Health care information technology is being advanced to support clinicians’ decision making. Clinical decision support from health care information technology presents an opportunity for collaboration between clinicians within nursing informatics and critical care nurses that could benefit the profession of nursing, improve patient care, and increase the quality and efficiency of health care. Weber reported that critical care nurses’ use of computer-based decision support tools varies and that personal digital assistants (PDAs) are a type of health care information technology that has been relied upon for these purposes. In this article, we identify nurses’ preferences for using PDAs and specific clinical software.

Background

PDAs are hand-held electronic (battery-operated) devices with memory cards. Memory cards are information storage units. Sophisticated PDAs have photo, recording/dictation, and music options along with Internet and Bluetooth technology (beaming information from one PDA to another electronic device or vice versa). Consequently, sophisticated PDAs are more expensive. A variety of electronic clinical reference programs (including Palm- and Windows-compatible) are available for PDAs. Numbered among these programs are an assortment of medical dictionaries, drug references, dosing calculations, and clinical guidelines. The programs range from general to specific references. Some programs are free; other programs require purchase. Professional health care organizations, PDA listservs (automatic e-mail broadcasts delivered to everyone on a defined list), and vendors offer information about PDAs and particular programs, and some also offer technical support.

Several factors may influence nurses’ use of PDAs to support patient-centered care. These factors include availability of electronic tools, access to desired software, and comfort levels or education associated with these devices.

PRIME POINTS

• Clinical use of personal digital assistants (PDAs) is becoming more popular among professional health care providers.

• Intensive care nurses are interested in having specific clinical references on PDAs.

• Critical care nurses’ interest in using PDAs to support clinical decision making and barriers to such use should be assessed.

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with using health care information technology. As nurses transition from relying solely on texts to accessing current information when planning and providing patient care, they will most likely increasingly rely on PDAs as an immediate consultation resource to influence decision making and avoid potential errors related to lack of knowledge or faulty memory. For example, intensive care unit (ICU) nurses may refer to Advanced Cardiac Life Support (ACLS) guidelines via a PDA when monitoring a patient with arrhythmias, or they might review the purpose and potential adverse effects of a newly prescribed medication and advise the patient accordingly during discharge teaching. PDAs may also store downloadable clinical data such as medication lists or results of laboratory tests, which are then convenient and easily accessible when transferring ICU patients within a facility or between facilities.

**Literature Review**

We conducted a structured search of the literature by using PubMed, a service for searching MEDLINE, the National Library of Medicine’s bibliographic database of peer-reviewed publications from the fields of medicine, nursing, and health care systems, among others. The purpose of the literature search was to examine how nurses (in particular, critical care nurses) reported using PDA technology to support clinical decision making. Key words used were *PDA* combined with *nurse* ($ where $ includes all forms of the word nurse).

The literature search using the just-mentioned key words resulted in identification of 66 publications. A review of titles excluded 16 articles (eg, articles on patent ductus arteriosus and articles specific to training/education of nurses), and an additional 32 articles were excluded upon review of abstracts and full text because they were not relevant to our research question. Eleven of the articles reported use of the following 4 PDA functions in support of nursing practice:

- knowledge resources or clinical decision support
- patient care tracking
- documentation
- information exchange

The remaining 7 articles provided background on PDA use in nursing practice (various applications such as pharmacological reference information), nurses’ perceptions of barriers and facilitating factors related to their use of PDAs in practice (including resistance to change, needed education for specific software, and depth of clinical experience), and the value added support of using a PDA for nursing practice (comfort level with new applications and social support).

**Purpose**

Growing interest among nurses in our cardiovascular and medical/surgical ICUs led us to investigate: (1) how a local urban facility’s critical care nurses report using PDAs, (2) what nurses’ perceptions are about using PDAs at the point of care to support their clinical practice, and (3) what type(s) of decision support tools critical care nurses want to receive via PDAs.

**Methods**

An exploratory investigation was undertaken to address our 3 study questions. A literature search was used to assess how nurse professionals were using PDAs (question 1). All 3 questions were assessed via a local survey of ICU nurses.

