

Workflow Interruptions and Nursing errors among staff nurses in Intensive Care Units at Oncology Center Mansoura University



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1. ABSTRACT

Background: The setting a rounding ICU staff nurses has been showed like a rapid changed and unexpected and staff nurses' perceptive burden as predictable weighty. Research of interruption and multitasking in health care setting are restricted and mainly concentrate on practitioner. **Aim of study:** The aim of study is to determine relationship between workflow interruptions and nursing error among staff nurse in ICU. **Methods:** A descriptive correlational study design was conducted with a convenient sample of (65) staff nurses worked in adult medical, surgical, and child intensive care units at Oncology Center of Mansoura University. Data was collected using two tools. The first tool was an Interruption observation sheet, and second tool was Nursing errors categories questionnaire sheet. **Results:** Regarding to source of interruption, the highest source is internal interruption, while the lowest source is patient related interruption. Regarding to types of nursing errors, main errors category of staff nurses was related to documentation errors followed by medication errors. There were statistically significant positive correlations between overall workflow interruption and overall nursing errors. **Conclusion:** It was concluded that increase rate of interruption occurrence causing increase incidence of errors. **Recommendations:** The study recommended that design a training schedule for staff nurses to modernize their information and expertise so as to improve patient's outcome for evading error occurrence related to interruption, and align staff nurses behavior, rights, duties, and values with the health care system policies, goals, and objectives in order to reduce effect of internal interruption.

Keywords: Workflow interruption, Nursing Errors, Staff nurses, Intensive Care Units

2. Introduction:

The role of staff nurses is very important as they responsible for various duties for example quick health recovery, primary identification of diseases, and reducing death rate. Sometimes, staff nurses as a human being vulnerable to faults at work, however these faults cannot be overcome at any price especially if they work in intensive care units (ICU) (Simões, 2020).

ICUs provide nursing care to critical ill patients, who need continuous attention, adjacent monitoring from high-risk drugs and complicated health devices to safeguard their health and improving healing process. They are cared by professional health care worker, who have experience in dealing with serious health condition (Cwiek, Kikano, Klaus, Novaretti & Weil, 2017).

Patients with serious health condition are exposed to errors due to complicated diagnosis that threaten their well-being and health, the ICUs atmosphere showing numerous interruptions and chance of different types of errors as result of frequent interruption (Hoogendoorn, Margadant, Brinkman, Haringman, Spijksstra & de Keizer, 2020).

Interruption in ICU may participate in patient's injury because of attention postponement and integrity risk. Interruption in nursing care can result to integrity compromise and reduce practice efficiency to patient as well as reduce staff nurses job satisfaction. All health care systems are aimed to achieve high score in patient's outcome, particularly when studies done by international agencies such as (Center for Medicare & Medicaid Services, 2020).

Interruptions can be known as a pause in the nursing practice started from inner or outer cause by staff nurses. A pause in practice lead to stop of a primary assignment and switch to sudden interruptive assignment, consequences of this is cessation of the primary assignment (Sanderson, McCurdie, & Grundgeiger, 2019).

Thus, workflow interruptions may reduce patient well-being, deterioration of diagnosis, and increase cost of hospitalization. Furthermore, disruptions may lead to anxiety, exhaustion, and increase feeling of guilt by staff nurses. So, we in need to develop interventions for staff nurses that decreasing effect of workflow interruption and enhancing their level of performance (Berg,

Källberg, Ehrenberg, Florin, Östergren, Djärv & Göransson, 2016).

Nurse workflow interruption is very complex adaptive processes and can be complicated by the number of patients assigned to the nurse, their condition and the constant requirement to coordinate with other team members' needs. Nurses have to perform many different tasks that demand critical thinking (Craker, Myers, Eid, Parikh, McCarthy, Zink, & Parikh, 2017).

The causal relationship between interruption and error has also been clearing that staff nurses were exposure to do mistakes when disturbed compared with when they were not disturbed. Some practices such as the existence of an investigation of interruptions and error, standardized of procedures, and talking clearly, were efficient in reducing error rate (Sanderson et al., 2019).

