

The Family Physician And Handheld Computers: A Beginner's Guide

T Balsbaugh

Citation

T Balsbaugh. *The Family Physician And Handheld Computers: A Beginner's Guide*. The Internet Journal of Family Practice. 1999 Volume 1 Number 2.

Abstract

Many family physicians are using handheld computers to improve their clinical practice. These devices have three main types of functions: reference, organization, and communication. Reference programs allow the handheld user to access medical information from any location at any time. Organizing programs can be used to help family doctors track clinical data. The latest communication applications for handheld devices allow the use e-mail and access the Internet. Using wireless technology with handhelds offers great promise for unique medical applications such as electronic prescriptions and billing. Growth of this new technology will be limited by the need to maintain patient confidentiality. This article reviews the current and future uses of handheld computers for family physicians

INTRODUCTION

Family physicians are joining a revolution in medicine. They are part of a growing number of doctors who are using handheld computers in their daily practice.

This article will review the history of handheld devices, the current uses of these devices, and the future promise of this technology. (Because of the tremendous popularity of the Palm brand of handheld devices, much of this article will specifically discuss Palm products. Many of the features of the Palm line are available in other handheld computers.)

Three main attributes describe the value of handheld computers for family physicians: "peripheral brain", organizer, and communication device.

These functions have evolved over the past 25 years from earlier electronic devices. Programmable scientific calculators were used in the basic science and engineering world. For the first time in history, handheld calculators could be used to solve extensive equations. Simultaneously in the business sector, pocket-sized data organizers replaced the Rolodex and allowed people freedom from their office and administrative assistants. These organizers became known as personal digital assistants or PDAs. This acronym has continued to generically describe handheld devices even as their functions become more diverse. Another important technical development was the evolution from desktop to laptop computers. Software applications for word

processing, spreadsheets, and computerized reference material became available anywhere, not just at the office. More recently, there has been rapid proliferation in the use of e-mail, the Internet, and mobile telephones. All of these electronic devices have created the niche for PDAs. The PDA combined the features of an organizer with significant storage memory, expandable software, and the ability to interface with the desktop computer and other telecommunication devices. The success of handhelds lies in the combination of functions, and it is this diversity that has made them popular among family physicians

A LOOK AT A POPULAR HANDHELD BRAND

During the mid-1990s, US Robotics developed a popular PDA known as the Palm Pilot. 3Com took over the company in 1997 and by May 1999 they controlled 73% of the US handheld market.¹ By May 2000, Palm, Inc. began trading on the NASDAQ stock exchange. Other companies made successful handheld products, but Palm created brand identity with unique features and simple design.

A Palm PDA is small enough to fit in your pocket, and integrates easily with a desktop PC. This feature allows the user to bidirectionally exchange information between the handheld and the desktop PC and is termed "HotSync". Another advantage of Palm technology is the use of a touch screen instead of a keyboard. The Palm user enters data by writing directly on the screen using a stylus. The alphabet for data entry is a set of easily learned characters also known

as “Graffiti”. For those users who do not learn “Graffiti”, there is an on-screen keyboard, or an attachable portable keyboard. Lastly, Palm products use an infrared port that can be used to “beam” information and software applications from one Palm to another Palm. The “beam” function can also be used to print documents.

Palm handhelds have a basic group of core programs that come with every new machine: AddressBook, Calendar, To Do List, and Memos. Palm’s operating system, Palm OS, is widely used by professional and amateur programmers, giving the user access to thousands of programs. These programs can be found on the Internet, some available at no charge (“freeware”), nominal charge (“shareware”), or more expensive proprietary products. A guide to downloading and installing software can be found at <http://www.pdamd.com/vertical/tutorials/guides/installsoftware.xml>.

HANDHELD DEVICES AS A “PERIPHERAL BRAIN”

Seven years ago, Slawson and Shaughnessy wrote a classic family medicine article about becoming an “information master”.² This paper operationalized the process of finding information, judging the quality of the information and integrating it into a physician’s practice. Handheld devices have given physicians the ability to use reference materials at the point of care.

SEVERAL TYPES OF HANDHELD PROGRAMS HELP FAMILY PHYSICIANS MANAGE INFORMATION

Document managers are applications used to create a “library” on the handheld using text files. For Palm OS, these are called “.doc” files. (You can purchase a document manager at <http://www.cesinc.com> or <http://www.aportis.com>.) The user can create a “.doc” or share files made by other PDA users. These files can be downloaded from PDA sites on the Internet or “beamed” from one user to another. There are hundreds of medical “.doc” files, explaining part of the success of Palm products for physicians.

