

Learning and teaching

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Introduction

As learning and teaching adapts to the demands of a modern world, we begin to see how customer demands, economic context and new communication tools are beginning to change the nature of the pedagogy used in teaching. Opening up access to further and higher education will need to be achieved at an affordable price. Increasing life-long learning will require greater flexibility in when courses can be started (why only October?), where they can be taken and how long they last. There are many examples of modular learning packages now which allow the learner to sign up to manageable chunks of learning. One of the tools for providing such flexibility will be the use of e-learning. There are many examples of this but one of the newest areas is that of using of personal digital assistants (PDAs). Here, Beatrice Doran describes one such use at the Royal College of Surgeons in Ireland.

PDAs for medical students at the Royal College of Surgeons in Ireland

The Royal College of Surgeons in Ireland (RCSI) is an independent international educational organisation (www.rcsi.ie). Since its foundation in 1784, the College has sought to maintain the highest standards in surgical and medical education and training. It is a postgraduate surgical College with Faculties of Radiology, Dentistry and Nursing. There are also undergraduate Schools of Medicine, Physiotherapy and Pharmacy.

The RCSI and information technology

The College has a history of being at the forefront in the use of information technology in medical education in Ireland, with a student laptop scheme in existence for the past 7 years for undergraduate

medical students. The College opted for Apple Macintosh laptops from the onset and this year's students received the latest version of the iBook. The College is also involved in software development and BeST (Basic Electronic Surgical Training) is an online program developed for basic surgical trainees. It is being marketed jointly by the College and by Harvard Medical International (www.intumed.ie). As the content for the basic surgical training courses is similar in all the UK surgical colleges, BeST is relevant for UK surgical trainees too. A Department of Medical Informatics was established in the College 2 years ago to teach medical informatics and carry out research in this important and developing area of medicine.

PDAs and *Pocket Medicine*

The RCSI has recently recognized the potential benefit of handheld computers for improving medical education and practice and it has issued personal digital assistants (PDAs) to all 3rd year students of its Medical School. Each PDA is loaded with a program called *Pocket Medicine*, the brain child of Prof. F. P. Muldowney, Professor Emeritus of Medicine, at University College Dublin, who acts as Editor-in-Chief. The Associate Editor-in-Chief is Professor John Harrington, former Dean of Tufts Medical School, Boston, with Assistant Editor Dr Stuart Carr from St. James's Hospital, Dublin. The program has two points of quick access to information: (i) a menu of major medical specialties which leads to the common 'referral points' or topics where second opinions are frequently sought, and (ii) a search facility which allows quick access to specific items or phrases.

Pocket Medicine is problem oriented and designed to aid the diagnostic/management approach which differs from classical textbook

teaching systems, which usually commence with a disease rather than a presenting symptom or problem. A standard taskbar lists an introduction, management, differentials and literature references. There are management flowcharts too designed to guide clinical investigation of each topic in a one-page outline, which is useful for quick scanning. The text itself appears in black with headings in red and blue links, leading to a more detailed discussion of special considerations. For a demonstration version containing lists of topics, e-mail: pocketdemo@eircom.net.

The advantages of *Pocket Medicine* are that it is extremely useful for quick consultation for acute patient management or the ordering of tests. It can also be very useful in the context of outpatient clinics, ward admissions and A&E decisions. It will have continuous updating by an international editorial board and by interactive input from the user's hospital or medical school. From an education and training point of view, *Pocket Medicine* will also be useful: consultation during weekly conferences, for journal club presentations and weekly MCQs. There will be a joint website with IBM Ireland which will allow the continuous upgrading of the product for registered users and ordering facilities with bulk discounts for software and hardware.

The growth of handheld computing

Handheld computers date back to the late 1980s with Jeff Hawkins, the designer of the original Palm Pilot. Early models such as the Apple Newton showed promise, but they were large in size, had a short battery life and poor handwriting recognition.¹ PDAs were originally designed as organizers but they can now do much more: they can retrieve or send e-mail, download information from the Internet, and in general do word processing, play music or video games.

