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Novice Nurse Information Needs in Paper and Hybrid Electronic-Paper Environments: A Qualitative Analysis

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Abstract. A within group, laboratory, experimental study of nurse information seeking was conducted. As a part of the study, 35 novice nurses assessed and planned the care of two patients in two simulation environments: a paper (PR) environment and a hybrid (HY) environment [i.e., part of the environment was made available in electronic form via an electronic patient record (EPR) and part of it was paper-based]. Subjects were asked to "think aloud" in each environment and participated in a cued recall session following participation in the simulations. Subjects' verbalizations and actions were audio and video recorded and then transcribed. In the first phase of the study audio and video data were qualitatively coded using Model Based Coding with concepts from Newcomer Information Seeking Theory (NIST). This paper presents the qualitative results of this study with a focus upon the types of information used by novice nurses during the assessment and planning of patient care. Qualitative findings revealed novice nurses used referent, relational and appraisal information (as predicted by NIST theory and research) including information composed of more than one type of information (e.g., referent-relational). Two new types of information emerged from the qualitative data – situational task and situational organization information.

Keywords. EPR-CPR-EMR, human interfaces, hybrid electronic-paper

1. Introduction

Health and nursing informaticians have found the ability of nurses to acquire information influences the quality of their decision making [1, 2]. This is especially the case among novices who are new to a profession, practice domain, and healthcare organization. Healthcare organizations (e.g., hospitals) have responded by implementing electronic patient records (EPRs) to address novice nurse information needs. Yet, even as organizations are implementing EPRs, nurses continue to experience difficulty obtaining information relevant to patient care [1, 3]. Research has attempted to develop models/taxonomies that classify the types of information needed [1, 4]. For example, Forsythe [5, 6] developed a taxonomy that describes three types of information health professionals attend to: formal versus informal, general versus specific, and local

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versus global. Currie [1] developed a model that classifies information according to type of event, resources used, type of outcome, and context. Much of this research has not controlled for clinician differences arising from EPR, clinical, disciplinary, domain and/or organizational experience – factors that may influence the type of information needed [2, 4]. As well, there is little qualitative research that examines information needs in paper (PR) or hybrid (HY) environments. Qualitative research about the type of information novice nurses attend to in such environments is needed [3]. The purpose of this paper is to report on the qualitative findings from a study investigating information seeking in PR and HY environments. More specifically, the authors report upon the types of information novice nurses attend to in PR and HY environments (empirically validated as well as new, emergent types of information).

2. Literature Review

In the management literature, theory has motivated empirical research involving differing types of information workers attend to. Newcomer Information Seeking Theory (NIST) is the most comprehensive, empirically validated theory that describes the types of information novices attend to in the workplace. NIST researchers have found individuals seek referent, relational and appraisal information in the workplace. Referent information informs individuals about what they need to do to be successful at work. Relational information gives individuals information about the nature of their relationship to others at work. Appraisal information tells individuals about how well they are doing in the workplace. NIST researchers have conceptualized and empirically validated the types of information sought by individuals in the workplace [2, 7]. NIST has not been used to study the types of information that novice nurses require in PR or HY environments as part of assessing and planning patient care [3].

3. Methods

3.1. Sample and Materials

A laboratory-based, experimental study was conducted (n=35 novice nurses). A Masters prepared nurse selected two medical patient records typical of the types of patients novice nurses encounter in a hospital (i.e., patient A and B). Both patients had a high degree of uncertainty associated with their health conditions as they were early in their hospital stay. Two types of nursing stations were simulated: a PR and HY environment. In the PR environment all information was paper-based. In the HY environment all information was paper-based except for the patient record. Part of the patient record was electronic and part of it was paper-based. Each patient record was originally in paper-based form and partially recreated in electronic form for the HY environment. Three health informaticians and three clinicians deemed the environments to be consistent with those in North American hospitals [see [3] for more details].

3.2. Study Design

The two environments (i.e., PR and HY) were used to conduct the within group, experimental study. The PR and then the HY environment were presented to prevent

carry over effects following EPR exposure [8]. Subjects were asked to assess and plan the care of two patient's (a task that stimulates nurses information seeking) [3]. Subjects received patient's A's or B's record first (i.e., the order of patient record presentation was block randomized – AB or BA) to prevent learning and order effects from the presentation order and differential difficulty between the records. Subjects were asked to "think aloud" in the PR and HY environments and then asked to participate in cued recall to clarify "think aloud" verbalizations/actions that were not understood (i.e., the researcher reviewed video tape with the subject) [9].

3.3. Qualitative Data Analyses

Transcriptions were made of the data. Transcribed audio and video data were uploaded to Transana®. Audio data was segmented according to natural pauses in speech [9]. The data was qualitatively coded using Model Based Coding with concepts from NIST [2, 7]. The unit of analysis consisted of utterances, words, phrases, sentences, paragraphs, and video frames (i.e., the smallest unit of information that could be understood) [9]. The data was coded using empirically validated concepts from NIST theory [2, 9]. In cases where the theory did not fully describe the data, Model Based Coding suggests data be coded with new or emergent concepts (e.g., new types of information) [9]. All emergent concepts were defined and used to code all subsequent data. Model Based Coding of qualitative "think aloud" data allows the researcher to determine if theory is valid, falsifiable or in need of extension [9].

