Personal Digital Assistant: An Information Management Tool for Medical Professionals

Shijith Kumar C* and AL Assan Kutty**

Handheld computing technology, commonly known as Personal Digital Assistant is having a tremendous impact in personal, educational and business settings. The potential is particularly significant for healthcare, specifically in clinical settings. This article explains the basics of personal digital assistant, its features, limitations, applications and advantages of using the technology in medical settings.

1. Introduction

Medical information revolution has attained a new dimension with the emergence of Personal Digital Assistant (PDA) as a tool for the Point Of Care (POC) information management. These powerful handheld devices are becoming invaluable in the daily lives of medical professionals. Medical information management with PDA can improve patient care activities and enhancing efficiency of health system.

2. What is PDA?

PDA, also known as palm computer or notebook computer, is a handheld device with information storage and retrieval capabilities. The earlier versions of PDAs were glorified electronic date books and address books. As the technology advanced, the functionality of PDAs expanded exponentially. In addition to the basic organizer functions, PDAs can now store reference books, database programs and can keep track of patients and clinical procedures. In addition modern PDAs have E-mail, Internet and other networking facilities.

3. Origin and Development

PDA was originally designed as personal organizer but developed into a multipurpose tool over the years. In 1993 Apple Computer Incorporation introduced the world to the first PDA, called 'Newton Message Pad'. The release of 'Newton Message Pad' was

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heralded as a mile stone of the information age. 'Newton Message Pad' was too big, expensive and complicated and its handwriting recognition was poor. As a result, it had only a limited number of users. Following Apple Computer Incorporation, other companies attempted to make PDAs. But none of them succeeded in the attempt.

Because of the drawbacks of 'Newton Message Pad', PDA use declined and was almost off the charts. The PDA technology was again revived by Palm Incorporation (Presently known as Palm One Incorporation), then a part of US Robotics with the release of a new type of handheld computers called 'Palm Pilot' in 1996. It was small and light, had long battery life, was easy to use and could store huge amount of data when compared to the Newton Message Pad. This new version of handheld device was met with tremendous acceptance world over and it became the first successful PDA.

The early versions of PDAs were about the size of a deck of a playing card and weighing around 155g. By 1999, still smaller sized PDAs were manufactured. At that time devices were equipped with a 160 X 160 pixel backlit screen and came complete with a comprehensive suite of PIM (Personal Information Manager) software including databook, address book, to-do-list, expense management software, calculator, note-taking applications and games.

The beginning of 21st century witnessed the development of Internet accessible PDAs. Several web content providers collaborated with PDA manufacturers to offer 'web-clipped' versions of their sites designed specifically for PDAs for easy download.

4. Features of PDA

1. PDA combines computing, telephone/fax, Internet and networking features.

2. It incorporates handwriting recognition features. Most systems are controlled by a pen-like stylus and have handwriting recognition software for entering text.

3. It has attractive portability.

4. PDA stores its basic programs in a ROM (Read Only Memory) chip.

5. It is powered by batteries.

6. In PDA, LCD screen serves as both input and output device

7. Information can be transferred back and forth between PDA and Personal Computer (PC), by a process called synchronization. Through synchronization, handheld data can be backed up and managed on the PC, and applications can be installed from the PC to the handheld.

8. PDA can also communicate with PC and Internet through an infrared communication port that uses Infrared light to beam information and the process is called beaming.

9. It has multimedia capabilities.

10. PDA has simple E-mail client software.

11. PDA offers easy mobility.

12. PDA provides spreadsheet and database programs

13. It is small and lightweight.

14. Popular PDA models do not have built-in keyboards, but external keyboards are available for some.

5. Applications of PDA in Medical Sciences

As the technology advances, the uses of PDAs expand exponentially in medicine. There are many PDA applications that are relevant in medicine. (A list of well-known medically related PDA software applications available in the market is given in Appendix). Some of these are:

a) E-Prescribing

Prescribing is one of the largest, paper-based processes in medical field. Not surprisingly, it's also one of the most inefficient. Errors due to illegible hand writing, and misprescribed medications are common in medical field. This can be solved to a good extent with the use of PDA for prescription, which will save time, and enhance patient safety.