A 1-page (double-sided), 20-item survey (Figure 1) was designed by the lead author (J.F.F.), an experienced ICU staff nurse, in the second phase of our work. Questions were based on ICU clinical observations, clinical practices, clinical needs, review of the literature, and convenient PDA programs available through the Web site of the American Association of Critical-Care Nurses (AACN). The survey queried nurses about desires for specific clinical references including cardiac medication, ACLS protocols and algorithms, cardiac and pulmonary assessments, drugs, infectious diseases, laboratory values, an English/Spanish dictionary,

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care plans, and bundled programs (a package of several software programs). In addition, study participants were asked to indicate whether or not they used a PDA regularly, how much if any personal financial resources they would be willing to spend on a PDA with or without loaded software, if they needed education about any aspect of a PDA, and if they were interested in purchasing an extra memory card for the PDA. Other available commercial software programs and PDA accessories were not presented because of space constraints on the survey page. A copy of the survey instrument is available upon request from the corresponding author.

Participants were asked to respond to each question by marking their choice using a Likert scale. Choices were marked as: strongly disagree/never = 1, disagree/rarely = 2, undecided/occasionally = 3, agree/frequently = 4, or strongly agree/always = 5. Options regarding pricing of PDAs and PDA programs were <$100, $100-$200, $200-$300, $300-$400, and $400-$500. Bar graphs depicted tabulated responses to each question in percentages correlating to the Likert scale response options. For each question, the mean (average) response score was computed on the basis of the Likert scale responses. Mean scores for all 20 questions ranged from a high of 4.44 to a low of 1.28 points. Questions were ranked according to their mean score.

The survey was administered in a 34-bed ICU in the western United States. Although clinical PDAs are not supplied by the hospital, other electronic clinical resource tools (Internet and online literature databases, corporate-specific clinical practice guidelines, clinical pharmacology references, and computer-driven drug protocols) are available via computer desktops located throughout the hospital, especially within nursing units.

The survey was distributed to all 120 full-time and part-time ICU nurses working at the hospital in staff, charge nurse, or clinical educator capacities. Traveling and
agency nurses were not included in this study because of their infrequent employment within the hospital. Although specific demographics were not collected for this study, administrators identified the ICU nursing pool as consisting of male and female registered nurses, with master’s, baccalaureate, or associate degrees, between the ages of 21 and 55 years, and some with CCRN credentials. The vast majority of the ICU nurses were white.

The protocol for survey administration was approved by the local institutional review board. A cover letter (printed on neon green paper to attract attention) attached to the survey explained the purpose of the study and also stated that the study had been approved by the institutional review board. The study was described and participation was encouraged during a staff meeting 1 month before the survey was distributed. One week before distribution of the survey, an e-mail was sent to the ICU nursing staff reminding each nurse about the survey. Surveys were placed in each ICU nurse’s mailbox. Individual consent was implied by completing the survey. Surveys were completed anonymously and submitted to the ICU administrative secretary, at which time participating nurses received a candy bar as a token of appreciation for their participation. One month was allowed for completion and return of the survey. Periodically throughout the month, the lead author (also a staff nurse) would verbally remind the group of nurses currently on shift to complete the survey.

Survey data were entered into an Excel file by the lead author. Descriptive statistics and graphic displays were prepared by an on-site statistician. Each question was valued at a maximum of 5 possible points as described earlier.

Results
The response rate for the survey was 37.5% (45/120). The 3 questions with the highest mean scores are described here:

• 41 study participants (91%) agreed or strongly agreed that they would like AACN cardiac medication references on a PDA. That question earned the highest mean score, 4.44, and was considered to be the highest priority interest (Figure 2).

• In response to the question, “Would you like ACLS protocols on a PDA?” 40 study participants (89%) agreed or strongly agreed. The mean score for that question was 4.42.

• A total of 39 nurses (87%) indicated that they strongly agreed or agreed they would like cardiac algorithms on a PDA. The mean score for that question was 4.36.