PDA's are one of the fastest-selling consumer devices history has ever known. To date, more than 20 million have been sold, the majority of them from one company, Palm computing. In general, handheld computers are designed to complement a desktop or laptop computer and their value lies in being able to synchronize or synch them with desktop/laptop machines. Placing the

device in a special cradle, or with wireless technology, using an infrared connection, can carry out the synching. Most handheld devices run on one of two operating systems: the Palm OS and Handspring Visor devices, and the Windows CE used by the Compaq IPAQ and HP Jornada. Palm machines are less expensive than those that operate with the Pocket PC. All handheld devices come with a basic suite of programs, a diary, address book, to-do list and memo pad.

Handheld computers can be used as an independent device, but their great benefit lies in the fact that their real power is unleashed when they are used with a PC. Another feature of handheld computers is the facility they have to beam information from one handheld device to another using infrared technology. In considering the purchase of a PDA, the importance of memory in this context is vital, as medical resources are inclined to require a very large amount of memory.

Handheld computers in medical practice

There is considerable evidence from the literature of the growing importance of handheld computers in medical practice and analysts predict that by 2004, 20% of physicians will use handhelds for e-prescribing, ordering and checking lab tests, capturing charges and dictating notes.² Handheld computers basic functions, an address book, a planner, a to-do list and a memo pad are useful to anyone trying to organize their time. However, healthcare professionals also need to keep track of patient information, especially medications and treatments. In addition, access to medical information in the form of reference works, medical calculations, code and billing for patient encounters, tracking patient data and writing prescriptions are all popular uses for PDAs among healthcare professionals today.³

Errors in medicine are frequently caused by not having access to appropriate clinical and non-clinical information at the point of care. A 1999 Institute of Medicine (IOM) Report in the USA, pointed out that 'preventable adverse events are a leading cause of death' and that 'at least 44 000, and perhaps as many as 98 000, Americans die in hospital each year as a result of medical errors. With the correct infrastructure and the availability

of clinical and non-clinical information on hand-held computers, it is suggested that they can lead to improved efficiency, they can help to avoid medical errors and in the long run achieve better healthcare outcomes.⁴

Medical software for the palm

Different types of software available for the palm include clerking or patient-tracking programs, which allow students and healthcare professionals to keep track of patients and ward round activities. Extremely popular is Patient Tracker (www.handheldmed.com) which provides a number of mobile time-saving features, but there are other products available such as Patient Keeper (www.patientkeeper.com), WardWatch (www.torlesse.com) or Digital-Doc (www.digital-doc.com). It is possible to add, delete, edit, view, manage and track patients via such programs.

In order to read documents and text files downloaded from the Internet, document readers are essential tools to have on your PDA. They often come as part of the software packaged with the PDA. Documents to go (www.dataviz.com), TealDoc (www.tealpoint.com), Wordsmith (www.bluenomad.com) and isilo (www.isilo.com) are probably the most popular.

Access to the knowledge base of healthcare at the point of care is invaluable and there are a number of software programs that allow access to programs that can be downloaded from the Internet. One such program, Avantgo, is a medical channel and among its offerings is mobile GPNotebook, described as the UK's leading clinical reference resource for health professionals (www.avantgo.com), but JournalToGo (www.journaltogo.com) is also popular.⁵ Medical textbooks, and journals which can be downloaded for a fee, are readily available from Franklin Electronic publishers (www.franklin.com), Skyscape (www.skyscape.com) and Handheldmed (www.handheldmed.com). A popular textbook which can be downloaded for free is Medical Approaches (www.medicalapproaches.org). There are other freeware programs available for PDAs such as ePocrates (www.epocrates.com): the American

evidence-based clinical drug database and infectious disease guide. It contains over 2700 branded and generic drugs, but may be of limited use on this side of the Atlantic. The same probably applies to the following pharmacopoeias available via the Internet: Lexidrug (www.lexi.com) and Mobile Micromedex (www.micromedex.com). I understand that the British National Formulary (BNF) will be available for handheld computers shortly. There is evidence, too, that prescribing using handheld computers is becoming popular with physicians writing prescriptions electronically and transmitting them directly to the pharmacy.²

The Johns Hopkins Antibiotic reference guide has three main sections: diagnosis, pathogen and antibiotic and can be downloaded for free (www.hopkins-abxguide.org). There is a free trial of CogniQ Clinical Evidence and the BMJ journals (www.bmj.com) which includes a full, integrated, handheld and web-based service featuring key BMJPG publications. Clinical Evidence, from the BMJ, is a monthly updated directory of evidence on the effects of common clinical interventions and is invaluable for medical students and other healthcare professionals. Ovid@hand (www.ovid.com) has A-Z drug facts available, together with Lippincott's Nursing Drug Guide and Medweaver disease profiles. Journals@Ovid offers over 200 journal titles' table of contents of the most current issue, which is updated every time you sync your palm with your computer.

