Interruptions Experienced by Registered Nurses Working in the Emergency Department

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CE Earn Up to 11.0 Hours. See page 105.

Introduction: A descriptive, observational study was performed to determine (a) the frequency (number of interruptions per hour) that a typical ED nurse experiences interruptions, (b) the type of interruptions a typical ED nurse experiences, and (c) the percentage of interruptions that take place during medication related activities.

Methods: A convenience sample of 30 nurses from 3 emergency departments of a major metropolitan academic medical center were each observed for 120 minutes to determine how many interruptions per hour the ED nurse experienced, the type of interruptions and what percentage of these interruptions took place during medication-related activities. A data collection tool was developed to record tasks performed by the nurses and the type of interruptions experienced. Interrater reliability was established with a Kappa of 0.825.

Results: A total of 200 interruptions occurred during the 60 hours of observation, or 3.3 interruptions per hour per RN. Of the 20 possible types of interruptions that were identified a prior to the observation period, 11 different types of interruptions were actually observed. The majority of interruptions (95%) were related to face-to-face communications with others in the ED. The total number of interruptions related to medication activities was 55 (27.5% of the total number of interruptions).

Discussion: The results of this study can serve as the basis for subsequent, larger studies that examine more closely the relationship between interruptions and errors in the ED, with the ultimate goal of developing interventions to reduce medication errors and other adverse events that occur due to nurse interruptions.

Key words: Interruptions; Medication related activities; Tasks; Emergency nursing

Health care errors are occurring in record numbers. The Institute of Medicine's report *To Err Is Human* indicated that 8% of preventable hospital deaths are caused by medication errors and that the emergency department is the unit within the hospital that has the highest rate of preventable hospital deaths.[1] The second most common sentinel event in hospital emergency departments is medication error. Common risk factors associated with medication errors in the emergency department include frequent distractions and interruptions.[2] Interruptions in other disciplines such as aviation and pharmacy have been reported to lead to errors.[3,4] The environment in the emergency department contributes to interruptions and errors. Patient visits are unscheduled, and therefore service requirements are unpredictable and often lead to interruptions in workflow and ongoing activities. In addition, the physical layout of the area allows for interruptions because it is often an open space.

Previous studies have established that errors occur frequently in the emergency department.[5-11] One study reported that the highest incidence of preventable adverse events in hospitals occurred in the emergency department (52.6%).[11] In a United States Pharmacopeia report reviewing medication errors over a 5-year period, the number of errors in the emergency department was more than double that reported from other areas in hospitals and health care facilities overall.[9] In 2003 Fordyce et al[6] described errors occurring in the emergency department, reporting 18 errors for every 100 registered patients and 0.36 adverse events per 100 registered patients. Their report showed that the second most frequent area of emergency care sub-

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Interruptions Data Collection Tool

ID #	Interruption	KEY		Task	KEY	
Date:		*Interruption Type:*	**Code**		*Task Interrupted:*	*Code*
ED RN		Communiciation	C		Communication	C
Interruptions		Overhead page	OP		patient report	PR
Observation Tool		Phone	PH		patient interview	PI
Start Time		Equipment Alarms	A		case discussion	CD
		Face-to-face	FF		telephone conversation	TC
End Time		Family	FA		Assessment	A
		Patient	PT		physical assessment	PAS
Comments		Nurse	RN		vital signs	VS
		Patient Care Technician	PCT		data analysis	DA
		Physician	MD		Other	O
		Secretary/Registrar	BA		Intervention	I
		Other	O		Medication preparation	MEDP
		Self	S		Medication retrieval	MEDR
					Medication order review	MEDOR
					Medication administration	MEDA
					IV insertion	IV
					Blood draw	BD
					Patient education	E
					Other	O
					Documentation	D
					medical record	MR
					computer	COMP
					medication administration	MAR
					other	O

FIGURE

Interruptions data collection tool. *IV*, Intravenous line.

ject to errors was pharmacotherapy (16%), second only to diagnostic studies (22%).

Additional studies have examined medication errors in pediatric emergency departments.[7-9,12] One study reported that medication errors were common in hospitalized patients, occurring at a rate of 3.99 per 1,000 medication orders. About 9% of these occurred in pediatric patients, and 5% occurred in emergency departments.[12] Other studies reported medication error incidences of 10.1%[7] to 39%[8] in ill and injured children treated in emergency departments.