Although about 70% of the nurses agreed or strongly agreed that they would like a bidirectional Spanish and English dictionary on a PDA (Figure 3), that question had a mean score of 3.98 and when compared with all questions (arranged according to high-low scores) fell in the
middle of the interest range. Another question in the middle of the interest range asked nurses if they would like the AACN cardiovascular assessment on a PDA. That question earned an average score of 3.84 points and ranked immediately below the dictionary question.

The question, “Do you use a PDA at the point of care” received a lower mean score of 1.93 and was considered to be of minimal interest. Less than 20% of the nurses marked that they frequently or always used a PDA at the bedside whereas more than 60% indicated that they never use a clinical PDA. However, more than 50% of the nurses indicated that they never or rarely use a PDA for administrative purposes. That question had a mean score of 2.40. Although about 70% of the nurses surveyed indicated that they would be willing to spend $200 or less for a PDA (2.01 mean score; Figure 4), 80% indicated that they are not willing to pay more than $100 for PDA references. That query had the lowest mean score of 1.26. These questions were selected by the lead author to provide samples of high-, medium-, and low-interest responses to all the survey questions (Figure 1).

**Discussion**

Findings from our exploratory investigation suggest that nurses are interested in using PDAs. Previous research suggests that a learning curve is associated with PDA use, but users become more adept at accessing information to plan patient care.

The survey findings indicated in general that these critical care nurses use PDAs sparingly and mostly for nonclinical situations (administrative purposes). Relatively few nurses indicated that they used a PDA for planning patient care, but more than half of the nurses indicated that they would be interested in receiving education about using a PDA. These findings suggest that education may have a significant role in influencing nurses to use PDAs to support their clinical decisions to facilitate intended clinical outcomes and that ACLS guidelines and algorithms are of utmost interest. Survey findings also indicate that cost may be a barrier for ICU nurses using personal PDAs at the bedside, a finding that is consistent with the literature.

ICU nurses are most interested in ICU-specific electronic references. Unlike school settings, where some students are required to purchase PDAs and specific programs for school and clinical use, most ICU nurses indicated hesitancy about purchasing (with their own resources) PDAs for clinical use. The ICU nurses were also not interested in purchasing more expensive clinical reference programs. It is not known to what extent these nurses would access clinical information from PDAs to support their decision making if PDAs with multiple programs were readily available in the ICU setting.
Limitations

Our exploratory investigation of PDA use, perceptions, and expectations of PDAs in practice had several limitations. The reliability and validity of the survey questions were not tested. Another limitation involved sample size. The number of participants completing the survey was limited to a small percentage of ICU nurses within 1 hospital at a multi-hospital health care system; however, most studies of use of health care information technology among nurses found in our search involved sample sizes of less than 30. Another limitation involved lack of respondent-specific demographics. Other regions and states throughout the nation may have responded differently. Because of time constraints and lack of financial resources, comparisons between seasoned ICU nurses and less experienced ICU nurses, issues around cultural competency and comfort using information technology, and a sub-analysis of financial questions regarding PDAs (see Figure 4) were not explored. Nevertheless, this survey of nurses’ perception of health care information technology (particularly with a focus on critical care) is the largest that is currently available. More research, however, is needed to address these nursing comparisons and evaluate whether they have any bearing on implications for nursing and clinical PDAs.

Conclusions

Clinical use of PDAs is becoming more popular among professional health care providers and clinical students. Based on results from our literature search and survey, results of this exploratory investigation indicate that ICU nurses are interested in having specific clinical references on PDAs although PDAs are not widely used in ICUs. Limited knowledge of PDAs along with personal financial concerns and unavailability of PDAs may influence their lack of use. Formal education, institutional support, and readily available software applications may encourage ICU nurses to use PDAs to support their decisions when planning patient care.

References


Financial Disclosures
None reported.


Figure 4 Percentage of respondents for each Likert score in response to the question, “How much money are you willing to pay for a PDA?” The mean score was 2.01.
Abbreviation: PDA, personal digital assistant.


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Crit Care Nurse 2009;29 58-64 10.4037/ccn2009570
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