Users can download pre-written articles from medical PDA web sites: <http://www.pdamd.com>, <http://www.tucows.com>.

Examples include:

- DSM IV Axis Criteria
- NHLBI Asthma Guidelines

- Folstein Mini Mental Status Exam

Figure 1



Figure 2



Physicians can also write their own “lists”, and no longer rely on the index cards in their white coat pocket. They can take a document previously saved in Microsoft Word and convert it to the PDA “.doc” format. Some document viewers include a desktop program to perform the conversion (Documents to Go: <http://www.dataviz.com>) and

other converter programs are available separately (PalmDoc:<http://www.wilbran.com/PalmDoc>). Residents can write lists of standard orders, differential diagnosis, lecture notes, and other documents.

Figure 3

Acute MI

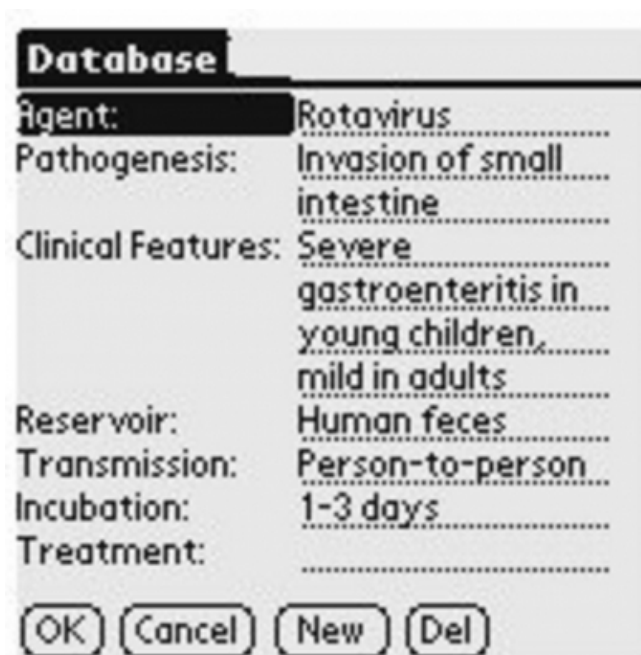


Electronic textbooks have also been published for PDAs. These programs cost around \$50-100 for individual texts, and discounted prices are available for multiple textbook packages. See <http://www.handheldmed.com> or <http://www.skyscape.com> for a full description. Some of the titles include:

- 5 Minute Clinical Consult
- Harrison's Principles of Medicine
- Red Book 2000
- Cline: Emergency Medicine

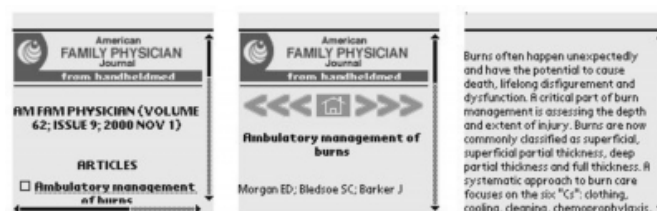
Database managers are another important group of applications for organizing data into easy to read charts. These programs allow the user to design a data entry form to track patients, compare similar diseases, etc. There are also many web sites where users can download pre-made files that list data in organized charts. These files can be used for quick reference instead of going through all the words of a ".doc" file. Popular database programs include JFile (<http://www.land-j.com>) and HandDbase (<http://www.ddhsoftware.com>).

Figure 4



Web-clipping programs allow the user to "surf the web" from the Palm device. The programs are said to "clip" from the Internet, because the user is not connected to the Web when viewing. The user will usually choose a group of sites that he/she wishes to visit. When the user activates the program, the Palm will connect to the Web through a desktop PC during "Hotsync" or via a mobile phone connection in some of the latest Palm models. The Palm saves the web pages for viewing after the user is no longer connected to the Web. The program uses a browser system that displays the images in a hyperlink format similar to desktop browsers such as Netscape. The best-known web-clipping program for Palm is AvantGo (Available for free at <http://www.avantgo.com>). Useful medical sites on the web can be "clipped" for use anywhere, anytime on the handheld. These programs can be used to get news updates and journal abstracts. Titles currently available include the New England Journal of Medicine, BMJ, and American Family Physician.

Figure 5



Medical calculators help family physicians make better decisions. Several tools are available for calculations

including blood gas analysis, kidney function, electrolyte concentrations, body-mass index, and growth percentiles. Many of the programs consolidate the calculations to a single PDA application. Another type of handheld calculator is replacing the “pregnancy wheel”. These programs are used to calculate a pregnant woman’s estimated date of confinement given the date of her last menstrual period or ultrasound determined gestational age. The programs can also remind the physician to perform tests at indicated gestational ages.

