than other groups. The average self-rating score of those who owned or had used a handheld computer before the program was higher than those who had not (3.45 vs 3.29), but this difference was not statistically significant ($P = .16$). Similarly, the mean composite score of those who had used a handheld computer before was slightly higher (36.3 vs 35.9). This difference also was not statistically significant ($P = .63$).

Which one of the following describes a limitation of the Palm OS?

a. Any note or memo must be under 4,096 characters in length.√
b. A maximum of three new applications can be installed regardless of the amount of memory available in the handheld.
c. Category names for different applications can have a maximum of 255 characters.
d. All newly installed applications are automatically erased if a handheld using the Palm OS is not "HotSynced" to a desktop every 24 hours.

Figure 1. Sample multiple choice question from evaluation quiz.

Table 2. Relation of Mean-Self Ratings and Composite Scores.

	Mean Self-Rating			
	2.00–2.49	2.50–2.99	3.00–3.49	3.50–4.00
Number in group	1	15	24	21
Average composite score of group	34	34.7	36.1	36.9

As shown in Table 1, participants were least comfortable with objectives that required theoretical knowledge, such as describing the functions of an operating system (average self-rating, 2.80), listing the different types of handheld operating systems and their features (average self-rating, 2.81), listing the different kinds of databases (average self-rating, 2.70), and describing how handhelds could be used to create and store documents (average self-rating, 2.91). Other challenging objectives included creating and using a database for the handheld computer (average self-rating, 3.11) and customizing the synchronization process, whereby information on a handheld is shared with a desktop computer (average self-rating 2.67).

Participants were very comfortable with the basic functions of Palm OS, such as using the date book, address book, and Graffiti handwriting recognition software. They were also very comfortable with using the preloaded medical software. Average self-ratings for these objectives were all above 3.50.

Not unexpectedly, average self-ratings and composite scores were correlated (Spearman rank coefficient 0.40, $P = .001$), Table 2.

Discussion

Handheld computing has a very bright future in the medical community. Roughly 15% of physicians in the United States currently use a handheld computer, mostly for medical and nonmedical reference use.[5] One in four family practice residencies provide handheld computers for their residents.[6] This number is expected to grow dramatically in the near future as are the number of tasks physicians will be able to accomplish with handheld devices increases. Today, for example, less than 1% of US physicians use using handheld computers for such transactions as prescription writing and order entry. This number is predicted to grow to 20% by 2004.[5]

This article describes a strategy for systematically introducing handheld computing in a residency program. Using the basic functions of a handheld computer, such as storing and retrieving addresses or telephone numbers, is very simple and does not require special training. Structured training, however, permits all physicians, rather than a few enthusiasts, to acquire a broader set of skills.

This technology is changing rapidly, and the UPMC-St. Margaret handheld computing initiative provided participants with skills that are valuable today but not necessarily in the future. It can be argued, furthermore, that the training program, evaluation quizzes, and self-evaluation survey questions need to be tested in other settings before this curriculum can be accepted as a valid way of introducing handheld computing to physicians. A formal packaging of the curriculum and distribution by the Internet or CD-ROM is being planned. The project did not assess how participating physicians use their devices after training was complete, how well they retain the skills, or how this training influences patient management and outcomes. These limitations aside, there is no question that the thorough introduction to handheld computing helped participants realize the full potential of these devices. Participants in this program are excited rather than apprehensive about the day handheld computers become a ubiquitous and essential part of the practice of family medicine.

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