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b) Drug reference

Cases of adverse drug reactions are primarily caused by dosing errors or inappropriate drug choice of doctors and many of these errors can be solved by point of care drug knowledge. Currently the most popular medical application of PDA is the drug database. PDA pre-loaded with drug information databases can deliver drug information to the doctors at the point of care thereby offering a time saving and convenient way to obtain current drug information.

c) Electronic Medical Record Management

PDA can be used as an access point of the electronic medical record and it serves as an effective interface between the doctors and the electronic medical records.New patient visit records can be generated and patient's chart in the exam room can be accessed either actively through a wireless connection or through a previous "synchronization" with the clinic Electronic Medical Record server.

d) Patient Tracking

Doctors need a better way to track and manage patient data. Patient Tracking is one of the most ambitious use of hand helds in medicine. Using PDA, caregivers can record basic patient information, admission diagnoses, patient histories, daily progress notes, and lab results It helps medical professionals to reduce paperwork, improve productivity, and access critical patient information quickly and easily even during the rounds.

e) Patient-Oriented Applications

A perfect use of handheld computers is to keep the patient healthy by helping them maintain a vigorous lifestyle. Handhelds are excellent tools for monitoring chronic diseases. For example using a cardiac risk calculator a patient can enter his details such as age, sex, weight, cholesterol level, blood pressure, family history and smoking status. The program then gives the probability of having a cardiac event in the next ten years. He can then see what would happen if he were a non-smoker or had lost weight. There are also many programs targeted at managing the health of different categories of people such as women, children, young and the old.

f) Electronic Medical Literature

PDA is very good at storing large amounts of textual information. The natural extension of this is to provide PDA forms of the reference books that doctors can carry around with them. This is another popular application of PDA in medicine. Presently a large number of medical titles, both text books and reference books are available to access over PDA.

g) Web Clipping

Web-Clipping programs allow capture of web page content for use on a PDA. Many web applications and files can download and can easily install on PDA. Some of these are free (freeware) and others are affordable titles. Some provide automatic information updating. PDA users can choose medical web sites they wish to visit or a site that they often reference in clinic and convert this to PDA format with ease.

h) Medical Calculations

The earlier medical use of handholds was solely to help medical professionals perform calculations. Medical calculators on PDA help caregivers to make better decisions, give valuable advice to the patients and avoid calculation errors. Hundreds of medical calculators are available

i) Electronic Mailing

It is possible for the medical professionals to send and receive E-mail messages from the PDA. PDAs allow wireless e-mail messages as well as by synchronization with the PC.

j) Address books/memo pads/to-do lists/date books

PDA is a powerful, portable personal information manager. It has enough memory to contain and organize thousands of names, addresses and phone numbers. Medical professionals can categorise them into "patients" "hospital," or "community resources" or " personal". The calendar section is a powerful cross- referenced and alarm-enabled "day-timer". Also PDAs include applications to create a 'to-do list' and quick writing of memo. The PDA can also remind medical professionals of important dates/meeting with an alarm sound.

k) Database Applications

Using the PDA-based database programs medical institutions can design in-house customized databases as well as they can use commercial databases. The database applications help track surgical procedures, track patients, distribute office-wide schedules, medical and office-related lists/databases, recommended immunizations, antibiotic efficacy information, ICD-9 coding information, comparing normal and abnormal laboratory results etc

l) Word Processing

PDA has word processing application called 'document manager' using which documents can be created and reviewed. The text files for PDAs are called 'DOC' files. Some of the 'document managers' allow links similar to web page links.

m) Medical Coding and Billing

With so many diverse rules to follow, coding and billing patient visits consumes more time than most medical professionals have. This can be done in a faster, more accurate way with a Personal Digital Assistant. PDA equipped with an online medical claim billing software process medical claims efficiently, handle patient invoices and obtain reimbursements.

n) Health Survey

Assessing patient's perceived health status is an important component of healthcare practice. The paper-based instruments remain inefficient for collecting data from patients because of the chances of missing data, respondent error, and the cost of administration and entering data. PDA provides an outstanding alternative to this.

