

Infusing PDA Technology Into Nursing Education

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Use of the personal digital assistant (PDA) has been infused into the accelerated baccalaureate program at Duke University to help prepare nursing students for professional practice. The authors provide an overview of the use of PDAs in the classroom, laboratory, and clinical setting. Technical aspects of PDA infusion and steps to ensure regulatory compliance are explored. Benefits of PDA use by both faculty and students in the program and challenges met with the infusion of this technology are also described.

Because of the expanded use of personal digital assistants (PDAs) in today's healthcare arena, the Duke University School of Nursing incorporated education and experience in the use of this technology as part of the second degree accelerated bachelor of science in nursing (ABSN) program in the fall of 2002. The project was funded for 1 year by a Center for Instructional Technology (CIT) Demonstration Project Grant through the Duke University Center for Information Technology. The overall goal is to infuse this current technology into the ABSN program by requiring PDA use in the classroom, learning laboratory, and clinical setting. The students use basic component functions such as the address book, calculator, calendar, and memo pad. They also have access to software providing current drug and infectious disease information, calculation capabilities, growth charts, immunization guidelines, and medical Spanish translation software.

Infusion of PDA technology into the ABSN curriculum supports the technology and leadership thread found throughout the program. PDA use supports the development of strong student organizational skills. In addition, leadership skills such as empowerment are enhanced by providing the student with evidence-based information and data. The software enhances learning by allowing the

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student to rapidly and efficiently access pertinent data while in the clinical setting. The student is able to provide immediate patient feedback to a variety of questions ranging from, but not limited to, the adverse effects of prescribed drugs to the date of the patient's next tetanus immunization without leaving the patient. Current software on bioterrorism and real-time data on communicable diseases is at hand on the PDA for students to answer questions and concerns for patients experiencing flu-like symptoms.

Technology, such as the PDA at the student's fingertips, allows for student reinforcement of core knowledge for practice as well as strengthening professional confidence by allowing the student to provide immediate patient feedback. Also, this technology fosters communication through language translation programs. Instructor-student communication is enhanced by wireless transmission or beaming information. Beaming information encourages student accountability for learning, self-improvement, and gathering and analyzing patient data. This unique pocket resource, the PDA, is particularly useful in teaching the

Generation-Xers, who have grown up playing computer games, accessing the Internet, and having information at their fingertips. This resource provides the student a bridge to a tool they are very comfortable with and that is the computer.

A recent technological advance in the healthcare environment, PDAs are used for clinical assessment, drug information, language translation, calculations, identification of normal laboratory values, pediatric developmental milestones, medical sign language, medical dictionary, anatomy, acuity of illness scales, growth charts, and immunization guidelines. The PDA can be uploaded with a wide variety of software and allows beaming of programs between users. This technological advance is a tool for use in decreasing medical errors in today's nursing practice arena.

Reported Use of PDAs in Nursing

Nursing, a practice discipline, occurs in many environments: from home care, to acute care, to the care of the community. Nurses in a variety of

settings have used PDAs, and the results of PDA use have been briefly reported in the literature. Goss and Carrico¹ have reported the use of PDAs by the infusion therapy team of the infection control department for enhancing evidence-based decision making. Data supported the positive impact on patient outcomes by this department with the use of PDAs.

Several studies have reported a positive impact of PDAs on nursing practice.²⁻⁴ A common theme among investigators was the positive impact of PDAs on providing care consistent with the best evidence and reduction of errors.

Another report indicates the use of the PDA by nurses in the operating room, which improves care and saves them time by streamlining their work.⁵ Also, PDAs have been used by nurses and the healthcare team for point-of-care trauma documentation. Findings support the use for many reasons, but most notably the alleviation of repetitive documentation by the nurse and team members.⁶

Few articles appear in the literature on the use of PDAs by nurse educators for teaching and infusing technology into clinical practice. Clinical nursing instructors use PDAs for student record keeping and evaluation.⁷ One article focused on the use of handheld technology in nursing education and suggested infusion of the technology into nursing curricula by first adopting the use of the PDA in a pharmacology class.⁸ For this pharmacology class, the students were required to purchase a PDA. In this course project, the faculty found incorporation of the PDA as a teaching strategy challenge; however, the students reported positive responses to the inclusion of this technology. Currently literature is unavailable on the evaluation of the use of the PDA by baccalaureate and/or accelerated baccalaureate students. For documentation of best practices in nursing education, more investigation into this technology infusion in nursing curricula is needed.

