

The USU Medical PDA Initiative: The PDA as an Educational Tool

Leon Moore, PhD¹, Bradley R. Richardson, BS², MD, Robert W. Williams, PhD¹

¹Department of Biomedical Informatics, School of Medicine

²Department of Nurse Anesthesia, Graduate School of Nursing
Uniformed Services University of the Health Sciences, Bethesda, MD

ABSTRACT

A medical personal digital assistant (PDA) initiative for healthcare students began in 2000 at the Uniformed Services University of the Health Sciences (USU). The University issued PDAs to Graduate School of Nursing (GSN) and School of Medicine (SOM) students. These devices were used to provide clinical reference material to the students, to facilitate clinical experience log collection, and the normal organizer functions of a PDA. Both medical and graduate nursing students were surveyed both before and during clinical training to determine the perceived usefulness of the PDA. A quantitative approach was utilized to emphasize the measurable variables.

INTRODUCTION

Healthcare professional schools, especially when in a military environment, leave students with many time management challenges. Student schedules constantly change, the students' educational experiences occur at multiple clinical sites, and even identifying the appropriate points of contact at each site can be a challenge. The USU medical PDA initiative began as a means to coalesce many of the efforts to streamline some of our educational methods.

METHODS

PDA Issue and Training For the past two years, PDAs (TRGPro™) have been issued to healthcare professional students at USU. The issue occurred approximately six months before beginning their clinical training. A series of optional introductory sessions to the PDA and provided software were held annually¹.

Clinical Experience Logs The Clinical WebLog (CWebLog) was developed in 1996 as a C language-based CGI script. The script creates a web-based form that both collects and reports summarized student clinical experience logs². It was designed to facilitate the accurate

documentation and rapid analysis of students' experiences with patients³. The CGI script reports to and from a centrally located and maintained database. PHP was used to handle the database interface with all other aspects of CWebLog. PostgreSQL was used to handle database functions. Operation of CWebLog has been described schematically on this web page⁴.

In addition to the web-based forms, by using an AvantGo™ channel⁵ students were provided the ability to collect the data on a PDA in 2000. PDA-based data is sent to the central database when they HotSync™ the PDA to a workstation connected to the Internet. In 2001 the CWebLog CGI was reworked as a standalone application, the Palm OS CWebLog client⁶.

Student Perceptions Survey A descriptive study attempted to identify the perceived utility of PDAs by graduate nursing students and medical students at USU.

The sample was 197 second year medical students and 24 2002 graduate nursing students. Students were surveyed twice with the same instrument. The first survey was administered four to six months before they began their clinical years (April thru June 2001). The second survey was administered six months after the students had entered the clinical years (November 2001 thru January 2002).

A web-based survey instrument⁷ was designed to assess students' perceptions in the following six areas: comfort with the device, amount of usage, software utility, hardware utility, PDA reliability, and the student's overall perception of usefulness of these devices in their clinical education experience. Content validity was verified by a review of faculty from the GSN Department of Research and the SOM Department of Biomedical Informatics. Students received an e-mail via their university e-mail accounts inviting them to complete the PDA questionnaire. The questionnaire was similar in

format to the student course evaluations, so the students were able to complete it without any difficulty.

RESULTS

PDA Issue and Training The impetus for the medical PDA initiative was from both USU students and faculty. PDAs were issued and initial training for connection to and setup of a desktop computer as a docking station were provided while students were in the didactic phase of their education. Additional training modules were provided between the time of issue and student progression to clinical training.

Clinical Experience Logs CWebLog was initially developed for the Internal Medicine clerkship³. Currently, it is used by six of the seven third year SOM clerkships. The CWebLog database has collected more than 50,000 patient contact records from almost 1000 students (Table 1).