6. Advantages of using PDAs in medical field

The major advantages of using PDA in medical field are :

1) Access to medical information on-demand

2) Efficient collection of medical data

3) Increased portability of and access to patient and clinical data.

4) Real-time communications with clinical team members

5) Quick transfer conformation among collaborating clinicians.

6) Improved drug knowledge of clinicians.

7) Increased patient safety and better patient outcomes.

8) Reduced drug interactions and medical errors.

9) Point of care access to the lists of current and past medications, drug-related problems and medical problems.

10) Enhanced incorporation of Evidence-Based Medicine into the practice settings.

11) Better informed patients

12) Generation of structured clinical documentation and well-organized data.

13) Data are generally clear and better organized compared with data on paper forms.

14) Enhancement in the quality of medical education and research.

7. Limitations

Although PDA is an effective personal information management tool for the medical professionals, it has some limitations.

1) Limited security features for storing sensitive data.
2) Easy loss or theft of the device owing to the small size.
3) Poor readability.
4) Small screen size.
5) Slow data entry.
6) Limited memory.
7) High cost.

8. Conclusion

The rapid, almost daily changes in healthcare environment require immediate access to relevant information at the point of care. PDA provides such access. They enhance medical practice, education and research by providing an effective means of storing

retrieving, analyzing and sharing large volumes of medical information. Practitioners in every branch of medical specialty can use these devices in various ways. In addition to common feature functions such as contact lists, calculators, calendars and expense logs, current PDAs have a wide variety of practical healthcare applications such as patient tracking, electronic medical records management, web clipping, and access to medical literature. Although PDA can provide many benefits in medical practice, it has some limitations also. As the technology improves these limitations can overcome and more programs can be made available.

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Appendix

Medical Applications of PDA : Examples

Sl. No.	Category of Application	Name of Application	Operating System	Company	Remarks/Description	Cost
1	Medical Calculator	ABG Pro	Palm	Stacworks Software	It analyzes arterial blood gases and tells whether or not the patient has a metabolic or respiratory acidosis or alkalosis. Also it calculates expected $PCO2$ and $HCO3$ and intimates concomitant acid-base disorder if any.	Free
2	Medical Calculator	BMI Calculator	Palm and Pocket PC	National Heart, Lung, and Blood Institute, NIH, U.S.A	This calculator measures the Body Mass Index (BMI) based on height and weight.	Free
3	Medical Calculator	EBM Calculator	Palm	Centre for Evidence-based Medicine, University Health Network, Toronto	EBM Calculator is designed to calculate relevant statistics for Diagnostic, Prospective and Case Control Studies and Randomized Control Trials (RCT)	Free
4	Medical Calculator	MedCalc	Palm	Medical Interactive Applications	It is designed for rapid calculation of common equations used in clinical medicine.	Free