Technical Aspects of PDA Infusion Into the First Cohort of ABSN Students

The Center for Information Technology and Distance Learning (CITDL),

the technical team at the school of nursing, was informed early that the first cohort of ABSN students would be required to use a PDA. The grant provided for the hardware, and the CITDL's responsibility was to assist in the deployment, maintenance, and support of the hardware. There were 3 distinct phases to the overall plan for this project: planning, implementation, and support.

Planning

Selection of hardware was among the first steps of this project. Technicians worked closely with the faculty to ensure that the hardware specifications would handle the expected applications. The ABSN faculty selected the applications that would be used in the curriculum. The CITDL staff assisted in any technical problems faced by the faculty in testing these applications. Over time, a collection of software packages was selected. The CITDL finalized their hardware recommendations on the basis of these applications.

Palm 515™ units were selected because of their support for color, amount of internal memory, and capacity for upgradation through the secure digital (SD) card expansion slot. Most of the applications that were selected were free, so the remaining grant funds were used to purchase a 16-MB SD card.

The CITDL received several units and loaded and tested the specified applications. After verifying the interoperability of the applications and hardware, attention then turned to devising a software deployment strategy. The CITDL had the task of installing 10 to 15 applications on 50 PDAs. Since loading the software directly onto the units too far in advance would drain the batteries, software was loaded onto 16-MB SD expansion cards that were purchased for each unit. After configuring one unit with all the necessary software, a freeware backup program was used to load all 50 SD cards. The nonvolatile SD card memory requires no power source to maintain the stored data. The PDAs were charged the day before their implementation.

Implementation

Students were given their PDAs during a scheduled training session. The

session included an overview of the hardware, using the Palm operating system (OS), application skills, synchronizing with the student's personal computer, and troubleshooting. Students signed a form indicating which unit they received. Students were instructed how to use the backup program to install the applications that had been preloaded onto the SD memory card. Once complete, each student had a unit loaded with the software collection chosen by the faculty. Students received the HotSync cradle and other documentation that came with the units. Students were responsible for connecting the cradle to their personal computer, and charging and synchronizing the unit.

Support

After the project was fully implemented, the CITDL staff provided support to the units for faculty and students. Several issues arose during the support phase, such as synchronization problems or inoperable units. Over time, the CITDL became more efficient at resolving problems that frequently occurred. In addition, the CITDL staff provided technical guidance for the faculty on how to best use the technology for activities. Several training sessions were held to increase technical knowledge.

The second cohort of ABSN students had to purchase their own PDA. The CITDL staff recommended they purchase Palm M130 to retain consistency in orienting students to the PDA use and simplify support issues. The majority of students purchased the model recommended. Although students were ultimately responsible for their own hardware, the CITDL staff provided support to students if requested. Having the students purchase their own PDAs worked well in 2 ways. First, students had experimented and used the PDAs before coming to the training session, which made the session more productive. Second, after the program is complete students were able to begin directly using the PDA in their clinical practice.

Regulatory Compliance

The Health Insurance Portability and Accountability Act of 1996 (HIPAA) is

designed to protect the privacy and security of personal health information.⁹ HIPAA regulations have a significant impact on the use of PDAs in clinical settings. Most healthcare applications for PDA use involve reference materials (clinical guidelines, formularies, etc) or clinical calculators (eg, medication dosage, body mass index, Glasgow Coma Scale); HIPAA regulations do not apply to these types of PDA use. HIPAA regulations apply when patient-specific data are added to or accessed by the PDA device.

There are 2 key issues related to PDAs and HIPAA requirements: (1) protecting patient information stored on the device and (2) maintaining that protection when transmitting patient information during a synchronization or wireless transaction.¹⁰ Since students do not use a wireless PDA, synchronization generally takes place between their personal computers, never in the clinical setting. Students are told how to de-identify and protect patient information stored on the device. While stronger security would de-identify and encrypt patient data, present software options do not allow encryption. We recommend that students' password-protect access to their PDA and de-identify all patient data maintained on the PDA. If the PDA were lost or stolen and a hacker got past a login password, the patient's identity still could be protected.

The HIPAA lists 18 personal identifiers of patient data that must be removed to de-identify.¹¹ While students can access and use patient data when in a clinical setting, issues involve students taking their PDA (and patient data) out of the organization for writing their learning observations, care planning documents, and academic assignments. Students are instructed to make up a code rather than use the patient's name or initials. When data are de-identified, the risk to patient privacy is minimal. To date, there have been no difficulties in maintaining compliance with HIPAA regulations on de-identification of data.