Nursing errors can be known as a mistaken actions, inattention or activities that staff nurses are accountable, which have negative or possibly opposing results in health condition, and which staff nurses will be blamed by other colleagues when occurred. These faults happen repeatedly in (ICUs) because of complicated nursing procedures, complex medical devices, various patient requirements, and reactions to curative practices (Eltaybani, Mohamed & Abdelwareth, 2019).

There are five categories leading to nurses' error as Individual causes such as burnout, deficiency in skill and information. Also, business burden such as a scarcity of manpower. In addition to, sightless practice for example classical care delivering. Furthermore, the singular ICU atmosphere such as various medical devices and shortage of monitoring. Lastly, absence of teamwork spirit among staff nurses (Guchait, Zhao, Madera, Hua & Okumus, 2018).

Errors are not limited to medication administration, nurses may make errors in performing various procedures, transcribing orders, charting or by missing subtle changes in patient's condition (e.g., failure to rescue). (Abbasi, Abe, Abu-Zayyad, Allen, Azuma, Barcikowski & Telescope Array Collaboration, 2018) found that only 58% of the errors reported by a random sample of United States hospital staff nurses were associated with medication administration, the remaining errors were associated with incorrect performance of procedures, transcription errors, or charting errors.

Nursing errors are very expensive to patients in terms of distress, and may reach to doom. Also, expensive to staff nurses feeling blame about injury occurred to patients. Currency need to counter act negative effect of errors is huge due to different objectives. In addition to, expensive in term of lack of confidence by patients and reduced satisfaction between patients and staff nurses (Cablan & Kynoch, 2017).

Staff nurses, as the largest provider of health care services, are essential to efforts to enhance patient safety through error reduction. Nursing professionals are uniquely positioned to detect and prevent health care errors due in part to their education regarding preventive care, adherence to the nursing process and constant vigilance of patient navigating within the care continuum (Yao, Wang & Guchait, 2019).

Error free performance is a level which predictable from ICU staff personnel (doctors, staff nurses, technicians) however, ICU staff personnel are not impeccable of faults, the errors in ICU could decrease patient safety also some errors could lead to injury or death (Kingstone, Evans, Smith & Berry, 2014). So, the aim of study is to determine relationship between workflow interruptions and nursing error among staff nurses in ICU

Significance of study:

There has been urgent need of research into interruption for two decades. Because of, workflow interruption led to negative results for staff nurses as, hinder efficient perfect of goal directed task, reduce work outcome and draw attention of primary task, so it related to frequent and large number of errors in health care setting (Li SY, Magrabi & Coiera, 2012).

Nursing errors are easy preventable, but costly to health care setting and usually lead to dangerous and destructive consequences as for patients and their family in ICU. Those errors have immediate and dangerous effect on critical ill patients as it reduce their safety, deteriorate their health condition lead to death, physical, psychological harm and increase cost of hospitalization (Valiee, Peyrovi, & Nasrabadi, 2014). So that the aim of study is to determine relationship between workflow interruptions and nursing error among staff nurse in ICU.

Aim of the study:

This study aimed to determine relationship between workflow interruptions and nursing error among staff nurses in ICU

Research Questions:

RQ1: What is the different interruption experienced by staff nurses during work in Intensive Care Units at Oncology Center Mansoura University?

RQ 2: What is the different error occurred by staff nurses during work in Intensive Care Units at Oncology Center Mansoura University?

RQ 3: What is the relationship between workflow interruptions and nursing error among staff nurses during work in Intensive Care Units at Oncology Center Mansoura University?

3. Subject and Methods

3.1. Study design:

The research design utilized a descriptive correlational design.

3.2. Study setting:

This study was conducted at adult medical, surgical, and child intensive care units in Oncology Center at Mansoura University. The center provides care at delta region and bed capacity is (500) beds. Oncology Center at Mansoura University consist of eleven floors.

3.3. Study subjects:

The subjects of the present study included all available nursing staff who are willing to participate in the study at time of data collection (65).

3.4. Tools of data collection:

The data of this study was collected by using two tools: -

Tool (I) Tool I: Source of Interruption observation sheet

This tool developed by (Abdel-aleem, & fatma, 2018) and aim to determine source of interruption.

