MEDINFO 2007
HISA Ltd Australia
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Differences in Nursing Time Spent Performing Work by Task Category Between Intensive Care Units With and Without Computerized Provider Order Entry

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Abstract

Previous studies of the impact of information technology have primarily focused on the impact of systems designed for use by the nursing staff, primarily documentation systems. This article focuses on the changes in nursing tasks between the medical and cardiac intensive care units of two hospitals. One hospital's two intensive care units (ICU) have computerized provider entry (CPOE) installed, while the other hospital did not installed CPOE in the two intensive care units studied.

Methods: Direct observation of nurses as they performed nursing tasks was conducted using work sampling technique. Observations were performed over ten 3-hour periods in each hospital. The data collected included the task being performed and the duration of each task performed by the nurse.

Results: The amount of time nurses spent conducting certain types of tasks was different between the two hospitals. Nurses in the ICUs with CPOE installed spent more time performing education and housekeeping tasks at the patient bedside. Nurses in the ICUs without CPOE installed spent more time on nursing documentation. Time spent performing personal and administrative tasks remained the same in both sites.

Keywords:
CPOE, nursing work, work sampling, activity theory

Introduction

Nursing has been described as job that involves considerable coordination and management of the patient care [1]. Previous studies examining the impact of information technology on nursing work have primarily been conducted upon the implementation of clinical documentation in an inpatient setting [2-5]. Nursing work has been described by the researchers as having different categories of tasks, including documenting or charting,, and patient care [2], with orders considered part of the charting activities of the nurse. The impact of these systems has been studied because there is a possibility that a change in the method of performing a task, for instance changing from documenting on paper to documentation on a computer, may impact the time available to perform patient care.

There has been a recent impetus toward implementing computerized provider order entry (CPOE) in the inpatient hospital setting. The primary drivers to the implementation of CPOE include increased patient safety [6] and private corporate pressure [7]. It has been proposed the implementation of CPOE will result in decreasing errors in medication order entry [8]. Although 9.6% of hospitals in the United States claim to have implemented CPOE, only 46.2% of these hospitals require use of the CPOE system by the physician [9]. Computer-based order review and order coordination result in nurses being indirect users of the CPOE system.

Nurses are also the direct users of CPOE system, by transcribing physician orders written by the physicians on paper into the CPOE system and entering verbal and telephone orders for future cosigning by the physician. Understanding the impact the implementation of CPOE would have on nursing work would enable clinical informatics and nurse managers to understand how to prepare clinical nurses for the change the implementation will bring to the work in the ICU.

With the current nursing shortage, the burden the working nurse performs under, and the increasing impetus to install CPOE systems, it is necessary to understand whether this system changes the work nurses perform to insure the implementation does not increase the workload of these nurses. Decreasing nursing time with the patient has the potential to negatively impact patient outcomes.

The Activity Theory, a structural theory of work having six concepts that could impact the work and the worker, was used to define the study. These concepts include the task, the environment, the organization, the worker, the role of the worker, and the technology being used to perform the task. Only a selected set of results are discussed here that pertains to the tasks the nurses performed.

Methods

Sample and site

The researcher observed nurses as they performed their work in two intensive care units located in two different sites. The first site did not have CPOE installed. This site was a large academic medical center in the upper Midwest. The medical ICU contained 24 beds and the cardiac ICU

had 8 beds. The nurse patient ratio was 1:1 or a maximum of 1:2.

The CPOE site was a large academic medical center in the southern eastern seaboard. The medical ICU contained 12 beds and the cardiac care unit contained 16 beds. Both hospitals had an all-registered nurse staff.

Permission was obtained from both hospitals institutional review board to conduct the study. Additionally, the medical directors, nurse managers, and clinical informatics personnel were informed of the study and permission was requested and granted to approach and observe the clinical nurses in the ICU.

Ten clinical nurses were observed at each site for a total of twenty nurses observed performing their work. The researcher followed the ten clinical nurses while they performed their work during a three-hour observation period during their normal workday.

Data collection

All tasks the nurses performed were entered into a computer-based instrument. The instrument consisted of 65 separate tasks divided into 11 different task categories (Table 1). The instrument was derived from an instrument used to observe nursing work in the ICU in earlier research [10]. Task categories included documentation, assisting, conversations, manual tasks, housekeeping, personal tasks, teaching/learning tasks, administrative, observational, conversational, transportation, and miscellaneous tasks. The instrument was developed with the cooperation of Dr. Matthew Weinger of the University of Vanderbilt. The instrument was reviewed by clinical nurses and nurse informaticians at a large Midwest University hospital to insure all the appropriate tasks were included. The instrument was installed on a tablet personal computer for use during the observations.

The instrument allowed the researcher to note the order of the tasks, the duration of the tasks and the number of instances of the tasks that were performed during each observation period. The instrument supported the ability to collect simultaneously performed tasks as well as tasks that were performed consecutively. Notations could also be made on the instrument by the observer. The eleven task categories were divided based on specific criteria shown in Table 1.

Table 1: Task category definitions

Task Category	Description
Manual	Care tasks provided to the patient at the patient bedside
Housekeeping	Cleaning tasks in the patient room or bed area
Transportation	Moving the patient
Observational	Looking at the patient or patient monitoring devices, but not performing care tasks
Documentation/ Reading	Reading or writing on the electronic or paper chart
Conversational	Talking to another caregiver
Assistance	Helping another caregiver perform work
Administrative	Performing schedules, email etc.
Teaching/Learning	Performing education for the patient or family
Personal	Taking a break away from patient care
Miscellaneous	Any task not easily categorized

Method

Observations were performed over a 14 day period. Each observation period lasted approximately three hours with observations conducted during both night and day 12-hour shift during the week and the weekend. Informed consent was obtained from the observed nurses before the observation was begun. Patients and family under the care of the nurse were informed of the research and were given the option to end the observation. No family or patient asked for the observation to end. No patient data was collected at any time.