The use of PDAs to generate clinical records was thoroughly reviewed by the Commission on Collegiate Nursing Education representatives of the American Association of Colleges of Nursing during an accreditation

visit; no recommendations were received. The school of nursing also complies with the policies of the Duke University Medical Center regarding the use of PDAs in the clinical setting.

Use and Value of PDAs for Students

While useful in the classroom and learning laboratory, PDAs are probably most useful in clinical settings, where the pace is fast and resources may not be readily available. Available programs allow quick access to information on drugs, laboratory values, and diseases along with nursing considerations, procedures, and protocols, to name a few. The information about specific diseases and nursing considerations is particularly helpful, because in Duke's ABSN program students receive their clinical assignment at the beginning of each clinical experience rather than the day before. Since students come to the unit without prior preparation, PDA information is a valuable reference to understand the patient situation and possible nursing considerations and interventions. In addition to practice information, the PDA can be used for procedural information, such as where the clinical postconference will be held and phone numbers for accessing the various services in the clinical facility.

Each week students are required to enter the following data regarding the assigned patient(s) into their PDAs using the commercial word-processing program Palm OS "Memo Pad": week of the semester; primary medical problem(s) leading to this hospitalization; significant past medical history; priority nursing diagnosis or problems and needs; skills and procedures watched or performed; and what the student learned that week. At the end of the clinical week, each student wirelessly sends the document to the instructor's PDA in the clinical setting. The following week, the student enters the same information regarding that week's assigned patient(s) to the same PDA document from the week before. In this way, each week's information is added to the information from the week before. The end result is con-

secutive documentation of each student's experience over the course of the semester.

At the beginning of the semester many of the students are uncomfortable using the PDA. Some have even asked if they can e-mail the clinical information later. E-mailing the information later is appropriate if the student's PDA is malfunctioning or it has been a particularly busy day, but it should not become the norm. Using the PDA is what allows a student to become comfortable in using the technology. As students become comfortable, they figure out their own uses for their PDAs such as entering information, while in the clinical setting, they will use later in written work, or to beam the information they have gathered to other students. For example, one student beamed her peers, answers to questions that might be asked by accrediting visitors. Once the technology becomes a tool rather than an obstacle to overcome, students find creative uses to facilitate their own learning.

Use and Value of PDAs for Faculty

The information the students beam to the instructor each week can be used for a variety of purposes. For the faculty, the PDA is useful for tracking each student's experiences, including identification of patient problems and needs, and what the student learned during that clinical encounter. It also allows the instructor to track student experiences and knowledge acquisition over the course of the semester.

Following the weekly beaming of the students' clinical documents, the instructor now has the information in his or her PDA. One way to use this information is to plan future assignments. Managing a clinical group and seeing that each student is exposed to the needed learning opportunities is a time-laden task for the faculty. With the use of the PDA, clinical activity planning for students by the instructor is enhanced. Time on this task is reduced and a more comprehensive, easily accessible, current record of student clinical activities is readily available to the instructor.

Clinical Evaluation Using a PDA

One of the many values of the PDA clinical template is its role in clinical evaluation. The PDA is a useful tool in gathering data to be used for the evaluation. The template contains the data needed for instructor evaluation of student clinical performance.

Use of a PDA by faculty and students for data collection and subsequent use in evaluation has not been described in the literature to date. Most clinical evaluation tools are hard copy documents completed by faculty with pen and pencil in hand. Instructors struggle with the task of completing these hard copy tools. The documents are time-consuming to fill out and later to analyze, with timely recording of significant events challenging in the clinical setting. Another barrier to the use of lengthy pen and paper evaluation tools is lack of consistency in record keeping.

Clinical days are busy, faculty time is scarce, clinical groups are large, and students may be providing care involving complex patient situations in multiple units or areas. Liberto et al describe how these factors may lead to inconsistency in documentation as well as sampling of clinical behaviors of each student being evaluated.¹² With this background, one can see how using the PDA would lead to efficiency in completing a clinical documentation tool. The PDA, with templates and word processing, stores all of the data for the entire clinical group, password-protected in

the lab coat pocket of the assigned faculty member. This is a stark contrast to the picture of faculty carrying 10- to 20-page evaluation documents for each of 8 to 10 assigned students as well as notebooks for anecdotal notes.

The clinical evaluation tool for the ABSN program lists outcomes the student must achieve to succeed in the clinical component of the course. This tool is supplemented with brief anecdotal narratives that describe observations of student behaviors, instructor-learner interactions, and outcomes in the clinical setting. Completion of the clinical evaluation document is done by both the student and the faculty.