Recommended sites, which provide details of available medical and healthcare software on the Internet, include: Handago (www.handago.com), and PDAMD (www.pdamd.com).

PDA initiatives in medical schools

An interesting project took place at the University of Cambridge where PDAs were used for evaluation of training for medical students in primary care setting.⁶ A more recent project (<http://www.cbcu.cam.ac.uk/cbcu/access/projects.htm>) has provided clinical medical students with a Palm Pilot and a full-size folding Qwerty keyboard. Templates were designed to facilitate note taking

and information collected in digital format was uploaded to a central database for sharing. Students were encouraged to use their Palm Pilots in their daily routines. Particularly popular was exchanging notes with each other by synchronizing their Palms and beaming the information from one PDA to another. A second version of the software during the project incorporated a trading environment to encourage sharing of information and to avoid free loading. How much students could download from the central resource depended on how much quality content they themselves had contributed.

The St George's Hospital Medical School PDA Project is also of interest (www.sghms.ac.uk/depts/is/pdasources). The PDA project at St George's is hoping to evaluate the use of handheld computers in the Community, local NHS Trusts, the Faculty of Health and Social Sciences and the Medical School. Another project worth looking at is *Knowledge in the palm of your hands: PDAs in the clinical setting* at the University Hospitals of Leicester NHS Trust (see www.le.ac.uk/li/lgh/library/palm).

There are a number of schemes in the United States too, Stanford Medical School in California has set up the *Stanford Mobile Med project* which is being funded by the School of Medicine's Lane Medical Library. They have recently announced development agreements with some of the biggest suppliers of medical information to make it available via PDAs. Students, who need to check drug interactions and treatment regimes, viewing patient data and checking on diagnostic codes and laboratory value, are using them. Another example of a medical school in the USA introducing PDA initiatives for medical and nursing students comes from the Uniformed Services University of the Health Sciences, Bethesda, Maryland.⁷

Handheld computers have also been used in the settings of objective structured clinical examinations (OSCE). The tasks to be undertaken by the clinical students are listed on handheld devices. The examiner can view tasks and their solutions by opening drop-down lists on the PDA screen. When the examination is completed, the data on all the students is synchronized and transferred to a database on a desktop computer and results can be generated rapidly.⁸

Within healthcare, handheld computing seems to be widely accepted in family practice and is used to access evidence-based information at the bedside.⁹ Their use includes the Framington calculator (www.statcoder.com), which allows doctors to estimate patients' risk of cardiac events over the next 10 years, a medical calculator (www.medcalc.be), which allows them to determine a patient's body mass etc. This program contains 73 formulas commonly used in medicine.

Handheld computers are also in use in research and, in particular, with customized software for research data collection. It has been found that the total time for collecting data on a handheld computer and downloading it to a PC was 23% faster than hand writing and actually generated 58% fewer errors.¹⁰

For handheld computers to be successful in the practice of medicine, they must be capable of integrating with the local patient-management system and the other software in use in the healthcare organization. Integration of all technology into a seamless environment should be the ultimate goal for all healthcare organizations. Patient confidentiality in using handheld computers is an area of great concern in implementing PDAs in patient care.¹¹ Protecting patient confidentiality is done at present by using codes instead of patient's names. PDAs do have security devices on them but one does not always remember to activate it when you want to close down your PDA. Using programs like Sign-On (www.cic.com) or TealLock (www.tealpoint.com) are safer alternatives.

What does the future hold in relation to handheld computing? Undoubtedly the technology will improve. There will be longer battery life, more features, more software and enhanced connectivity, which will drive the future of PDA technology. With increased availability of flexible roll-up keyboards and increased capacity, the PDA might even make the laptop obsolete. Blue-tooth wireless technology will increase and extend the capacity of PDAs in the future. Increased mobile phone/PDA integration is likely making it necessary to only carry one integrated device. Another technology to watch is tablet computing, and I know that some departments at our main teaching hospital in Dublin, Beaumont Hospital, have been issued with tablet computers. It will be interesting to see

whether the PDA or tablet computing will become the norm for patient care in healthcare organizations in the future.

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