Nurses and the Use of Personal Digital Assistants (PDAs) at the Point of Care
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Abstract
Nurses are knowledge workers who require access to evidence-based resources to provide safe clinical care and improve patient outcomes. Nurses face heavy workloads, staff shortages, and limited technological resources, factors that inhibit their ability to access electronic healthcare resources where they need them most at the point of care. Although there is extensive research about nursing students using hardware devices such as personal digital assistants (PDAs) to access electronic resources, there are few studies about nurses who follow or continue this practice in the clinical setting. This paper discusses the use of PDAs to provide access to electronic educational resources for nurses at the point of care in a hospital setting. Although the use of wireless PDAs in nursing would facilitate access to an array of evidence-based resources, PDAs are not commonly used by nurses.

Introduction
Today’s healthcare organizations face many challenges. Fiscal restraints, staff shortages, prolonged wait times, and an aging population with complex medical conditions are issues that hospitals and other healthcare organizations face. These organizations are expected to deliver exemplary patient care with maximum efficiency while improving patient outcomes despite the identified challenges. Technological advances in the last decade have transformed the manner in which healthcare is delivered. Technology can be used “to improve workflows within healthcare organizations” (Courtney, Demiris, & Alexander, 2005, p.315). Access to patient records, ordering medications, and educational resources are instantly available via the Internet or Intranet to promote knowledge transfer and clinical excellence in care delivery. There are a multitude of online healthcare resources such as journals available through searchable databases such as MEDLINE, CINAHL, and ProQuest, as well as many other online reference materials and clinical guidelines.

Nursing is a complex profession which utilizes the integration of knowledge, skills and competencies to provide patient care and improve outcomes. Nurses are knowledge workers who are responsible for the delivery of patient care. Accessing online evidence-based resources may be challenging for nurses as computers are often located away from where patient care occurs – at the bedside. This paper discusses the use of handheld computers or personal digital assistants (PDAs) to provide access to electronic healthcare resources for nurses at the point of care in a hospital setting. An extensive review of the literature demonstrates that although the use of wireless PDAs in nursing would facilitate access to an array of evidence-based resources, PDAs are not commonly used by nurses.

Literature Search
An extensive search of medical databases was conducted, particularly CINAHL and MEDLINE. CINAHL, the Cumulated Index to Nursing and Allied Health, was the primary source for articles, as the focus of this paper is nursing. MEDLINE was also searched as it contains over 16 million articles in the life sciences field. Both databases had an OVID interface for article searching. Specific MeSH (Medical Subject Heading) terms such as ‘nursing’, ‘nurse’ and ‘handheld
computers’ were mapped and combined to find appropriate articles. The LISA database, which is library-specific, was useful for articles related to information seeking behaviour of health care professionals.

**PDAs in Health care**

Advances in technology have dramatically changed our personal lifestyles. Computers, laptops, cellular phones, PDAs, and smart phones have to some degree simplified our lives. There has been “an 18% increase in sales to 13.1 million devices worldwide [and] the PDA has had the greatest impact due to its multi-functionality use as a phone, a camera, an organizer, and direct access to the Internet” (Di Pietro et al., 2007, p.140). Dale & LeFlore (2007) describe PDAs as “a delivery method for point of care information. The key in providing evidence at the point of care is the speed at which information can be delivered” (p.340). Hardware devices like the PDA have also had a dramatic effect on the manner in which health care is delivered.

The literature demonstrates that there is considerable evidence in that physicians, residents, and interns have adopted PDA technologies to access evidenced-based electronic health care resources to guide their decisions and improve patient outcomes. Rothschild et al. (2006) found that physicians with PDAs and access to evidence-based resources such as drug databases “used these tools frequently, and found them to improve patient care and to be valuable in learning of recent alerts and warnings” (p. 619). In a study conducted by Dee, Teolis, and Todd (2005), with 108 physician participants, it was determined that 55% used their PDAs before, during, or after patient encounters and 67% indicated that using the PDA influenced their decision-making.