Each week of the clinical experience when the student beams the completed PDA template, the clinical instructor then adds his or her anecdotal notes. Some instructors add to the original student documentation template described earlier with additional categories: general performance, medication administration, communication, and documentation. As the weeks progress, the clinical instructor builds on the previous week's entries creating a comprehensive document depicting the student's clinical experience. With frequent HotSyncing and transferring of data into a word document by simply copying and pasting, the final clinical evaluation tool is completed.

The student also completes the same clinical evaluation document using their PDA document. They are required to complete this at midterm

and prior to their end-of-semester conference with their clinical instructor, then e-mail or bring an electronic copy of this document with them to the conference. The 2 perspectives are merged into 1 document for final printing and official filing at the end of the semester.

Benefits and Challenges

There are many benefits and some challenges to the use of PDAs in nursing education. (Table 1). One benefit relates to the mobility of the PDA. Owing to this mobility, work can be done in many different settings such as in a conference room waiting for meetings to start or on the shuttle bus back to the parking deck after clinical. This mobility also allows the instructor to complete the notes and review the student's entry promptly after the actual events.

The second benefit relates to work management. From a time management perspective, this process saves the clinical instructor time in completion of the clinical evaluation document. The entries are made in real time by the students, with the instructor supplementing the notations with anecdotal notes. Overall, for 8 to 10 students per clinical group, the instructor spends approximately 15 minutes total for all students. At the midterm and end of the clinical rotation, time is also saved. The maximum time spent on each documented evaluation is approximately 15 minutes. All of the data is there in one file. The instructor can just copy the data and

Table 1. Benefits and Challenges to Using Personal Digital Assistants in Nursing Education Programs*

| Benefits to Using PDAs | Challenges to Using PDAs |
|---|--|
| Can be used anywhere/anytime | Complying with HIPPA regulations |
| Allows convenient access to large amounts of data | Protecting patient confidentiality |
| Increases student-faculty organization in the clinical setting | Encouraging consistent use by faculty and students in the clinical setting |
| Improves student-faculty time management in documentation of clinical performance | Troubleshooting synchronization problems |
| Encourages timely recording of significant events in the clinical setting | Breakage or inoperable units |
| Reduces paper usage through wireless transmission | Acquiring software beyond the available freeware |
| Prepares graduates for the future by embracing microtechnology use at the bedside | |

*PDAs indicate personal digital assistants; HIPPA, Health Insurance Portability and Accountability Act.

add this information to the clinical evaluation document template by the appropriate outcome and summarize the student's clinical performance and areas for growth.

The third benefit of the use of PDAs relates to the size of this device. Students are required to complete the PDA template categories such as "skills done" and "my learning" immediately after the events of the clinical time. This instant reflection creates an account of their experiences and allows the clinical instructor to plan future assignments to move the student toward attainment of the clinical objectives. Students are encouraged to refer to the clinical evaluation tool frequently and use their PDA template document to begin their self-evaluation. Use of the data from the PDA template is frequently evident. The students comment on the benefit of having such a comprehensive record of their progress. Use of the PDA allows faculty and students to have all information related to clinical experience evaluation in one tiny device.

One of the main challenges to using PDAs with nursing students is ensuring that all faculty use the PDA consistently, require its use with all students, and promote its application in the clinical setting. Achieving consistency is especially difficult with sessional faculty who may not be as familiar with evaluation processes, technology, and informatics standards for nursing education.

Conclusion

The faculty recognized early that additional clinical resources beyond the available free software are needed. The faculty are now requir-

ing students to purchase a commercial software package featuring general nursing references (PEPID).¹³ The cost of approximately \$140, comparable to one textbook, would be justified for use in the 16 months of the program.

Overall, the infusion of PDA technology into an accelerated baccalaureate program has been very successful. The technical challenges and lessons learned from this project have kindled an interest in PDA technology in the school. To better understand the PDA's specific impact and as part of the initial grant process, data are being collected from 1st-semester students concerning their baseline knowledge and prior use of PDAs and from students right before graduation concerning their overall impression of the PDA application in their nursing program.

In the future, the hope is to see nurses routinely synchronizing their handheld computers with strategically centralized database ports throughout a healthcare agency. Remarkably smaller with each new build, these microcomputers are helping pioneer very important advancements in healthcare. It is important that nursing graduates know how to embrace the tools that microtechnology is bringing into daily patient care operations, and using PDAs in baccalaureate nursing education is an effective way to accomplish this.

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