It consists of two parts: -

Part (1) Demographic characteristic of study subjects as age, gender, marital status, educational level, workplace and years of experience.

Part (2) Sources of interruption observation sheet. It used to determine types of interruption in the ICU. It contained of 48 items derived from five main dimensions which are (Environmental interruption (6items), Patient related interruption (2items), Organizational interruption (28items),

Technological interruption (4items) and Internal interruption (8items)).

The response was measured by 3-point Likert scale (Always scores (3) – Sometimes scores (2)- Never scores (1)).

Tool (II) Nursing errors questionnaire:

Nursing errors categories questionnaire sheet. It used to determine the types of nursing errors. This sheet developed by (Elsayad, Shazly, & Mahmoud, 2017). Questionnaire sheets consist of 34 items derived from three main domains (Causes of error from your perspective (7items), Type of error (15items), and Reaction toward errors (12items)).

The response was measured by 3 point Likert scale (Agree scores (3) –Agree to somewhat scores (2) – Disagreescores(1))

3.5. Validity of the study tools:

Tools translated by researcher into Arabic and tested for its content validity and relevance by a panel of five expertise from Faculties of Nursing: who revised the tools for clarity, applicability, comprehensiveness, understanding, relevancy and ease for implementation and according to their opinions, modifications were applied. The modifications were related to grammatical language and rephrasing of some sentences.

3.6. Reliability of the study tool:

Reliability test of the study tools, Source of Interruption observation sheet, and Nursing errors questionnaire were tested by Cranach's Alpha Reliability was computed and found (0.84), (0.81) respectively.

3.7. Pilot study:

A pilot study was carried out on 7 staff nurses 10% of the study sample to test the clarity, feasibility of the questions and to determine the time needed to fill-in questions staff nurses who shared in the pilot study were excluded from the total sample to appraise the clarity, feasibility and applicability of the tools and necessary modifications were done based on their responses.

3.8. Ethical consideration:

Formal approval was be obtained from the research ethics committee of Faculty of Nursing, Mansoura University (Ref:245) An official permission to conduct the study obtained from the responsible administrator of Oncology Center, the participation was voluntary, and confidentiality and anonymity of the subject were assured through coding of all data. Privacy of the study sample was be assured. The results will be used as a component

of necessary research. As well as it will be used for future publication and education

3.9. Data collection:

Data collection took three months from beginning of February to end of April 2021. The aim of the study and how to fill tool was explained by the researcher. Recording of the observation was began when staff nurses had completed informed consent. The researcher collected data through observing staff nurses using interruption observation sheet. Observations were recorded on a minute-by-minute basis. The researcher collected data about nursing errors through interviewing and distributing questionnaire to each subject in the study during work hours in morning and afternoon shifts. Give 10-15 minutes to fill the questionnaire sheets. The number of collected questionnaire sheets from nursing staff per day ranged from 3-4 sheets. The researcher went to Oncology Center two days per week.

3.10. Statistical analysis:

The collected data were organized, tabulated and statistically analyzed using SPSS software. Categorical variables were represented as frequency and percentage. Continuous variables were represented as mean, and standard deviation. Pearson correlation coefficient test was conducted to test the association between two continuous variables. Statistically significant was considered as ($p\text{-value} \leq 0.01$ & 0.05)

4. Results:

Table (1): Showed personal characteristics of the studied staff nurses working in ICU at oncology center Mansoura University (65nurses). Regarding to age, most of them were age group between (20->30) years old. Related to gender, most of them were female. Concerning to marital status, more than half of staff nurses were married. As regards to level of education, more than half of them were graduated from technical institute. In addition to workplace, above one third of them were worked in medical ICU. Finally regarding to level of experience, more than half of staff nurses had (1->5) years of professional experience.

Table (2) and figure (1) Illustrate mean scores of workflow interruptions as reported by the studied staff nurses working in ICU at oncology center Mansoura University. According to the table, the highest source of observed staff nurses' interruption was related to internal interruption

(75.87%), while the lowest source of observed staff nurses' interruption was related to patient related interruption (65.5%).