Courtney et al. (2005) describe nurses as knowledge workers within the healthcare system like their physician colleagues and state that the majority of research has focused on physicians rather than nurses. Estabrooks, O’Leary, Ricker, and Humphrey (2003) found that nurses lag behind physicians in their use of the Internet and technology to access health care resources. They discuss possible explanations for this discrepancy, such as financial, educational, and/or power differences between the two professions. Estabrooks et al. also determine that the structure of work could be a factor in the differences between the two as physicians tend to be more autonomous, have private office space with computer access, and can schedule their time to conduct research on the Internet, whereas nurses have less autonomy, have to share computers at a central nursing station, and cannot schedule research time as they must attend to patient care needs.

**Nursing Use of PDAs**

In the descriptive literature there are multiple articles about projects involving nurses and PDAs at the point of care. Most of the articles are anecdotal and describe projects that occurred at specific hospitals or in specific areas of a hospital.

McCord (2003) describes the use of PDAs to streamline nursing processes in the operating room (OR). Circulating nurses were responsible for accessing the computer to retrieve and print surgeon preferences for each surgical procedure. The OR integrated a process where the circulating nurse would utilize a PDA to set up the OR, gather specific supplies, and alter surgeon preferences as necessary through a database specifically built for the device. Hohler (2004) also describes the use of PDAs in the OR to access electronic resources. She provides advice to OR nurses about online PDA programs that are available as well as resources that would benefit all nurses, as well as how to buy a PDA, how to protect the PDA, and how to secure the data on the PDA. The PDA as a general resource is also described by Dale and LeFlore (2007), who discuss types of PDAs and available resources. Peterson (2007) provides an overview of how different types of nurses are using PDAs. She discusses projects occurring in the emergency department and intensive care unit (ICU) and how they access reference protocols, with the pre-operative nurses using PDAs for drug
reference, inpatient unit nurses using PDAs for calculations and references, and nurse practitioners using them for charting and beaming medication orders to the pharmacy. An interesting project related to the infectious control department and the intravenous (IV) therapy team is described by Gross (2002). PDAs were used to gather data, track workload, and document patient outcomes. The IV team nurses found that using the PDAs kept them organized, and were easily portable and convenient to use.

Nursing students, our future professionals, have been shown to readily adopt PDAs in their classroom studies and clinical practice. Many nursing programs expect their students to purchase PDAs and download evidence-based resources because textbooks are often out of date before they are available in print (Peterson, 2003). Numerous studies have shown that the experience of nursing students using PDAs has been positive (Hodgson-Carleton, Dillard, Campbell, & Baker, 2007; Kuiper, 2008; Huffstutler, Wyatt, & Wright, 2002; Farrell & Rose, 2008; Greenfield, 2007; Pattillo, Brewer, & Smith, 2007; Miller et al., 2005; and Smith & Pattillo, 2006).

Hodgson-Carleton et al. (2007) found that the benefits of PDA usage by nursing students included increased classroom and clinical productivity as well as increased time savings and portability of information. Greenfield (2007) used a case study methodology to determine if students with a PDA could potentially reduce medication errors. She found that students with a PDA could access information faster and with greater accuracy thus potentially reducing the risk of medication errors. Pattillo, Brewer, and Smith (2007) studied the types of reference materials that students accessed in their clinical practice and found that they most often consulted medical dictionaries and drug reference guides. Overwhelmingly, studies with nursing students using PDAs for their classroom and clinical studies indicated that there was greater efficiency, accuracy in the data accessed, and portability of information (Hodgson-Carleton et al., 2007; Miller et al., 2005; White, Allen, Goodwin, Breckinridge, Dowell, & Garvy, 2005).