In a 2004 Institute of Medicine report, *Keeping Patients Safe: Transforming the Work Environment of Nurses*,[13] inefficiencies arising from interruptions and distractions associated with nursing tasks have been identified as aspects of nurses' work that pose a threat to patient safety. Many studies have noted that nurses perceive interruptions and distractions as a primary cause for making errors.[14-16] The perception that interruptions contribute to errors has been validated in research completed with other professional groups.[3,4]

Although studies have indicated that interruptions and distractions occur frequently in the emergency department,[17-21] the frequency of interruptions that nurses experience in the emergency department has not been widely studied. Thus an important first step is to determine the actual occurrence rate. A second step is to determine what proportion of interruptions occur during medication preparation, administration, or documentation, because medication errors are one of the most frequent sentinel events in the ED setting. This study will specifically analyze the role of interruptions and its possible association with potential medication errors.

Methods

A descriptive, observational study was performed to determine (1) the frequency or number of interruptions per hour that a typical emergency nurse experiences, (2) the type of interruptions a typical emergency nurse experiences, and (3) the percentage of interruptions that take place during medication-related activities (medication preparation, documentation, or administration). An exploratory research question examined whether frequency and/or type of interruption varied across the 3 different types of emergency departments used for data collection.

SETTING

Three emergency departments of a major academic medical center in the New York metropolitan area were used for the study. All 3 emergency departments were level II trauma centers with total annual visits of over 210,000 patients. One emergency department received a combination of 55,000 adult and pediatric patients annually. The second emergency department is in the children's hospital and received 60,000 pediatric patients annually (aged from birth

TABLE 1
Descriptive statistics of study sample and environmental variables across all 3 emergency departments at time of observation

Variable	Adult emergency department	Pediatric emergency department	Combined emergency department
RN age [mean (SD)] (y)	33.8 (7.6)	37.0 (7.4)	35.7 (9.8)
RN experience [mean (SD)] (y)	6.5 (6.8)	12.8 (9.2)	9.5 (5.5)
ED RN experience [mean (SD)] (y)	3.4 (1.0)	6.2 (4.6)	4.5 (5.6)
No. of RNs on duty [mean (SD)]	13.3 (2.9)	5.7 (0.9)	10.7 (0.9)
No. of patients in emergency department [mean (SD)]	78.9 (27.2)	31.0 (17.2)	60.3 (22.4)
No. of patients assigned to RN [mean (SD)]	4.7 (1.5)	3.1 (0.9)	5.3 (1.6)
No. of assigned emergent patients	18	5	9
No. of assigned urgent patients	29	13	42
No. of assigned nonurgent patients	0	13	2

to 21 years). The third emergency department received 95,000 adult patients, aged 21 years and older, annually.

SAMPLE

A convenience sample of 30 RNs was used in this study. The nurses were stratified by individual emergency department and by shift worked. Ten RNs from each of the three emergency departments were recruited, five from each shift. For the purposes of the study, 5 RNs were selected from the time period from 8 am to 6 pm and 5 RNs were selected from the time period from 8 pm to 6 am for each emergency department. The hours before (6 to 7 am and 6 to 7 pm) and during (7 to 8 am and 7 to 8 pm) both shift changes were excluded because there would not be a consistent RN to observe. There were no overlapping time periods within each emergency department. Observation periods were 120 minutes for each RN, for a total of 20 hours per emergency department. Inclusion criteria were all full-time, part-time, per-diem, and agency RNs working in the 3 emergency departments of the health care system. RNs on orientation, RNs in charge, and RNs acting as preceptors were excluded because they potentially would have experienced different types of interruptions based on their roles.

PROCEDURES

Three different data collection tools were developed and used. First, an RN demographic data collection tool was developed to measure the demographic variables of interest to the study. RN gender, age, and years of RN and emergency nursing experience were the demographic characteristics collected. Second, an environmental data collection tool was developed to measure the contextual variables. The variables collected were (1) shift of observation episode (day, evening, or night); (2) number of RNs on duty; (3) number of patients in the emergency department at the beginning of the observation; (4) start time; (5) number of patients assigned to the RN; (6) number of emergent, urgent, and nonurgent patients assigned to the RN; (7) end time; and (8) number of patients in the emergency department at the end of the observation period. Lastly, an interruptions data collection tool was developed to measure the number and type of interruptions occurring during the observation period, along with the task being performed at the time of the interruption.

The interruptions data collection tool was designed after a literature review of the domain content of interruptions.[17-21] There were 2 categories of interruptions: communication and self. A communication interruption was an interruption caused by one of several different types of communication, whereas a self-interruption was when an individual independently suspended an activity to perform another task. A task was defined as work to be done. Tasks were broken down into 4 major categories and further broken down into subcategories (Figure). Interrater reliability was established with a κ of 0.825.