Table (3) Illustrate mean scores nursing error types as reported by the studied staff nurses working in ICU at oncology center Mansoura University. According to table, the highest nursing errors category of staff nurses was related to documentation errors followed by medication errors about (63.79%, 62.19%) respectively.

Table (4) and figure (2) Illustrate reasons of nursing errors from the studied staff nurses' perspectives who working in ICU at oncology center Mansoura University. According to table, the highest reason of nursing errors is presence of workloads and increases your perspective (67.7%), while the lowest reason is lack of supervision (26.2%).

Table (5) Illustrate nursing reaction toward nursing errors as reported by the studied staff nurses working in ICU at oncology center Mansoura University. According to table, the highest reaction of staff nurses toward error is search for effective solutions (69.2%), while the lowest reaction toward error is fear and loss of self-confidence (15.4%). As regard to supervisor reaction toward error, the highest reaction is punishment (47.7%), while the lowest reaction toward error is chapter \termination (7.7%).

Table (6) Illustrate mean scores of nursing errors in relation to personal characteristics of the studied staff nurses working in ICU at oncology center Mansoura University. According to table, there is statistically significant relationship between medication errors and age by years of studied nurses, and that there is statistically significant relationship between documentation errors and level of education of studied nurses

Table (7) and figure (3) Illustrate relationships between workflow interruptions and nursing errors as reported by staff nurses working in ICU at oncology center Mansoura University. According to table, there is statistically significant relationship between technological interruptions and overall nursing error, also there is statistical significant relationship between documentation errors and overall workflow interruptions. In addition, there is statistical relationship between overall nursing errors and overall workflow interruptions.

Table (1): Personal Characteristics of the Studied Staff Nurses Working in ICU at Oncology Center Mansoura University (n=65).

| Variables | No | % |
|---------------------|----|------|
| Age years: | | |
| 20->30 | 54 | 83.1 |
| 30->40 | 11 | 16.9 |
| Gender | | |
| Male | 10 | 15.4 |
| Female | 55 | 84.6 |
| Marital status | | |
| Single | 23 | 35.4 |
| Married | 42 | 64.6 |
| Level of education | | |
| Diploma nurse | 3 | 4.6 |
| Technical institute | 40 | 61.5 |
| Bachelor of nursing | 22 | 33.8 |
| Workplace | | |
| Pediatric ICU | 20 | 30.8 |
| Surgical ICU | 18 | 27.7 |
| Medical ICU | 27 | 41.5 |
| Experience years | | |
| 1->5 | 41 | 63.1 |
| 5->10 | 12 | 18.5 |
| 15->20 | 12 | 18.5 |

Table (2): Mean Scores of Workflow Interruptions as Reported by the Studied Staff Nurses Working in ICU at Oncology Center Mansoura University(n=65).

| Workflow interruptions | No of items | Min- max | Mean±SD | Mean percentage | Rank |
|----------------------------------|-------------|------------|--------------|-----------------|------|
| 1-Internal interruptions | 8 | 10.0-24.0 | 18.21±3.28 | 75.87% | 1 |
| 2-Technological interruptions | 4 | 6.0-12.0 | 9.01±1.73 | 75.08% | 2 |
| 3-Environmental interruptions | 6 | 9.0-16.0 | 13.61±1.71 | 73.00% | 3 |
| 4-Organizational interruptions | 28 | 40.0-77.0 | 57.96±9.14 | 69.0% | 4 |
| 5-Patients related interruptions | 2 | 2.0-6.0 | 3.93±1.18 | 65.5% | 5 |
| Overall workflow interruptions | 48 | 76.0-127.0 | 102.75±13.48 | 71.35% | |

Figure (1): Mean Scores of Workflow Interruptions as Reported by the Studied Staff Nurses Working in ICU at Oncology Center Mansoura University(n=65).

