



## Original Articles

## Challenges and facilitators to nurse use of a guideline-based nursing information system: Recommendations for nurse executives

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## ABSTRACT

**Aims:** The aims of this study were to develop empirical data on how nurses used an evidenced-based nursing information system (NIS) and to identify challenges and facilitators to NIS adoption for nurse leaders.

**Background:** The NIS was part of the electronic health record with 200 evidence-based, interdisciplinary clinical practice guidelines from which clinicians selected to guide the patient's care.

**Methods:** A purposeful sample of 12 randomly selected nurses in three units across two hospitals participated in scenario-testing. Sessions were audio-recorded, transcribed, content analyzed, and coded for themes.

**Results:** Major themes emerged: computer placement in patient rooms; difficulty using NIS; documentation completeness; efficiency; time spent at the bedside; team communication; training; unintended consequences of workflow changes; perceived NIS value as challenge to adoption.

**Conclusions:** Nurse executives' opportunities to improve adoption include enhancing communication to/from front-line clinicians about the hospitals' goals, perceived NIS value at the bedside, and constructive feedback especially for patient care/safety and software functionality.

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Nursing information systems (NISs) are promoted as a technology supporting collaboration and improving health care decision making at the point-of-care and ultimately health care outcomes. An NIS contains data collection and integration functionality for nurses and could be used as a part of an electronic health record (EHR) or in conjunction with an electronic medical record (EMR). NISs have the potential to improve the processes of obtaining patient history and care planning and to increase nursing documentation completeness, readability, and availability. NISs also provide the means to decrease double documentation and assist with more precise compliance with legal documentation requirements (Ammenwerth, Rauegger, Ehlers, Hirsch, & Schaubmayr, 2011). However, a recent systematic review found no evidence of measurable impact of nursing record systems on nursing practice and patient outcomes. The review included only two hospital studies of NIS: both assessed quality of documentation (Urquhart, Currell, Grant Maria, & Hardiker Nicholas, 2009). Due to the scarcity of hospital NIS studies, relatively little is known about the impact of the increasing adoption and use of NISs in hospitals. There is a larger body of literature on EHRs. These systems

chronologically order patient clinical information captured by systems. These include order entry and results reporting systems such as laboratory, pharmacy, and radiology, as well as medication administration systems. While nurses are the end users of EHRs, very little is known about how nurses are affected, and whether they associate EHRs with quality care and patient safety (Kutney-Lee, 2011). Studies have shown that nurses are frustrated with the inconveniences of EHRs such as poor impact on nursing workflow (Stevenson, Nilsson, Petersson, & Johansson, 2010), increased workload, and high frequency of irrelevant notifications or alerts (Sassen, 2009; Sidebottom, Collins, Winden, Knutson, & Britt, 2012). As a result of such frustrations, nurses are less likely to use the EHR as intended (Sockolow, Lehmann, Bowles, & Weiner, 2009). To address this knowledge gap, the study described in this article focused on a hospital-based NIS, using a strong research design for the evaluation.

Implementation of NIS is relatively new, and due to a lack of evaluation studies, it is not well understood. This study focused on an urban, non-profit, academic, health system that implemented an NIS in its hospitals in 2011. The health system's goal in implementing this NIS was to promote patient safety and improve patient outcomes by: (1) standardizing care and reducing variability in clinical practice among the clinical disciplines with evidence-based clinical practice guidelines (CPGs), and (2) supporting nurse provision of patient-centered care. Nursing leadership expected that the NIS would save

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time and improve the quality of care provided. The health system wanted to learn from the evaluation whether the NIS made a difference in nurse practice and whether nurses were satisfied with the NIS. The research question was, what were the challenges and facilitators to NIS adoption? The purpose of this paper is to present empirical data on how nurses used an evidenced-based NIS and, based on the study findings, provide practical guidance about adoption of NIS designed to support clinical process and decision making.

## 1. Methods

The researchers conducted a qualitative study with staff nurses using the NIS. The research team obtained approval from the researchers' academic institutions' institutional review boards. The study received strong backing from nurse leadership at the health system level as well as in the individual hospitals.

### 1.1. The intervention

The NIS is a module within a nationally known electronic health record (EHR) previously implemented throughout the hospital system. The NIS provides approximately 200 evidence-based, interdisciplinary clinical practice guidelines (CPGs) from which clinicians select to guide patient care.