4. Results

NIST described some of the types of information used by novice nurses. A number of new concepts or types of information emerged from the qualitative data revealing the need to extend NIST to include other types of information. The following are the qualitative findings by code:

Referent, Relational and Appraisal Information: NIST [3] suggests individuals use referent, relational and appraisal information.

Referent Information: Most subjects used referent information in the PR (82%, n=29) and HY (86%, n=31) environments. Sources of referent information included the patient record (i.e., paper or electronic form) and other resources in their environment (e.g., text books). Referent information included information about patient attributes (e.g., age), treatments and attributes of nursing tasks, for example in the excerpt:

> He is to have acetylcystine, a mucomyst. Not sure about that so I would look into the drug guide which is the CPS [referent]. [PR, Subject 1]

Relational Information: Novice nurses used relational information. 89% (n=31) used relational information in the PR environment while in the HY environment 91% (n=32) used relational information. In general novices focused on identifying relational information (i.e., health professional names) that could influence their patient's care. For example, some noted the attending physician's name (as they may need to contact them to obtain or clarify orders as well as update them on their patient's condition):

> I want to check who the doctor is. I like to know who my patient's doctor is just in case anything happens during the day. I can click reference [relational]. [PR, Subject 10]

Appraisal Information: Subjects used appraisal information the least. 9% (n=3) of novice subjects in the PR and 3% in the HY environment used appraisal information. The following is an example of a novice employing appraisal information – here, the novice is commenting on their ability to gather information using the EPR during cued recall:

> A dialogue box would pop up, and I would think I did something wrong to the computer [appraisal]. [Cued Recall, Subject 2]

More Than One Type of Information: Subjects also used information made up of more than one type of information (i.e., referent-appraisal, appraisal-relational and referent-relational). 49% (n=17) of subjects in the PR and 31% (n=11) in the HY environment used referent-relational information. The use of combinations of information was new and emerged from the coding.

Referent-Relational Information: All subjects acquired referent-relational information from the patient record. Subjects noted referent-relational information that was relevant to tasks that support patient care as illustrated below:

> Let's see the doctor's orders [referent-relational] [PR, Subject 1]

Referent-Appraisal Information: Information composed of referent-appraisal components was also used by subjects. 6% (n=2) of subjects used referent-appraisal information in the PR environment. No subjects used this type of information in the HY environment. Subjects obtained all referent-appraisal information from the chart as illustrated by the following excerpt:

> Maybe they (nurses) can tell me where they (the medication administration records) are on the chart. If not from that point, I would probably call the pharmacy and get them to fax a copy of her medication records so that I don't make a mistake with (the patient) [referent-appraisal] [PR, Subject 4].

Relational-Appraisal Information: An even smaller number of subjects (i.e., 3%, n=1) used information composed of relational-appraisal components in the PR environment. No subject used this type of information in the HY environment. The following is an example of relational-appraisal information from the cued recall data:

> I would bring my drug book. I would bring my little guides – sometimes in my pocket. Because of the teacher (would ask). What is this drug. What's it for? Why is he getting it? What are the contraindications like? [relational-appraisal] [Cued Recall, Subject 34].

Situational Task and Situational Organizational Information: Two new types of information emerged: situational task and organizational information.

Situational Task Information: All of the subjects used situational task information (STI) in both environments. STI refers to information about the object of the task (i.e., the patient). During the course of assessing and planning patient care for each patient, subjects sought out STI to construct a mental model of the object of the task to gain situation awareness, for example:

> I have the patient's name [situational task], age [situational task], gender [situational task], diagnosis [situational task], history of exacerbated CHF [situational task] [PR, Subject 11]

Subjects sought out STI until there was a need to directly interact with the patient to acquire further information as no more information could be obtained from their environment and/or to verify acquired information.

Situational Organizational Information: Subjects sought out situational organizational information (SOI) to learn about organizational resources and processes relating to

patient care. This was used to build a mental model or develop situational awareness of the organization. Most subjects (i.e., 89%, n=31) in the PR and in the hybrid condition (i.e., 94%, n=33) used SOI. This included SOI about patient care activities that had been completed by other health professionals as part of organization work, for example in the following excerpt:

> First I am going to check her vitals. See when they were last done. It looks like at 8:25 I think [situational organizational]. [PR, Subject 6]

In summary STI provided subjects with information about the object of the task (i.e., the patient) and SOI with information about the organization's resources and processes involved in patient care. Both types of information were used to build mental models (i.e., of the patient and organization) and to obtain situational awareness. A Kappa coefficient of 0.914 was calculated indicating high inter-coder agreement.

5. Conclusions

Qualitative data indicates NIST describes some types of information used by novice nurses during assessment and planning of patient care (i.e., referent, relational and appraisal). New findings include: (a) novice nurse use of combinations of differing types of information outlined in NIST (e.g., referent-relational), and (b) new types of information (i.e., STI and SOI). STI and SOI helped novice nurses to develop situational awareness and mental models of: (a) the patient and (b) the organization and its processes as they relate to patient care. In the quantitative part of the study significant differences in information seeking were found between paper and hybrid electronic-paper environments [3]. Findings from this research inform HIS development and interface design as they identify several types of information that novice nurses attend to not previously published in the NIST, health or nursing informatics literature. Developing user interfaces that address such nurse information needs may improve mental model development and subsequent decision making.

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