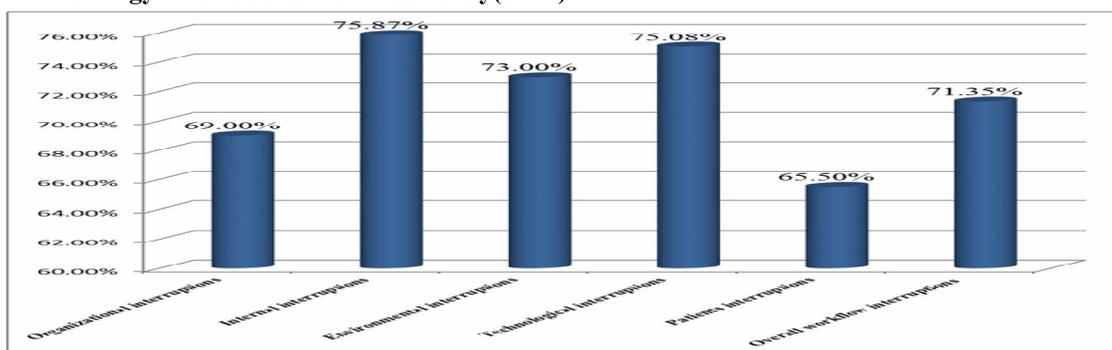


Table (3): Mean Scores Nursing Error Types as Reported by the Studied Staff Nurses Working in ICU at Oncology Center Mansoura university (n=65).

| Types nursing errors | No of items | Min- max | Mean±SD | Mean percentage | Rank |
|------------------------|-------------|-----------|------------|-----------------|------|
| A-Documentation errors | 8 | 8.0-24.0 | 15.31±4.19 | 63.79% | 1 |
| B-Medication errors | 7 | 7.0-21.0 | 13.06±4.25 | 62.19% | 2 |
| Overall nursing errors | 15 | 15.0-45.0 | 28.36±7.57 | 63.02% | |

Table (4): Reasons of Nursing Errors from the Studied Staff Nurses' Perspectives Who Working in ICU at Oncology Center Mansoura University(n=65)

| Reasons of nursing errors | Disagree (1) | | Agree to somewhat (2) | | Agree (3) | |
|--|--------------|------|-----------------------|------|-----------|------|
| | No | % | No | % | No | % |
| 1. Presence of workloads and increases your perspective. | 4 | 6.2 | 17 | 26.2 | 44 | 67.7 |
| 2. Lack of experience and practice. | 15 | 23.1 | 27 | 41.5 | 23 | 35.4 |
| 3. Lack of supervision. | 30 | 46.2 | 18 | 27.7 | 17 | 26.2 |
| 4. Apathy in work performance. | 28 | 43.1 | 15 | 23.1 | 22 | 33.8 |
| 5. Lack of instructions to avoid mistakes | 14 | 21.5 | 32 | 49.2 | 19 | 29.2 |
| 6. Failure communication between staff nurses. | 20 | 30.8 | 22 | 33.8 | 23 | 35.4 |
| 7. Lack of continuous training | 19 | 29.2 | 18 | 27.7 | 28 | 43.1 |

Figure (2): Reasons of Nursing Errors from the Studied Staff Nurses' Perspectives who Working in ICU at Oncology Center Mansoura University(n=65) .

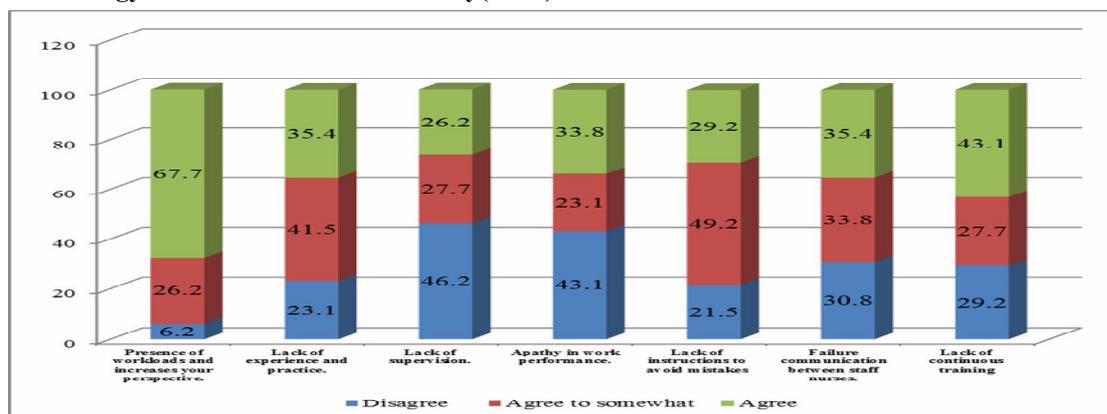


Table (5): Nursing Reaction toward Nursing Errors as Reported by the Studied Staff Nurses Working in ICU at Oncology Center Mansoura University (n=65).