Figure 6

A-A Oxygen Gradient Calculator (From MedMath (Phillip Cheng, MD, 1999)

The figure shows three sequential screens of the A-A Oxygen Gradient Calculator. Each screen has a title bar with 'A-A' and a formula $(pRtm - pH2O) \times FIO2 - pO2 - pCO2/RQ$. The input fields are: pO2 (mmHg), pCO2 (mmHg), FIO2 (%), Resp Q (L/min), p Rtm (mmHg), and p H2O (mmHg). A numeric keypad is on the right, and a 'Calculate' button is at the bottom. The third screen shows the result: A-a Grad 38.25 mmHg.

Another type of medical calculator can be used to help physicians make evidence-based decisions. These decision rule calculators allow the user to enter in patient specific data and the handheld calculates the chances of a particular diagnosis, or mortality figures. Popular calculators exist for Bishop score for induction of pregnancy, the Gail model for invasive breast cancer risk, Ranson’s criteria for pancreatitis, and streptococcal pharyngitis score. The calculations are based on well-known studies and are usually cited with each application. An excellent freeware program for this function is MedRules developed by Kent Willyard, MD (2000 (<http://pbrain.hypermart.net/medrules.html>).

Figure 7

The figure shows three screens of the MedRules application. The first screen is titled 'Select a Rule:' and lists various medical conditions. The second screen is titled 'Ranson's 0' and shows input fields for 'On admission' (Age, WBC, Glucose) and 'At 48 hours' (HCT, BUN, Co, pO2, Base def, Fluid req), with a 'Mortality 15%' result. The third screen is titled 'Reference' and provides a citation for Ranson's criteria.

Pharmaceutical reference programs are one of the most popular uses of the PDA “peripheral brain”. Leading applications include ePocrates (<http://www.epocrates.com>), Lexidrugs (<http://www.skyscape.com>), and Tarascon’s Pharmacopea. (available at <http://www.medscape.com>). These programs provide dosing information, adverse reactions, and interactions. Epocrates’ unique features include automatic updates of changes in prescribing

recommendations and a mechanism to check drug interaction. A survey done by investigators at Brigham and Women’s Hospital found that many physicians using ePocrates had fewer prescribing errors.³

Figure 8

The figure shows three screens of the ePocrates application. The first screen is a list of drugs. The second screen shows drug information for Metformin, including dosing and interactions. The third screen shows drug information for Metformin with a table of approximate retail prices for different strengths and quantities.

HANDHELD DEVICES AS AN ORGANIZER

Today’s family physician must be an efficient coordinator of care. Unfortunately, many doctors have less administrative support because of pressure to decrease overhead costs. Handheld devices can help the busy practitioner stay organized. The address book functions of most PDAs allow for storage of thousands of addresses. Palm handhelds can import phone lists easily from a PC spreadsheet. This feature enables the family physician to carry a staff directory on the handheld. Most PDAs include a search feature that will list all of the contacts containing a particular word, a first or last name, or even a number.

The calendar function is also invaluable for the family physician on the run. The handheld can be programmed to keep a usual template that can include office hours, regular meetings, birthdays, and other repeating events. Most programs offer the convenience of viewing by the day, the week, the month, or the entire year. Schedules changed on the desktop PC or the handheld can be synchronized. Programs usually include alarm and reminder capabilities. These programs are usually included in the initial software package installed on the PDA, and there are also some excellent “add-on” versions.

Handheld devices also have tremendous utility as a “clinical organizer”. The PDA can keep track of a patient names, medical record numbers, medications, historical information. Many programs have been designed to keep a patient census for the physician. More sophisticated versions of these programs allow for easy data entry and will create printable history and physicals, daily progress notes, and end of the day “sign-out” sheets (PatientKeeper: <http://www.virtmed.com>). Some family medicine residencies are using handhelds to document resident procedure experience for training and credentialing purposes.⁴

Coding and billing programs are another helpful handheld

application for family physicians. New HCFA rules regarding coding of services make physicians spend more time documenting and generating billing data. A simple PDA solution is to use a searchable document reader to store commonly seen diagnoses and the corresponding ICD-9 code. More sophisticated proprietary programs allow the user to audit their documentation and determine if the billed level of service appropriately coded (<http://www.statcoder.com>). Some programs combine documentation and coding features into one product, with a printable-electronic record with automatically coded billing data. An advanced product allows the physician to perform coding and billing while on rounds, after the physician "Hot-Syncs" the billing data is submitted to third-party payers electronically.