Care plans, designed with information from CPGs, are further individualized by nurses for each patient. Content from the care plan populates throughout the assessment and education flowsheets producing a comprehensive and detailed assessment specific to the chosen plan of care, prompting nurses to recognize important elements of the selected care plan. For example, for a patient admitted for chemotherapy, a nurse selects a chemotherapy CPG for the plan of care which incorporates or embeds chemotherapy specific assessment elements in the assessment and education flowsheets. These embedded elements in the documentation fields are intended to reduce variability in nursing care. The NIS is accessible on newly installed computers in each patient room.

### 1.2. Site

The study took place in two hospitals within a three-hospital health system. The flagship hospital has 760 beds and the other has 300 beds. Nurses attended 8 hours of training in advance of the NIS implementation. They were instructed to document almost all patient-related issues in the NIS including the admission assessment, physical assessment, educational interventions, vital signs, intake and output measurements, medication administration, assessment findings, interventions completed, and significant event summaries. Two key benefits emphasized in the training were: (1) reduction of redundant questions addressed to patients by clinicians in various disciplines; and (2) support for patient-centered care. An example of the latter is eliciting from the patient an individualized statement indicating information about unique patient needs not readily apparent from his or her diagnosis or CPGs. "Super-users" (nurses identified by managers to have advanced user skills) provided ongoing support on each unit.

### 1.3. Participants

Nurses were selected purposefully to insure variety in the study participants. The nurses worked on units that met the following criteria: (1) were representative of most units in the hospital (e.g., medical or surgical unit); (2) had a conference room with a computer where the study could be conducted; and (3) had a contact person on the unit known to a research team member (to facilitate introduction of the study to the staff). Eligible participants were registered nurses who provided and documented direct patient care. Nurses were

selected from among those working that day and were asked to participate if they could spare 20 minutes away from their work. Individually, a team member obtained the nurse's consent outside the conference room. To protect the nurses' identities in such a small sample, no demographic or identifying information was collected.

### 1.4. Procedures

The research team was composed of academic researchers and clinical nurses who conducted the evaluation from March to May of 2012. The team used scenario-based user testing, presented as a modified think-aloud protocol (Nielsen, 1993) which is a standard methodology used to elicit data about cognitive reasoning that occurs during a problem solving task. In a conference room with a computer, the research team presented the previously prepared scenarios to the nurses and simultaneously conducted follow-up interview questions (shown in Fig. 1) while observing the nurses using the system. The scenarios were designed by the investigators to have the nurses interact with the major components of the NIS. For example, one scenario asked the nurse to document a patient fall. A different group of randomly selected multiple scenarios was presented to each nurse, ensuring that all scenarios and questions were asked at least once for each unit. The 20 minute sessions were audio recorded and transcribed. Three researchers (i.e., PS, MR, KB), independently performed directed content analysis for challenges and facilitators to NIS adoption, analyzing the transcripts of the answers to the scenarios and interview questions. The inter-rater agreement goal was 100% and discussion was held until it was reached. Similarly, the data were individually coded for themes. After the coding was completed, the themes were mapped to the concepts and components within the Health Information Technology Reference-based Evaluation Framework (HITREF). The HITREF is a comprehensive framework firmly grounded in research evidence that provides a comprehensive list of 20 evaluation criteria related to HIT characteristics (Sockolow et al., 2009). During the analysis process, questions that arose were referred to the authors (i.e., KHJG) who worked as nurses in the hospitals. These authors provided validation as well as facilitated member checking validation among their colleagues.

Following interpretation of the findings, the team developed solutions to the identified challenges to adoption. The team also identified existing facilitators to adoption and proposed avenues to support or enhance these facilitators. Health system nurse executives received the team's final recommendations.

## 2. Findings

Participants were 12 registered nurses. They were from two units of the flagship hospital and one unit of an acute care hospital—four nurses from each unit. To protect their anonymity no socio-demographics were collected.

Transcripts from the scenario testing sessions revealed the following themes. Further analysis and synthesis identified the challenges and facilitators to NIS adoption.

1. *Hardware* referred to placement of the computer in the patient room. Nurses reported they tended to chart in the room especially for complex patients and were less likely to document at the bedside for uncomplicated patients. As one nurse stated, "I find especially with my xxx patients, I really like it because they have so much going on, they have a-lines, they have chest tubes, they have epidurals, and it's easier to be like, 'forgot to look at this', and you can just peek at them real quick and finish your charting. And that part I do it in the room with those patients, because I don't want to miss something. With these patients back here [observation patients] I don't usually document at the bedside, cause it's pretty straightforward."

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