

Relationship between Workflow Interruptions on the Occurrence of Nursing Errors Among the Nursing Staff in the Intensive Care Units

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Abstract

Background: The environment surrounding ICU nurses has been described as fast-paced and unpredictable, and nurses' cognitive load as exceptionally heavy. Studies of interruptions and multitasking in health care are limited, and most have focused on physicians.

Aim of the Study: The current study was conducted to assess the relationship between workflow interruption and the occurrence of nursing errors among the ICU nurses.

Material and Methods: Design: A descriptive correlational study design was utilized to achieve the aim of the current study. Setting: The study was conducted in 185 new emergency hospital at Al-Kasr Al-Aini Hospital, Cairo University Hospital. Sample: Convenient sample of all available staff nurses, agreed to participate in the study, deliver direct patient care working at the emergency department and Intensive care unit department. The total number of participant were (50) of (60) nurse. Tool: Data was collected by using observational tool to assess the type of interruptions that occur in the selected setting and another observational tool to assess the nursing errors.

Results: The results of the current study revealed that is no statistical relationship between the total interruptions and the occurrence of total errors.

Recommendations: Although there was no significant relationship between interruptions and nursing errors, the results of this study show that nurses' work environment is complex and error prone. The staff nurses that were observed experienced a high level of discontinuity in the execution of their work. Although nurses manage interruptions and multitasking well, the potential for errors is present, and strategies to decrease interruptions are needed.

Key Words: *Interruption – Distraction – Nursing errors – Multitasking.*

Introduction

NURSING is an art and science. As a science nursing has the knowledge base needed for the care that is given, as an art means possessing skills needed for the application of the knowledge to

help others achieve maximum health and quality of life [1]. A professional nurse should learn to deliver care carefully with compassion, caring and respect for each patient's dignity and personhood [2].

Most hospitalized patients with critical conditions are cared for in intensive care units which are patient care areas designed to provide extraordinary treatment by specially trained healthcare professionals, often with the use of high-tech equipment [3]. Nurses play a critically important role in ensuring patient safety by monitoring patients for clinical deterioration, detecting errors & near misses, understanding care processes & weaknesses inherent in some systems and performing countless other tasks to ensure patients receive high-quality care [4].

The Intensive Care Unit deserves to be emphasized, as it presents considerable challenges in relation to patient safety, considering that highly complex processes are undertaken in this unit. The nursing care in this unit requires much attention from the professionals who frequently need to take fast and risky decisions, in addition to undertaking a high number of invasive interventions and using a variety of devices, various high-alert medications and new therapeutic technologies, with studies indicating the high incidence of adverse events [5].

Interruptions acts which disrupt or suspend an activity are derived from external events originating from people or from the sounds of equipment, such as telephones and alarms, or from self-interruption. Interruptions contribute to distracting human attention, possibly resulting in disrupting or interrupting the activity which is being undertaken, even if temporarily, reducing time for reflection and ability to think. After experiencing the interruption, the professional runs the risk of omitting or repeating some steps, or it may even happen

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that the entire task may be repeated, which may have disastrous effect [6].

The interruptions may cause cognitive errors, including failures in attention, memory or perception, affecting concentration and contributing to the human being forgetting what she was doing, increasing the probability of committing errors. The consequence of these failures causes delays in the care, loss of concentration, incomplete work, the omission of the care, and an increase in the risk of errors and exposure of the patient to errors [7].

Error-free performance is a standard that is expected of medical staff personnel (doctors, nurses, technicians) however, healthcare systems and personnel are by no means infallible from committing mistake and errors, the errors in intensive care unit could decrease pt. safety also some errors could lead to injury and death. Errors were defined as actions or missed actions that would have resulted in a change in the patient's care, actions that caused harm or death to the patient, or actions with the potential to do so [8].

Main categories were obtained about the causes leading to nurses error: Individual causes such as exhaustion, Lack of experience and knowledge, work pressure such as shortage of work force, blind caring such as traditional caretaking, the uniqueness of caring environment such as technology and lack of monitoring, and lack of coordination among health care team members [9].

Significance of the study: Nursing errors are occurring at an alarming rate, these errors are both preventable and expensive to the health care system and often lead to severe and devastating consequences as for patients and their family in ICU [9]. As the investigator observed that many interruptions as (frequent doctor order, staff nurses asking for help, noise, emergency situation) occurred in the intensive care unit, that could be the cause of many of nursing errors. Those errors have a direct and fatal impact on the critical patient as it endanger his safety, complicate his condition or may lead to death, physical, psychological harm and increase the cost of hospitalization.