Using PDAs to access evidence-based clinical resources could profoundly impact clinical excellence at the point of care and improve patient outcomes. Although nursing students have been extensively studied in relation to their use of PDAs to seek information, there have been very few formal research studies in the clinical setting involving nurses. Information-seeking behaviours of practicing nurses differ from those of student nurses. Students tend to consult references whenever there is a clinical decision to be made; however, “expert nurses make clinical decisions using deliberate and conscious discrimination along with intuitive responses” (Kuiper, 2008, p. 91), rather than consulting electronic or paper-based reference materials. Doran’s (2007) research found that it is a challenge for nurses to access information that is up to date, current, and timely, due to the task-driven nature of their practice and the heavy workloads they experience. She found that nurses often seek information away from the point of care, in clinical information systems and manuals, and “the most frequent source of information was nurse colleagues” (p.69). The objectives of her study included: the identification of resources nurses would like to access using a PDA at the point of care; determination of patient outcome data and assessment data that should be collected using a PDA; identification of how nurses collect and use data; and the creation of a software system for PDA use. A cross-sectional, mixed method research study with 51 participants from both hospital and home care nursing environments was conducted. Work sampling and focus groups were used to gather data for analysis. Electronic resources most frequently accessed in the hospital setting included drug reference information and compatibility guidelines. Doran (2007) concludes that mobile technologies provide an opportunity “to access relevant information at the time of nurse-patient contact” (p. 69).

Currently there is ongoing research in
Australia investigating the use of PDAs at the point of care for nurses. The purpose is to study the impact on patient safety and quality of care of nurses using wireless PDAs (Roberts & Ward, 2007). The 3-year project is currently in the implementation phase. It will be very interesting to review the results of this study when they are released.

Tachakra (2006) discusses the use of PDAs in telemedicine specifically in relation to consultation in clinical practice. Images of injuries are transmitted wirelessly by emergency nurses to their nurse practitioner counterparts wherever they may be, up to 16 miles away. The research study, although not specifically about nursing use of the PDA, concentrated on the images transmitted to the PDAs. The images were assessed for quality and the ability of clinicians to make an accurate diagnosis based on the image. Confidence ratings were very high. This is significant to nurses, in that the study helped to assess staffing patterns and ensure that the appropriate staff mix was available to provide patient care. Future plans include using the PDA for point of care documentation, implementation of a drug database, and continuing use of the PDA to transmit diagnostic images. Although this study is not directly related to nurses’ use of PDAs in relation to resource acquisition, the results did affect their staffing mix and staff scheduling in their department. Overall the literature on PDAs in nursing indicates that PDAs are portable, convenient and improve efficiency and productivity.

**Discussion**

Nurses are quite “willing to embrace technology in the workplace when it enhances the care process” (Courtney, 2005, p.316); however, there are many factors that affect the adoption of PDAs in nursing practice. The advantages of adopting a PDA into daily practice must outweigh the disadvantages or barriers in order for it to be successful.

The benefits of integrating a PDA into practice include point of care access to electronic resources, which increases efficiency/error reduction, facilitates time savings, increases productivity, and provides the nurse with a wide variety of resources that are formatted for the PDA. Nurses no longer have to find paper resources, manuals, or textbooks, as these resources can be provided in an electronic format. No more will they have to find and wait for a computer at the nursing station to look up an electronic resource, as this can be done directly at the bedside, when the need arises, using a wireless-enabled PDA. One of the most popular electronic resources is the drug reference database. These databases provide information about prescribing indications, interactions, and compatibility with other drugs, as well as patient contraindications and education. Clinical reference guides for nurses are also available and are a valuable resource for novice nurses or experienced nurses who may encounter a patient with an unfamiliar medical condition. Clinical calculators to assist in the calculation of IV drip rates or weight-based dosing for medication administration are invaluable to a busy nurse. Other resources include clinical guidelines, medical dictionaries, and diagnostic tools. Often companies will market a suite of resources including a dictionary, drug reference database, and a clinical reference manual.

There are barriers that hinder the adoption of PDAs by nurses in their practice. Instead of being praised for their innovation in adopting technology to enhance practice, nurses are often met with suspicion by their managers and colleagues: ‘Is that a phone? Are you playing games on that?’ Additionally, there is rarely financial reimbursement for the cost of PDA when it is used to support clinical practice. Paradoxically, the large amount of information that can be accessed through a wireless PDA can be overwhelming and difficult for nurses to sort and analyze when trying to obtain a fast answer to a specific question. Even in organizations where the PDA is supported, there is sometimes a lack of training and technical support. Other issues that are potential barriers are directly related to the device itself: battery life, small screen, and limited...
One avenue for support is the Nursing PDA listserv, sponsored by PDA Cortex. This is a subscription list for nurses to share their experiences, ask for advice, and access information related to the use of PDAs in clinical practice. The listserv is open and unmediated for its members. Discussion threads often include recommendations about hardware or software purchase decisions and requests from students seeking advice. The associated PDA Cortex web site provides access to recent articles and survey results and ranks the top PDA software for nurses (McCarthy, 2004).