Table 1. CWebLog Summary Results

Count	Number
Total students	970
Patient contacts	51709
Mean patient age	47.22
Total problems reported	236051
Mean problem list	4.56
No. of inpatients	13600
No. of outpatients	35876
Male patients	25268
Female patients	26284
Participated in care	37002
Teaching rounds only	2967

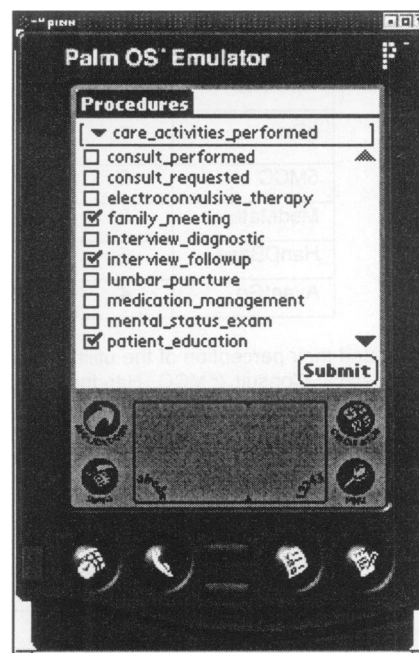
Summary of CWebLog database usage (March 6, 2002). CWebLog data entry forms have been optimized for each SOM clerkship and six of the seven third year clerkships utilize the database with a web browser, a PDA with the AvantGo™ client, or beginning this summer with a PalmOS CWeblog client.

The CWebLog web client has been used for for almost six years. The CWebLog tools are freely available for use or customization by any interested group. Source code for the tools is available from the web site². Deploying this web site through an AvantGo™ channel seamlessly moved the data collection process to PDAs in 2000. CWeblog can be used with any PDA with

either the PalmOS or WindowsCE/PocketPC operating systems and the AvantGo browser.

To further enhance and distribute data collection, the CWebLog PalmOS client was developed over the summer of 2001 (Figure 1). This client will be distributed to SOM students moving into the clinical years in June of this year. The PalmOS client consists of an executable cweblog.prc, 40 KB, and a .pdb file for each problem category in each clerkship, altogether about 250 KB in size. This is a relatively large number of files and requires about 30 minutes to install on the palm device on an 9600 Baud serial cradle, but we think that it allows for more flexibility than would otherwise be possible. Each .pdb file contains the list of problems related to that category, and can contain a text description related to each problem. Installation is substantially faster when performed from an auxiliary memory card that can be moved between individual student PDAs.

Figure 1. The CWebLog PalmOS Client



The CWebLog PalmOS client is a standalone application for PDA built upon the PalmOS. It duplicates the function of the web-based client. PDA-based data is sent to a central database when students HotSync™ the PDA on an Internet-connected workstation.

Student Perceptions Survey The response rate for the first survey was 12 percent for SOM students and 50 percent for GSN students. The rate from the second survey was 6 percent for

SOM students and 79 percent for GSN students. Most respondents felt very comfortable with computers prior to the PDA issue, but had not owned a PDA. Most respondents took a few hours to a few days to become familiar with the PDA. The majority used the PDA daily and 36 percent more than once daily. Most students (80 percent) synchronized the PDA with a desktop machine between two times a week to two times a month. Those students who rarely synchronized the PDA with a desktop computer (11 percent in the first survey) increased to 26 percent when surveyed the second time.

The students ranked five software titles that were included with the issued devices. The first survey covered a period when most students did not have clinical experiences to log. In the second survey, 43 percent who recorded clinical experience data used web-based logs, 30 percent used PDA-based logs, and 23 percent used other methods. None used a combination of reporting methods.

Most students purchased a case for their PDA. The issued PDA allowed memory expansion and 58 percent bought a compact flash memory module (the majority purchased a 32 or 64 MB module) by the time the first survey was administered. Most students had purchased a compact flash memory module by time the second survey was administered (40 percent opted for a 32 MB module). Reliability was measured by asking how often the student had to *soft reset* or *hard reset* the device, and how often it required repair. Both surveys indicated that few students experienced problems with the PDA (>80 percent).

A critical summary of the students' perception of utility was the last survey question: Knowing what you know now, would you buy a PDA if the university did not issue one to you? Seventy-nine percent answered positively in the first survey and 71 percent in the second survey.