Nurses in ICU face a lot of interruptions like (medical tools or telecommunication devices such as phones, or medical device alarms and noise) when they provide care to the patients those interruptions could influence the nurses ability to focus on the task or the procedure that they provide to the patients so it could lead to increasing task completion time, error rates, and job stress.

Research in this area can improve the nursing image because when we find out the relationship between interruption and nursing practice errors we can make practice errors all of this will lead to improve the patient safety, out come and satisfaction so it will lead to improve the nursing image.

Research in this area are necessary to identify the interruptions occurs in the intensive care unit and its impact on the occurrence of nursing errors.

Therefore, the aim of this study was to assess the relationship between workflow interruption and the occurrence of nursing errors among the ICU nurses.

Subjects and Methods

The study was conducted from January 2017 till November 2017.

Research questions:

To fulfill the aim of the study, the following research questions were formulated:

- What are the types of interruptions that face the nurses in intensive care units at Al-Kaser Al-Aini Hospital?
- What is the relationship between interruptions and the occurrence of nursing errors?

Research design:

A descriptive comparative research design was utilized for this study.

Setting:

The current study was conducted in 185 new emergency hospital at Al-Kasr Al-Aini Hospital, Cairo University Hospital. The departments that were selected from 185 new emergency hospital were the emergency department and Intensive care unit department.

Sample:

Convenient sample of all available staff nurses, agreed to participate in the study, deliver direct patient care working at the emergency department and Intensive care unit department. The total number of participant were (50) of (60) nurse.

Tools of the study:

To collect data for the present study, two tools were developed by the investigator to achieve the aim of the study it included the following:

1- *Frist tool:* Sources of interruptions in the ICU was developed by the investigator based on literature review it contained of two parts:

Part 1: Personal characteristic data, it included (age-gender-qualification-years of experience-working unit-marital status-type of the shift).

Part 2: Sources of interruption observation sheet to determine the types of interruptions in the ICU. This tool was developed by investigator it contained 22 items derived from five main dimensions indicate some of interruptions by staff nurse observation. Scoring system for the first tool: 3 point likert scale (always-some times-never) and the weighting scores that will be assigned to the response are (3 to always) (2 to some times) (1 to never).

2- Second tool: Nursing errors categories observations sheet was used to determine the types of nursing errors and it was developed by the investigator based on literature review. Observations sheet of 53 item derived from 7 main domains. Scoring system of the second tool is 3 point likert scale (always-some times-never) and the weighting scores that will be assigned to the response are (3 to always) (2 to some times) (1 to never).

Content Validity was checked before the pilot study a group of experts are consulted and they were five experts consisting of two professor at medical surgical department and three professor at administration department. Each of the expert were asked to examine the two data collection tool for content, coverage, clarity, wording, length, format and the over all appearance of the tool. Then based on the experts comments and recommendations some changes were made at the data collection tools. Tool reliability was tested by Cronbach's Alpha test and the result was (0.90).

Ethical and legal considerations:

An official permission was obtained from vice dean of post graduate studies and research at Faculty of Nursing Cairo university, the director of 185 new emergency hospital at Alkasr Al Aini Hospital, Cairo University Hospital and the ethical committee was obtained to carry out the study. also the purpose & nature of study will be explained to the head nurses of the selected ICUs that included in the study. The investigator will assure voluntary participation and confidentiality to each subject who participate in the study.

Pilot study:

Pilot study was conducted on 10% of the total sample to test feasibility, objectivity, clarity of tool contents and applicability of study tool. A total of 10 subjects were recruited for Pilot Study. All subjects recruited for Pilot Study met the

inclusion criteria in the study. Needed modification was done based on the results of the pilot study.

Statistical analysis:

Data collected from observation checklist to assess the of workflow interruptions and the nursing errors categories practiced by the ICU nurses affiliated to previous mentioned units entered to (SPSS) for analysis. Data were analyzed using descriptive statistics in the form of frequency distributions, percentage, mean and standard deviation, and inferential statistics in the form of *p*-value (< 0.05).