| Nursing reactions toward nursing errors | Disagree (1) | | Agree to somewhat (2) | | Agree (3) | |
|---|--------------|------|-----------------------|------|-----------|------|
| | No | % | No | % | No | % |
| A: Nurses' reaction toward nursing errors | | | | | | |
| 1. Denial to error. | 32 | 49.2 | 21 | 32.3 | 12 | 18.5 |
| 2. Anger. | 28 | 43.1 | 21 | 32.3 | 16 | 24.6 |
| 3. Fear and loss of self-confidence. | 29 | 44.6 | 26 | 40.0 | 10 | 15.4 |
| 4. Felling of guilt all the time. | 19 | 29.2 | 31 | 47.7 | 15 | 23.1 |
| 5. Control of the error. | 3 | 4.6 | 20 | 30.8 | 42 | 64.6 |
| 6. Return to your boss at work to find out the error. | 4 | 6.2 | 23 | 35.4 | 38 | 58.5 |
| 7. Search for effective solutions. | 3 | 4.6 | 17 | 26.2 | 45 | 69.2 |
| 8. Measure the situation to avoid recurrence of mistakes. | 4 | 6.2 | 17 | 26.2 | 44 | 67.7 |
| 9. Loss of respect for herself. | 40 | 61.5 | 14 | 21.5 | 11 | 16.9 |
| B: Supervisors' reaction toward nursing errors | | | | | | |
| 1. Punishment. | 19 | 29.2 | 15 | 23.1 | 31 | 47.7 |
| 2. Chapter \termination. | 53 | 81.5 | 7 | 10.8 | 5 | 7.7 |
| 3. Transferring to another unit. | 32 | 49.2 | 19 | 29.2 | 14 | 21.5 |

Table (6): Mean Scores of Nursing Errors in Relation to Personal Characteristics of the Studied Staff Nurses Working in ICU at Oncology Center Mansoura University(n=65).

| Personal characteristics | Types | Of | Errors |
|--------------------------|-------------------|----------------------|----------------|
| Variables | Medication errors | Documentation errors | Overall errors |
| Age years | Mean±SD | Mean±SD | Mean±SD |
| ▪ 20->30 | 13.51±4.32 | 15.48±4.18 | 29.00±7.69 |
| ▪ 30->40 | 10.81±3.18 | 14.45±4.32 | 25.77±6.37 |
| t-value / p value | 1.96/ 0.05* | 0.73/ 0.46 | 1.50/ 0.13 |
| Gender | | | |
| ▪ Male | 12.40±3.13 | 14.70±3.23 | 27.10±5.25 |
| ▪ Female | 13.18±4.43 | 15.41±4.36 | 28.60±7.94 |
| t-value / p value | 0.49/0.62 | 0.53/0.59 | 0.57/0.56 |
| Marital status | | | |
| ▪ Single | 12.73±3.55 | 15.69±4.03 | 28.43±6.17 |
| ▪ Married | 13.23±4.62 | 15.09±4.31 | 28.33±8.31 |
| t-value / p value | 0.44 / 0.65 | 0.54 / 0.58 | 0.05/ 0.95 |
| Level of education | | | |
| ▪ Diploma nurse | 16.66±3.78 | 21.00±2.64 | 37.66±5.68 |
| ▪ Technical institute | 13.17±4.42 | 15.05±4.41 | 28.22±8.02 |
| ▪ Bachelor of nursing | 12.36±3.87 | 15.00±3.43 | 27.36±6.24 |
| f-value / p value | 1.40/0.25 | 3.08/0.05* | 2.58/0.08 |
| Workplace | | | |
| ▪ Pediatric ICU | 13.65±5.10 | 15.95±5.06 | 29.60±9.40 |
| ▪ Surgical ICU | 13.11±3.96 | 15.22±4.22 | 28.33±7.04 |
| ▪ Medical ICU | 12.59±3.83 | 14.88±3.52 | 27.48±6.50 |
| f-value / p value | 0.35/0.71 | 0.36/0.69 | 0.44/0.64 |
| Experience years: | | | |
| ▪ 1->5 | 13.36±4.34 | 15.82±4.26 | 29.19±7.76 |
| ▪ 5->10 | 12.91±3.80 | 14.16±4.26 | 27.08±7.39 |
| ▪ 15->20 | 12.16±4.58 | 14.66±3.89 | 26.83±7.29 |
| f-value / p value | 0.37/0.69 | 0.89/0.41 | 0.65/0.52 |