Some evidence already existed regarding validity of the tool based on previous studies conducted in the emergency department.[17-21] Categories for tasks and interruptions were chosen based on these studies. In addition, 5 experts in the field of emergency nursing were chosen to review the categories to determine content validity. Lastly, observational sampling was performed. The investigator observed

TABLE 2
Descriptive statistics of documented interruptions

Type of interruption	No.	%
Communication		
Face-to-face		
RN	85	42.5
Physician	56	28.5
Family	16	8.0
Patient care technician	12	6.0
Other	10	5.0
Secretary/registrar	6	2.5
Patient	5	2.5
Phone call	5	2.5
Other		
Alarm	2	1.0
Overhead page	1	0.5
Self	2	1.0

work in the emergency department for 120 consecutive minutes noting any and all interruptions and tasks observed. This allowed for a representative list of examples of interruptions and validated the list developed.

Approximately 1 hour before the observation time period, the researcher approached a potential subject to be observed, offered an explanation of the study, and obtained consent. Demographic data of the RN to be observed were collected at this time. The time period in which the observation was to occur during the shift was based on previous observation time periods. The purpose was to provide a variety of time periods during each shift so that the entire shift was covered. Each observation was a 2-hour time block, for a total of 10 hours per shift, with 20 hours per unit. Two minutes before the start of the observation period, the environmental data collection tool was completed by the researcher using the daily assignment sheet and the computerized patient-tracking system. By use of a stopwatch, start time and end time were noted. For the purpose of the study, an interruption was defined as a break in performing a task that lasted longer than 10 seconds. The stopwatch was also used to calculate the interruption time. Observations were made for 120 consecutive minutes. Data were logged and coded by use of the interruptions data collection tool.

Results

Three categories of data were collected and analyzed: demographic characteristics of the subjects observed, environmental variables, and interruptions. Characteristics of the study sample and environmental variables are summarized in Table 1. The typical emergency nurse was female and aged 35.5 years, with 9.6 years of RN experience and 4.7 years of emergency nursing experience. The busiest emergency department (adult) had the greatest number of RNs on duty, as well as a higher percentage of emergent patients, compared with the other 2 emergency departments. In contrast, the least busy emergency department (pediatrics) had fewer assigned patients per RN, with lesser-acuity patients, than the other 2 emergency departments.

TABLE 3
Descriptive statistics of activities interrupted

	No.	%
Documentation		
Medical record	74	37.0
Computer	29	14.5
Medication-related interruptions preparation	24	12.0
Medication retrieval	23	11.5
Medication administration	4	2.0
Medication order review	3	1.5
Documenting medication administration	1	0.5
Drawing blood	20	10.0
Communicating (patient interview, patient report, case discussion, telephone call)	7	3.5
Obtaining vital signs	6	3.0
Performing physical assessment	3	1.5
Inserting intravenous line	3	1.5
Other interventions	2	1.0
Data analysis	1	0.5

A total of 200 interruptions occurred during the 60 hours of observation, or 3.3 interruptions per hour per RN. During the 120-minute observation period, the number of interruptions ranged from 2 to 12 per observed nurse, with a mean of 6.6 per RN (SD, 3.1). The peak period for interruptions occurred during the evening time periods.

Table 2 describes the types of interruptions. The majority of interruptions (95%) were related to face-to-face communications with others in the emergency department. The individual most frequently interrupting the RN was another RN, followed by a physician. Interruptions were much less frequently caused by other categories of individuals or by phone calls.

Table 3 describes the activities interrupted. Medication-related activities were the second most frequently interrupted activity (27.5%). The first was documenting

in the medical record (37%). Paper medical records were used in all 3 emergency departments. The third most frequently interrupted activity was documenting in the computer (14.5%). All 3 emergency departments used a computer patient-tracking system and ordered laboratory tests on the computer, whereas only the pediatric emergency department used the computer to document medication administration and vital signs. The fourth was blood drawing (10%). Other tasks that were interrupted less than 3% of the time were assessing vital signs, performing physical assessment, inserting an intravenous line, communicating a patient report, interviewing a patient, discussing a case, communicating on the telephone, and analyzing data.

Medication preparation and medication retrieval were most often interrupted by face-to-face communications with other RNs and physicians. RNs were more likely to interrupt these medication-related activities than physicians.