Table 2. PDA Software Usage Frequency

Software Title	First Survey		Second Survey	
	Rank	How often used	Rank	How often used
qRx	1	2x q week	1	2x q week to 2x q day
5MCC	2	Daily to 2x q week	2	Daily
MedMath	3	Seldom to none	3	Seldom to none
HanDBase	5	Seldom to none	4	Seldom to none
AvantGo	4	Seldom to none	5	Seldom to none

Students rated their perception of the utility of the software titles issued with the PDA. These included qRx™ (Epocrates), 5-Minute Clinical Consult (5MCC, Handheldmed), MedMath (Phillip Cheng, MD), HanDBase (DDH Software), and the AvantGo client (AvantGo). qRx is a clinical drug database. 5MCC provides concise clinical information. MedMath is a medical calculator designed for rapid calculation of common equations used in adult internal medicine. HanDBase is a relational database for PDAs. The Avantgo browser allows web content to be delivered to a PDA. An AvantGo channel has been used to make the CWebLog web site available to PDAs.

Table 3. Students' Perceived Value of the PDA

Value	First survey	Second survey
As a planner	2	2.8
For communication thru e-mail or shared calendars	3.2	3.7
For clinical reference, i.e. qRx or 5MCC	1.8	1.6
For clinical experience documentation	3	3.6
Overall	2.5	2.9

Students rated their perceived value of the PDA on a scale of 1 = most useful to 5 = least useful.

DISCUSSION

Use of personal digital assistants (PDA) has accelerated and roughly half of physicians surveyed at one hospital already own one⁸. In this study the primary uses of these devices were to track outpatients and as a drug reference. Rothschild and coworkers found that physicians and medical students are able to successfully incorporate PDAs into their patient care workflow. With the use of a drug information database (qRx, ePocrates), clinicians save time, improve knowledge for themselves and their patients and possibly decrease preventable adverse drug effects⁹.

The goal of the USU Medical PDA Initiative is integration of this technology in the clinical setting. The objectives of the initiative are:

- Communication while students are at clinical sites (various databases)
- Clinical encounter log collection (AvantGo and CWebLog)
- Clinical reference material access (qRx, and 5MCC)
- Clinical calculator availability (MedMath)
- Shared calendar - information push

CWebLog provides an evaluation of the breadth and depth of clinical learning at teaching hospitals. The level of responsibility that each student assumes in every contact, and the types of problems that each student sees are recorded. The CWebLog is probably the single most widely used program for clerkship evaluation in the US. An early version was used by UCLA in the construction of a similar system. The University of Alabama at Birmingham School of Medicine has been using CWebLog on a public site for two years: <http://somlog.lhl.uab.edu/>. Several other medical schools have used parts of CWebLog, or are in the process of evaluating it for their own use.

The introduction of CWebLog has enhanced administration of clerkships. It documents student contacts with patients on most USU clinical rotations. The software has been frequently revised to simplify data entry and to take advantage of our recent introduction of PDAs to students. CWeblog documents satisfactory and site-to-site equivalence in number, age and complexity (number of problems per patient) of patients, as well as in percentage of core clinical problems. CWebLog

has been used for several years as a web-based form, for a full year as a web-based form available on the PDAs. The PalmOS CWebLog client was first available for the School of Medicine class that has began their clerkships in June 2002. Once the current third year students have six months to a year experience in their clerkships, we should be able to determine the impact, if any, afforded by the PalmOS version of CWebLog. Like other studies¹⁰, we have found, in a preliminary way, that the AvantGo™-based PDA form provides an alternate and improved means to capture data regarding patient encounters at the point of the encounter.

A survey six months into their clinical training indicated that most students often used, and are using, their PDAs. Students either use the PDAs often or use them very little. Those who used the PDAs often had a high-perceived value of the device and of most software. Those who didn't use the PDAs often had a low perceived value.

The most used and valued software were the clinical references. The least valued were the clinical experience documentation and communication functions. The clinical references were easy to learn and perceived as most valuable. After six months in a clinical setting, student perception of the medical PDA initiative is best summarized as: about 75 percent of the students claim they would purchase a PDA if they had not been issued one by the University.

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