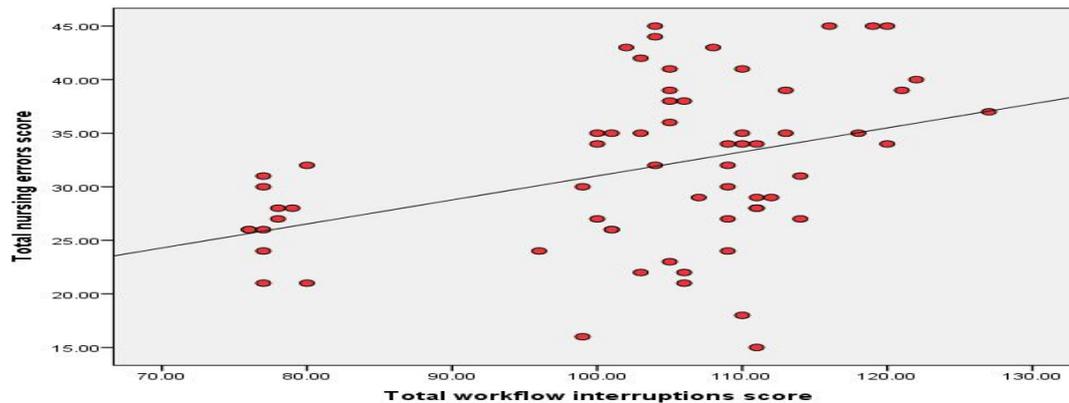
Statistically significant (p ≤0.05)

Table (7): Relationships between Workflow Interruptions and Nursing Errors as Reported by Staff Nurses Working in ICU at Oncology Center Mansoura University (n=65).

| Workflow interruptions | Medication errors | | Documentation errors | | Overall nursing errors | |
|---------------------------------------|-------------------|----------------|----------------------|----------------|------------------------|----------------|
| | R | p | r | P | r | p |
| 1. Organizational interruptions | 0.38 | 0.001* | 0.36 | 0.003** | 0.41 | 0.001** |
| 2. Internal interruptions | 0.26 | 0.03* | 0.12 | 0.31 | 0.21 | 0.08 |
| 3. Environmental interruptions | 0.16 | 0.20 | 0.03 | 0.97 | 0.09 | 0.48 |
| 4. Technological interruptions | 0.40 | 0.001** | 0.15 | 0.21 | 0.31 | 0.01** |
| 5. Patients related interruptions | 0.08 | 0.52 | 0.16 | 0.19 | 0.13 | 0.28 |
| Overall workflow interruptions | 0.40 | 0.001** | 0.31 | 0.01** | 0.39 | 0.001** |

** Highly statistically significant (P ≤0.01)

Figure (3): Relationship between Workflow Interruptions and Nursing Errors as Reported by Staff Nurses Working in ICU at Oncology Center Mansoura University (n=65).



5. Discussion:

Staff nurses working in ICU face a lot of interruptions as (medical devices alarm, frequent doctor order, other staff nurses asking for help, noise, emergency situation) when they provide care to patients. Those interruption influence the staff nurse's ability to focus on the task or the procedure that they provide to their patients, so it led to increasing task completion time, error rates and job stress. Nursing errors have a direct and fatal effect impact on critical ill patients as it worsens their condition or led to death, endanger their safety, causing physical or psychological harm and increase cost of hospitalization (Nasrabadi, Peyrovi & Valiee, 2017).