An analysis of variance was performed to determine whether a statistically significant difference existed in the number of interruptions across the 3 emergency departments. Results showed that there were significant differences across the 3 emergency departments ($P = .003$). Post hoc comparisons by use of the Bonferroni and Scheffé methods showed a significant difference ($P < .01$) between the adult emergency department, with a mean of 8.9 (SD, 3.2), and the pediatric emergency department, with a mean of 4.4 (SD, 2.1). No significant difference was detected between the adult and combined emergency departments, which had a mean number of interruptions of 6.7 (SD, 2.3).

χ^2 Analyses were conducted to evaluate whether there were significant differences among the units on percentage of interruptions related to medication administration activities. The results showed that there were no significant differences between ED type and percentage of interruptions related to medication activities ($\chi^2 = 2.23$, $df = 2$, $P = .3$). Interruptions related to medication activities comprised 11% of the total number of interruptions for the adult emergency department, 8% of the total for the pediatric emergency department, and 8.5% of the total for the combined adult and pediatric emergency department.

Discussion

The adult-only emergency department had the youngest nurses with the least amount of experience compared with the other 2 emergency departments. This could be attributed to the highly specialized orientation programs in place to support the new nurses. The adult-only emergency department also was the busiest, with the highest number of emergency patients. Of the 3 departments studied, this emergency department sees the greatest number of patients each year.

Literature that is specific to RN interruptions in the emergency department is scarce. One recent study, however, was located that reported a mean of 11.65 interruptions per hour, much higher than the number we observed.[22] The study setting may have contributed to the higher number. In addition, no specific time parameter for suspension of a task, to identify an interruption, was defined in the study. Our study defined a specific time parameter of 10 seconds or more as an interruption. Interruptions that occurred under this 10-second parameter were not counted. This restriction or threshold could account for the lower number of interruptions identified when compared with the previous study. Further studies are required that include a standard definition or metric for the event "interruption." In addition, a larger sample of hospitals should be studied, including different types of emergency departments in a broader geographic location, to determine whether these findings are supported. It would be interesting to explore whether nurse demographics or unit characteristics impact the findings.

The findings of this study suggest that RNs experience fewer interruptions during the course of performing their duties in the emergency department as compared with studies completed on interruptions experienced by emergency physicians.[18-20] However, the studies cited all had methodologic differences that could account for the lower number of interruptions. These differences were also found and discussed in previous RN studies cited and warrant further investigation.

The majority of interruptions occurring during the study were reflective of communication issues, as described in Table 2. The content of these communications was not investigated. Previous studies have shown findings similar to this study.[17,20] None of these studies investigated the content of the communications. Further study is needed to identify the nature of the communications that were being observed. It is important to determine whether the communication that caused the interruption could be judged to be essential for safe patient care at that moment in time or nonessential. Appropriate interventions could then be developed to decrease nonessential communication interruptions.

A high percentage of interruptions occur during medication-related activities, as described in Table 3. Previous studies have indicated that medication errors occur frequently during nursing medication administration,[23-25] but definitions of medication administration varied or were not provided.[25] Studies that included a definition of medication administration included areas defined by our study.[23,24,26] Although previous research has reported that interruptions can lead to errors,[3,4,14-16] further studies are needed to more firmly establish this linkage. This will be useful in developing interventions to reduce interruptions and thereby reduce errors.

On the basis of the findings of this study, the following recommendations can be made: ED leaders need to define geographic areas in the emergency department where nurses can perform medication-related activities in an interruption-free zone. Leaders also need to explore other means of providing essential communications among staff without interrupting activities in progress. This can be accomplished by regularly scheduled interdisciplinary patient rounds or team huddles to discuss patient care plans and progress. Lastly, pharmacists should be available in the emergency department to review orders and prepare medications so that nurses can perform their duties and are not interrupted while performing these tasks.

The results of the study must be interpreted in light of several limitations. The study sites may not be representative of emergency departments throughout the United States and other countries, and therefore generalizability is limited. The operational definition provided for this study may have been too rigid compared with other studies,[17-19] thereby yielding fewer interruptions. The instrument used to measure interruptions and tasks interrupted was developed by the researcher. Although the tool was developed based on tools and data from prior research in the field[17-21] and reliability testing was performed, further research is needed to determine reliability. Lastly, the researcher conducted all the observations, and thus there is the potential for bias in trying to find interruptions as the endpoint of the study.

The study provides seminal information on interruptions RNs experience while working in the emergency department. Subsequent investigations may build on this information to determine whether there is a relationship between interruptions experienced and subsequent adverse patient events. This can ultimately lead to the development of interventions to reduce interruptions and thus reduce errors.

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