Results

Table (1) showed that highest percentage (60%) of the staff nurses is female while (40%) are male. The highest percentage (53.3%) according to the age of the staff nurses ranged from (20-30) years, while years of experience (60.0%) ranged from 1<5. The highest percentage (46%) of the staff nurses graduated from technical institute of nursing while (42%) of the staff nurses graduated from technical scholarly of nursing and (12%) of the staff nurses graduated from faculty of nursing. Also (61.3%) of the shift when staff nurses were observed is long day shifts while (38.7%) of the shift when staff nurses were observed is night shift.

Table (1): Percentage distribution of the staff nurses according to their personal characteristic data (n=150).

Variables	Number	Percentage (%)
<i>Sex:</i>		
Male	60	40.0
Female	90	60.0
<i>Age:</i>		
20-30	80	53.3
31-40	70	46.7
<i>Years of experience:</i>		
1<5	90	60.0
6<10	60	40.0
<i>Qualification:</i>		
Nursing diploma	63	42.0
Associated technical diploma in nursing	69	46.0
Bachelor in nursing	18	12.0
<i>Shift:</i>		
Long day shift	92	61.3
Night shift	58	38.7

Table (2) showed that the highest Source of observed staff nurses interruption was related to (Internal interruption) (76.53%), but regarding the lowest Source of observed staff nurses interruption was related to (Patient-related interruption) (56%).

Table (3) showed that showed that the highest nursing errors category of observed staff nurses was related to (Various nursing intervention errors). (72.22%), but regarding the lowest nursing errors category of observed staff nurses was related to Blood and blood products errors) (47.688%).

Table (4) showed that showed that there is statistical relationship between nursing errors categories and the experience of observed nurses p (0.042).

Table (5) showed that there is statistical relationship between environmental interruptions and the occurrence of patient rights errors p (.000). Also, there is statistical relationship between environmental interruptions and the occurrence of nursing intervention errors p (.000), furthermore. There is statistical relationship between environmental interruptions and the occurrence of Medication errors p (.032), but there is no statistical relationship between the total interruptions and the occurrence of total errors.

Table (2): Mean & Standard deviation of. Sources of interruptions in intensive care units.

Sources of interruptions dimensions	Minimum	Maximum	Mean	Std. Deviation	Mean %
Environmental interruption	6	18	12.1067	1.66345	67.26%
Patient-related interruption	2	6	3.3600	0.94322	56%
Organizational interruption	28	84	54.6333	5.85784	65.03%
Technological interruption	5	15	8.4867	1.74070	56.58%
Internal interruption	8	24	18.3667	2.20560	76.53%
Total	49	147	96.9533	8.82289	65.97%

Table (3): Total mean percentage of the staff nurses observation toward types of nursing errors (n=150)

Nursing errors categories	Minimum	Maximum	Mean	Std. Deviation	Mean %
Patients rights	10	30	18.7133	3.39826	62.3 8%
Various nursing intervention errors	10	30	21.6667	2.44858	72.22%
Patient fall	6	18	11.3000	2.92811	62.777%
Medication administration error	13	39	22.5533	2.53178	57.828%
Documentation error	8	24	13.9467	1.98919	58.11%
Equipment injuries	5	15	9.5133	1.72131	63.34%
Blood and blood products errors	5	15	7.1533	1.57470	47.688%
Total	57	171	104.8000	7.22	61.286%

Table (4): Relation between observed sources of interruptions dimensions by the respondents age.

Nursing errors categories	Experience
<i>Patients rights:</i>	
<i>r</i>	.015
<i>p</i>	.853
<i>Various nursing intervention errors:</i>	
<i>r</i>	.022
<i>p</i>	.786
<i>Medication administration error:</i>	
<i>r</i>	.096
<i>p</i>	.243
<i>Documentation error:</i>	
<i>r</i>	.184
<i>p</i>	.024
<i>Patient fall:</i>	
<i>r</i>	.191
<i>p</i>	.019
<i>Equipment injuries:</i>	
<i>r</i>	.133
<i>p</i>	.104
<i>Blood and blood products errors:</i>	
<i>r</i>	.184
<i>p</i>	.024
<i>Total:</i>	
<i>r</i>	.166
<i>p</i>	.042

Table (5): The relationship between interruptions and the occurrence of nursing errors.