Each task the nurse performed was selected on the instrument. Each observation period resulted in a text file consisting of the tasks, notations made by the researcher, task start times and task duration. The file was saved to the tablet hard drive. The text file was converted to a Microsoft Excel© file to enable data review and analysis.

Data analysis

Upon completion of the data collection, twenty files were available for analysis. Each file contained information about one observation period. Ten files were from observations performed in the ICUs with CPOE implemented; ten files were from observations from the ICUs without CPOE implemented. The tasks were aggregated into the eleven task categories. The percentage of time spent performing each task was calculated. Additionally, the percentage of time spent in each task category was calculated. A comparison of the means of the task categories of

the observations performed in the ICU with CPOE implemented and the means of the task categories of the observations performed in the ICU without CPOE implemented was performed.

Results

Table 2 shows the total time of observation at each site and total time spent performing each task category.

Table 2 - Observed time in minutes

Task Category	Non-CPOE	CPOE
Manual	635.20	637.15
Housekeeping	31.03	49.30
Transportation	3.18	6.62
Observational	5.80	62.40
Documentation/Reading	427.48	322.42
Conversational	671.22	490.87
Assistance	12.78	35.60
Administrative	46.85	57.60
Teaching/Learning	54.78	71.23
Personal	16.82	84.13
Miscellaneous	20.92	53.95
Totals	**1926.07**	**1871.27**

The percent of time the nurse spent performing tasks in the different categories in the ICUs for the non-CPOE hospital is illustrated in Figure 1.

Figure 1- Percentage of work by Task Category in ICUs of non-CPOE hospital

The same task categories of nursing work obtained from the observations in the ICUs of the hospital where CPOE was installed are presented in Figure 2.

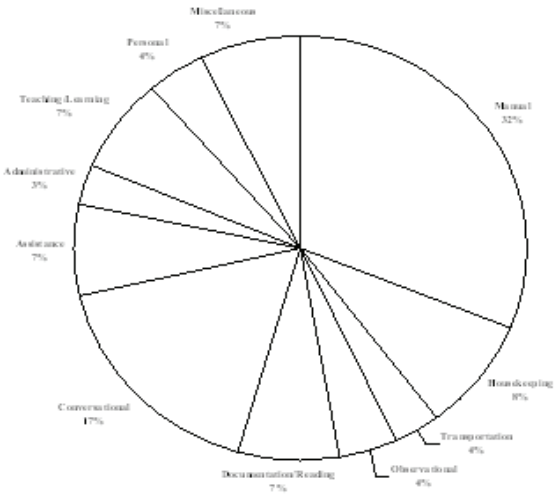

Figure 2 - Percentage of work by Task Category in ICUs of hospital with CPOE

Figure 2 above has larger sections than the equivalent sections of Figure 1; indicating more time performing housekeeping tasks, manual patient care tasks, and observing the patient, implying the nurses had more available time when CPOE was installed. Additionally, the nurses spent less time than in the non-CPOE site documenting, conversing with other clinicians, and on miscellaneous tasks.

Table 3 illustrates the percentage of time nurses spent performing work in each task category. Statistical significance was evaluated for each task category.

Task Category	Non-CPOE	CPOE	Significance
Manual	30.55	34.29	>0.05
Housekeeping	1.50	2.64	>0.05
Transportation	0.33	0.32	>0.05
Observational	0.39	3.34	>0.00
Documentation/Reading	21.25	17.38	>0.05
Conversational	35.59	26.05	>0.05
Assistance	0.63	1.83	>0.05
Administrative	2.13	2.89	>0.05
Teaching/Learning	2.63	3.86	>0.05
Personal	0.78	4.57	>0.05
Miscellaneous	4.23	2.82	>0.05
Totals	**100.00**	**100.00**	

Table 3 - Percentage of time worked by task category

Discussion

As Murphy points out, nursing is performed as part of a complex system [1]. A change in this complex system has the potential to increase nursing workload and burden for an already heavily burdened worker. The implementation of CPOE does have an impact on nursing work. The consequences of that impact have not been closely examined at this time. Because CPOE has not yet been implemented widely, although according to Ash there are many hospitals considering or beginning to implement this innovation [9], now is the opportune time to better understand the impact these systems will have on nursing.

The consequences of the additional time available to the nurse to perform manual patient care tasks and education/ learning tasks are also not clearly understood. It is assumed there would be improved patient outcome, however further research may be needed to verify this hoped for result of the implementation of CPOE.

Another area not understood that this study illustrates is the impact of decreased time spent on documentation/reading and conversing with other clinicians. The decrease of time spent in these tasks does not reflect the quality of the communication. Further research is needed to discover if less documentation and communication equates with better information communicated and if the communication results in a clear understanding of the patient care needs.

Conclusions

The results indicate there is a significant difference in the way nurses in an ICU utilizes the time at work. The impact of the implementation of CPOE on the division of time a nurse spends performing tasks would, at first, seem to show the nurses job tasks change with this information technology change. The nurse spends less time on work related to supportive tasks such as documentation and conversing with clinicians and more time performing manual and observational work at the patient bedside. The implementation of any information technology, even when not primarily designed for use by the nurse, should be examined to determine the possible impact the new system could have on the nurse.

Acknowledgements

The author would like to thank Dr. Patricia Flatley-Brennan and the professionals in the University of Wisconsin – Madison HealthSystem Laboratory.

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