Facilitating the adoption of PDAs into everyday nursing practice will require social acceptance, managerial and financial support, as well as changes in workplace culture. Additional research to identify and reduce barriers that inhibit PDA adoption and use is required.

Conclusion
There is a large body of research about nursing students using PDAs in classroom studies and clinical practice. The students using PDAs in their classroom studies and clinical experience generally describe the experience as a positive one. Students are the nurses of the future and it is hoped that they will continue to use their PDAs after they graduate and once they are pursuing their nursing careers.

Although there is a multitude of studies about the use of PDAs in nursing student education, there are very few formal research studies about the adoption of PDAs in clinical nursing practice. Doran’s research in Toronto, which identifies PDA resources, examines how nurses collect/use data, and collects patient outcome information is providing valuable information that can be applied to the clinical setting. Although the Australian study is only in the implementation phase it will be interesting to follow their results when they are released. The literature also provides anecdotal description of a variety of projects that are not research-based but draw the same conclusions about the use of PDAs at the bedside in relation to productivity, efficiency and convenience.

As technology becomes more advanced, the adoption of PDAs will become more prominent in nursing and other aspects of healthcare. Provision of devices, training in their use, and education about the evidence-based resources that are available will facilitate nursing use of PDAs at the bedside.

Future Implications
Will PDAs be phased out over the next few years? A new generation of smart phones are rapidly replacing the traditional PDA model. “Sales of traditional PDAs are declining because the demand for combination PDA/cell-phone devices, called Smart-phones, is rising sharply” (Dale & LeFlore, 2007, p. 339). However, clinical software is just becoming available for the smart phones, which means that the PDA will be with us for a while yet.

How will patients perceive nurses using a handheld device at the bedside? One key element related to nursing adoption of PDAs that was not discussed in this paper is the patient response. One small study in Hong Kong indicates that although “patients perceived that PDA use could increase nurse’s efficiency in data retrieval and calculation, [they] were concerned about data accuracy and privacy, [and] preferred that nurses explain the reasons for PDA use,” they still “valued nursing care over technology” (Lee, 2007, p. 109). Nurses using PDAs at the bedside will have to be prepared to respond to their patients’ questions and perhaps to demonstrate how the PDA can access electronic resources.

What happens as electronic patient records are developed at the local, provincial or national levels? Will PDAs be secure enough to protect sensitive patient information? Are PDAs the appropriate device to access and utilize the patient record? PDAs have a relatively small screen size,
which would make it difficult to read information from the display; however, there may be an opportunity to use the PDAs as data entry tools provided that they are secured behind a firewall.

Are there generational differences in the adoption of PDAs in clinical practice in nursing? Another interesting topic that would be excellent for a study is generational differences in the use of PDAs at the bedside by nurses. Does age make a difference? This author was unable to find any research to indicate that there are ongoing studies of the differences between young and mature nurses in the adoption of the PDA as a knowledge tool. Training nurses to use the devices will also need careful consideration. Younger nurses have grown up with technology and many have never known a world without computers. However, mature nurses have had to learn how to use computers and have varying levels of computer expertise and comfort with technological devices. Training programs will have to be carefully designed to meet the needs of the individual nurses using a variety of modalities including classroom, paper-based manuals, online references, e-learning and one-on-one support.

Nurses will use online resources at the point of care if they are provided, and if there is appropriate education about the use of the handheld device as well as the evidence-based resources available to them. Peterson (2003) sums up her thoughts on the future of the PDA in nursing when she states, “the PDA will become as much a part of the practice of the nurse as the stethoscope”.

Works Cited


Hodgson-Carlton, K., Dillard, N., Campbell, B.