#	Category	Name	Platform	Company	Description	Fee
5	Database program	HanDBase	Palm & PocketPC	DDH Software	HanDBase is a relational database program. A single file (a drug database or ICD-9 codes file for instance) can be accessed by many other data files. It is suitable for complex database designs or in situations where different database applications use common pieces of data.	Free
6	Database program	JFile	Palm	Land-J Technologies	JFile is a fast, efficient and user friendly database program for the PalmOS Platform. It support encrypting databases and movement to and from VFS memory cards.	Free
7	Document Reader	CSpotRun	Palm	Bill Clagett	CSpotRun is a free open source reader for documents in the Pilot DOC format.	Free
8	Document Reader	TealDoc	Palm	TealPoint Software	Read, edit, and browse documents, doc files, Books and text files.	Free
9	Drug References	ePocrates Rx	Palm	EPocrates Incorporation	ePocrates Rx is a comprehensive yet concise drug reference program. Easy access to drug dosing, interactions, and medication cost and packaging information is included. Formulary configuration allows customization for many regional health plans. ePocrates Rx is one of the earliest drug reference resources available in a dedicated handheld format.	Free
10	Database program	MobileBD	Palm	Handmark Incorporation	MobileDB is a database program to view and edit any list, table or spreadsheet-like information. It utilize the powerful sort, filter, and find features. It can create and manipulate hundreds of data lists.	Free
11	E-prescribing software	TouchScript ®	Pocket PC	Allscripts Healthcare Solutions	TouchScript ® is a leading e-prescribing software. It is faster, safer or more reliable. TouchScript helps clinicians increase patient safety, reduce pharmacy callbacks and improve office efficiency	Fee
12	Database program	BioMedical PDA	Palm	Professional PDA Publishing, LLC	BioMedicalPDA is a knowledge management tool containing expert-authored biomedical databases. Databases published in BioMedicalPDA are peer-reviewed and provide insights into the growing volume of emerging biomedical data. With over 60 databases currently available BioMedicalPDA is intended to provide quick facts and figures that research is regularly quick reference.	Fee
13	Reference document	5-Minute Clinical Consult	Palm, PocketPC	Lippincott Williams & Wilkins	The 5-Minute Clinical Consult is a comprehensive and structured clinical resource for handheld devices, and is one of the most respected sources of information for medical disorders. It covers more than 1,000 medical/surgical conditions and is indexed with more than 7,500 terms and medications to help clinicians locate the desired information quickly.	Fee

Personal Digital Assistant...

#	Category	Name	Platform	Publisher	Description	Fee/Free
14	Database Program	Diagnosaurus	Palm, PocketPC	McGraw-Hill Professional & Unbound Medicine	Through the Diagnosaurus, healthcare providers can make more informed decisions by instantly receiving a list of alternative diagnoses after selecting a diagnosis or patient symptom from an index on the PDA. Diagnosaurus provides with an invaluable tool that is especially useful for rounds and case conferences.	Free
15	Database program for patients	Diet & Exercise Assistant	Palm & Pocket PC	Keyoe Incorporation	The Diet & Exercise Assistant product line is committed to providing easy-to-use software tools that help consumers manage their daily nutrition, exercise, and health. It helps to achieve fitness and weight loss objectives by giving the tools necessary to monitor and analyze data.	Fee
16	Web application	PubMed for Handhelds	Palm & Pocket PC	National Library of Medicine	PDA based web application designed to help healthcare professionals to search PubMed, read journal abstracts, and access *ClinicalTrials.gov*.	Free
17	Evidence-Based Medicine reference	MedRules	Palm	Kent E. Willyard	MedRules is a popular, free EBM tool featuring useful clinical prediction rules taken from the medical literature, ranging acute sinusitis to UTI diagnosis, with additional rules being released occasionally.	Free
18	Evidence Based Medicine reference	Medical Info Retriever	Palm & Pocket PC	InfoPOEM	Medical Info Retriever is one of the best full-text EBM references for handhelds. This EBM reference work, includes thousands of abstracts from the Cochrane database, clinical-prediction rules, evidence-based guidelines, and Griffith's 5 Minute Clinical Consult.	Fee
19	Medical Dictionary	Stedman's Medical Dictionary	Palm & Pocket PC	Lippincott Williams & Wilkins	Provides quick access to definitions for over 102,000 medical terms and each term is reviewed by medical/healthcare experts for accuracy and clarity. Easy-to-navigate user interface makes finding medical terms and definitions on-the-fly faster and easier.	Fee
20	Security software	LockMe	Palm	René Witte	This PDA security software periodically locks PDA, starting at a specified time	Free
21	Patient tracking software	Patient keeper	Palm & Pocket PC	Patient Keeper Incorporation	Designed specifically for healthcare environments, the PatientKeeper Platform provides an open, extensible infrastructure for integrating, managing, developing, and deploying mobile healthcare applications.	Fee
22	Medical billing	MediLync	Palm & Pocket PC	2K medical softwares	The MediLync Mobile Practice Management System offers portability and scalability to practice management. MediLync seamlessly merges data to and from the patient accounting database to handhelds.	Fee