Interruptions Errors occurrence	Environmental	Patient interruption	Organizational	Technological	Internal interruption	Total interruption
<i>Pts rights:</i>						
<i>r</i>	.347	.129	.095	.022	.062	.103
<i>p</i>	.000	.116	.249	.793	.454	.208
<i>Nursing errors:</i>						
<i>r</i>	.294	.119	.450	.268**	.219**	.475**
<i>p</i>	.000	.146	.000	.001	.007	.000
<i>Medication errors:</i>						
<i>r</i>	.175	.161*	.074	.106	.004	.085
<i>p</i>	.032	.050	.368	.198	.958	.302
<i>Documentation errors:</i>						
<i>r</i>	.054	.196*	.031	.027	.044	.046
<i>p</i>	.508	.016	.705	.744	.589	.575
<i>Patient fall:</i>						
<i>r</i>	.007	.205	.054	.030	.094	.086
<i>p</i>	.931	.012	.510	.714	.252	.296
<i>Equipment:</i>						
<i>r</i>	.182	.106	.056	.158	.221**	.101
<i>p</i>	.026	.195	.493	.054	.006	.219
<i>Blood:</i>						
<i>r</i>	.234	.055	.138	.233	.144	.224**
<i>p</i>	.004	.500	.092	.004	.079	.006
<i>Total errors:</i>						
<i>r</i>	.115	.091	.025	.050	.030	.012
<i>p</i>	.162	.269	.759	.547	.718	.881

Discussion

As regards the demographic characteristics the current study revealed that the majority of the study sample were females, the majority study sample age ranged from((20-30), more than half of the staff nurses years of experience were ranged from (1<5). Near half of them were holding technical school of nursing and the majority of the nurses were observed in the long day shift.

This study showed that the highest source of observed staff nurses interruption was related to (Internal interruption and regarding the lowest. Source of observed staff nurses interruption was related to (Patient-related interruption). This may be because of their were no rules or polices that prevent the staff to interrupt their work by privet telephone calls or talking to each other out side patient care, also may be because of lake of supervision to staff nurses and the work load.

The previous result was congruent with Fairbanks et al., [11], whose study was under the title (Emergency department communication links and patterns) the results showed that a high volume of inter provider communication that interrupt their work and affect negatively on their performance.

It makes intuitive sense that staff nurses who interact often have greater opportunity to interrupt one another.

More over the previous result was congruent with Alvarez [12], whose study was under the title (Interruptive communication patterns in the intensive care unit ward round) the results showed that the predominant sources of interruptions to nursing work were other members of the health team, including other nurses, and these were more prevalent on medical care units. Also they stated that interruptions occurred more frequently during the afternoon shifts and were caused mainly by the nursing staff members talking to each other by starting a conversation and stopping to do patient care.

This study showed that the highest nursing errors category of observed staff nurses was related to (Various nursing intervention errors), this may be because of work pressure in the selected units, the unscheduled arrival for the patients, lack of supervision, absence of procedure bock and staff shortage all of this could be a leading cause in committing interventions errors. This result was consistent with Verklan [13] whose study under the

title (Malpractice and the neonatal intensive-care nurse). The majority of errors found in this study fall into the delivery of nursing intervention (67%) followed by verbal and written communication categories (22%). But regarding the lowest nursing errors category of observed staff nurses was related to Blood and blood products errors).

This study result's showed that there is statistical relationship between nursing errors categories and the experience of observed nurses which may be because of the nurses with more years of experience have much knowledge and skills so they have committed less errors.

The results revealed that there is statistical relationship between environmental interruptions and the occurrence of patient rights errors which may be because of the environmental interruptions such as the noise would decrease the nurse concentration when accomplishing nursing tasks this lead to committing errors and also the interruptions increase the work stress. This result was consistent with Amy [14] who conducted a study under title (Measurement of the frequency and source of interruptions occurring during bedside nursing handover in the intensive care unit).

There is statistical relationship between environmental interruptions and the occurrence of nursing intervention errors which may be because of performing the nursing procedures and interventions are based on the recall of the residual knowledge and when interruptions occurs this recall process is cut so the nurse could forget the procedure that she was performing then errors occurs. This results were consistent with Jeanmonod [15] who conducted a study under title (The nature of emergency department interruptions and their impact on patient satisfaction) the results showed that Over half of the observed interruptions resulted from healthcare team members creating a noisy work environment that was distracting to the nurses' work and direct nursing interventions.