There is an important word of caution for handheld users who keep clinical data on their device. The Health Insurance Portability and Accountability Act of 1996 (HIPAA) mandates that electronic communications maintain patient confidentiality.⁵ The Department of Health and Human Services issued a final rule regarding the electronic data interchange in October 2000, and enforcement of this rule will begin in 2001.⁶ To keep patient data confidential, handheld users who keep clinical records on their PDA should not share their device. There are number of handheld password programs that will lock access to confidential files, including TealLock (<http://www.tealpoint.com>) and PadLockHack (<http://www.tucows.com>). Confidential files can also be accidentally distributed when a PDA is synchronized with a desktop PC. Therefore, users should not "Hotsync" on a desktop PC without appropriate security measures. Despite the widespread availability of information encryption the Internet, security protocols for wireless handheld data transmission are less robust.⁷ These problems make PDAs more vulnerable to breaches of patient confidentiality. Consequently, physicians should address security issues before entering confidential patient information on their handheld.

THE MOST RAPIDLY GROWING DOMAIN OF HANDHELDS IS COMMUNICATION

PDAs became communication devices with the addition of e-mail, fax, and phone capabilities. The growth of wireless Internet access has spawned novel uses for handhelds including electronic prescriptions. A number of companies are currently providing e-prescriptions via handhelds. (Two examples are <http://www.allscripts.com> and <http://www.iscribe.com>.) Some of the currently existing

products help the physician to select a medication for a patient that is formulary appropriate for the insurer. The programs also check dosing and potential interactions. The prescription is sent to the e-prescription company's computer via "Hot-Sync" and the Internet. The company electronically submits the prescription to a participating pharmacy. A record of the prescription can be printed for the medical record and a hard copy can be generated at the patient's request. A review of these services can be found in Medical Economics, October 23, 2000.⁸

THE FUTURE OF HANDHELDS: WIRELESS ELECTRONIC MEDICAL RECORD AND BEYOND

Because of privacy concerns and technical limitations, the applications for a wireless medical record are in their infancy. Most companies are initially offering prescribing tools and plan to expand into a wireless chart. The interpretations of HIPAA in 2001 should spur many companies to address privacy concerns. As wireless encryption improves, many medical applications of wireless handhelds can be developed.

Chronic disease management could be revolutionized using handheld devices. PDA programs currently exist to allow patients to track glycemic control or peak expiratory flow. In the future, their physician could wirelessly access patient logs when the patient calls with a question. Data from home nurses or therapists could also be gathered using a PDA and transferred to the ordering physician.

The ultimate hand held device for the family physicians of the future will be wireless and will be capable of protecting the patient's privacy. These handhelds will integrate the electronic medical record, medical references, prescribing, physician orders, billing, and communications. Handhelds have already been shown to decrease the number of medication errors. With the growth of PDA use, there could be significant improvements in the quality of patient care. In the future, PDAs could be used to provide reminders for physicians, and give more evidence based decision support. Today's family physician can help to achieve these gains by participating in the development and use of handheld devices.

References

1. Palm, Inc. Company history. Available at: <http://www.palm.com/about/corporate/timeline.html>. Accessed on December 8, 2000
2. Slawson DC, Shaughnessy AF, Bennett JH. Becoming an information master: Feeling good about not knowing everything. *J Fam Pract* 1994; 38:505-513.
3. Rothschild JM, Lee TH, Bae T, Yamamoto R, Horsky J,

Bates, DW. A Survey of physicians' experience using a handheld drug reference guide. AMIA 2000: Annual Symposium, American Medical Informatics Association. November 6, 2000.

4. Garvin R, Otto F, McRae D. Using handheld computers to document family practice resident procedure experience. *Family Medicine* 2000; 32: 115-118.

5. Department of Health and Human Services. Health Insurance Portability and Accountability Act Of 1996. Available at: <http://www.hcfa.gov/medicaid/hipaa/content/hipaasta.pdf>.

Accessed on December 12, 2000.

6. Department of Health and Human Services. Health insurance reform: Standards for electronic transactions. Available at:

<http://aspe.hhs.gov/admsimp/final/txfin00.htm>. Accessed on December 12, 2000.

7. Bannan KJ. The promise and perils of WAP. *Scientific American* 2000; 283 (4):46-49.

8. Chesanow N. PDAs for doctors: Your ticket to fast, flawless prescribing. *Medical Economics* 2000. 20:93-97.

Author Information

Thomas A. Balsbaugh, MD

Assistant Clinical Professor, Ellison Ambulatory Care Center, UC Davis Department of Family and Community Medicine