There is statistical relationship between environmental interruptions and the occurrence of Medication errors which may be because of medication administration is complicated process that need a great deal of concentrations so when interruptions occurs the nurse could loss her concentration which leads to medication errors. This results were consistent with Conklin et al., [16] who conducted a study under title (Interruptions and medication administration in critical care) and his study revealed that out of 150 registered nurses (RNs) surveyed across two hospitals, 32% stated that the

greatest cause of a medication error that they had experienced in the past were contextual factors such as noisy, distracting environments.

Although some items of the table have statistical relationship between each other but there is no statistical relationship between the total interruptions and the occurrence of total errors this may be because of the effect of interruption was very difficult to estimate because there was many other factor with the interruptions that could cause nursing errors such as work load, shortage of the staff, nature of the emergency hospital, also personal factors such as fatigue, personal problems all of this factors can contribute to occurrence of nursing errors so we cant say that interruption alone contribute to occurrence of errors but we can tell that it has a negative effect on the thinking process and increase the task completion time and increase the work pressure.

In conclusion, is no statistical relationship between the total interruptions and the occurrence of total errors.

Recommendations:

The nurse director should:

- 1- Design a training program about how to handle different types of interruptions.
- 2- Set strict rules about having privet phones during caring for the patients.
- 3- Ensure nursing committee was done at least every month for the staff nurses to know what they want to improve in their practice.

The head nurse should:

- 1- Supervise the nurses during performing procedures.
- 2- Ensure that staff nurses follow the procedure book when performing procedures.
- 3- Try to apply the (safe zone) especially when administrating medications.

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العلاقة بين تقطع سير العمل على حدوث الأخطاء التمريضية بين أفراد التمريض بالرعايات المركزة

سير العمل بالرعاية المركز وقسم الطوارئ معرض للتقطع بسبب طبيعة العمل، حيث أن المرضى حالتهم معقدة، تعامل الممرض/ة مع حالات الموت المتكرر والبيئة في الرعاية المركز توصف بأنها غير متوقعة. عمل الممرض/ة يحتاج إلى كثير من التركيز والدقة لإن خطأ صغير ممكن أن يؤدي إلى موت المريض أو حدوث مضاعفات له لذلك يجب على الممرض/ة أن يقدم الرعاية التمريضية بكثير من الدقة والتركيز حتى يحافظ على حياة المريض من أي خطر. تقطع العمل يمكن أن يكون بسبب الضوضاء، المكالمات التليفونية الخاصة بمكان العمل، الآلات الطبية وأسئلة المريض أو أهله. أما الأخطاء التمريضية التي يمكن أن تحدث للمريض تكون في صورة أخطاء في إعطاء العلاج، وقوع المريض على الأرض وأخطاء في إعطاء الدم أو مشتقاته. كان الهدف من البحث هو تقييم العلاقة بين تقطع سير العمل على حدوث الأخطاء التمريضية بين أفراد ممرضى الرعايات المركزة بمستشفى ١٨٥ للطوارئ والحروق بالقصر العيني جامعة القاهرة وتم تنفيذ الدراسة بمستشفى ١٨٥ للطوارئ والحروق بالقصر العيني جامعة القاهرة و تم اختيار قسم الطوارئ والرعاية المركزة لعمل البحث وأشتملت عينة البحث على جميع أفراد الممرضين والممرضات السريرى الذين يقدمون الرعاية التمريضية المباشرة للمرضى والذين يعملون بمستشفى ١٨٥ للطوارئ والحروق على ألا تقل خبرتهم عن سنة وموافقين على الاشتراك بالبحث وكان عدد المشاركين ٥٠ ممرض وممرضة. تم ملاحظة كل ممرض/ة ثلاث مرات أثناء القيام بالأعمال التمريضية اليومية وقد أستغرق جمع البيانات مدة ١١ شهر من شهر يناير ٢٠١٧ إلى شهر نوفمبر ٢٠١٧ وقد تبعه تحليل لتلك البيانات وأظهرت النتائج أنه لا توجد علاقة إحصائية بين تقطع سير العمل وحدث الأخطاء التمريضية وأوصى الباحث بتصميم برنامج تدريبي للممرضات على كيفية التعامل مع تقطعات سير العمل المختلفة وإجراء المزيد من الدراسات القائمة على الملاحظة للتحقق من الاختلاف في وجه النظر بين الممرضين.