Regarding to different workflow interruptions. The present study showed that the highest source of observed staff nurses' interruption was related to internal interruption, while the lowest source of observed staff nurses' interruption was related to patient related interruption. This may be because of there were no rules or polices that prevent the staff to interrupt their work by privet telephone calls or talking to each other outside patient care, also may be because of lake of supervision to staff nurses and the workload.

On the same line with, Fairbanks, Walters, Potter, Wolf, Tucker & Spear, (2014), who study results showed that a high volume of communication between staff nurses 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.

In contrast, the previous result was incongruent with Alvarez, (2015), who study results showed that the main cause of disruptions with staff nurses is their colleagues, and most frequent on ICU. 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.

Regarding to nursing error types. The study result detected those main errors category of staff nurses was related to documentation errors followed by medication errors. This may be because of those errors are believed that a universal trouble that double death average, increase duration of hospitalization, and associated expenses. As documentation and drug errors have a negative effect on health well-being and cure expenses that lead to threats to patients and their relatives.

On the same hand with, Holmström, Järvinen, Laaksonen, Keistinen, Doupi, & Airaksinen, (2019), who mentioned the documenting error and incidence reports should be developed to ensure complete electronic records for drug security in ICU. In another study by (Mehrabifar, Mansouri, Gholami, Ghaeli & Javadi, (2017), who conculded that 94% of patients had exposure to at least one medication error. Also, they added that is alarming and need developing and implementing of an intervention to reduce medication errors as fast as possible.

In contrast to, Verklan, (2014), who reported that most of errors occurred due to fall into the delivery of nursing care (67%) followed by verbal and written communication categories (22%). Also, this result is inconsistent with Abdel-Aleem, etal., (2018), who reported that that most of errors occurred due to various nursing intervention errors.

Regarding to reasons of nursing errors. The present study revealed that main reasons of nursing errors is presence of workloads and increase your perspective while the lowest cause is lack of

supervision. This may be because of staff nurses have many numbers of duties compared to before because of 4 major causes as frequent nursing requests, shortage of staff nurses and increased overtime, and lack of hospitalization period which mean there was large number of tasks and duties demanding from staff nurses to achieve in specific time.

In the same vein with Trinier, (2016), who suggested that there was a statistically correlation between nursing workload hours and occurrence of error, which mean increase staff nurses duties lead to increase incidence rate.

In contrast study by Elsayad, et al., (2017), who concluded that the most of staff nurses had little awareness related to workload while smaller of them had great awareness related to workload as a cause of errors.

Regarding to nursing reaction toward nursing errors. The present study revealed that staff nurses' reaction toward errors is search of effective solution and supervisor's reaction toward errors is punishment. This may be because of there are 4 main obstacles for error disclosure by staff nurses working in ICU: (a) fear of blaming and protection of fame; (b) avoiding of bad results as punishment, legal issues (c) sense of uncertainty - pointing a finger at nurses and deficiency of supervisor help and (d) difficult to determine main reason of error.

On the same context with, Dyab, Elkalimi, Bux, & Jamshed, (2018), who showed that many of staff nurses have positive attitudes about medication error reporting. Although, other causes as shortage time of reporting, scarcity of reporting culture without blaming, reducing of effective feedback, and fear are estimated as a main causes for under reporting errors.

On the other hand with, Elsayad ,etal 2017, who reported that nursing supervisors prefer empowering staff nurses and give them opportunity to arrange their work, while small number of them prefer applying punishment rules.

Regarding to personal characteristics of the studied staff nurse's workflow interruption and nursing error. Firstly, the present study shows that there is statistical correlation between medication errors and age by years of studied nurses. The may be because of medication administration is complicated process that need a high percent of concentration and experience, so the nurse with more years in age also have more years of experience that have much knowledge and skills so they have committed less errors.

On the same line with, Westbrook, Raban, Walter & Douglas, (2018), who showed that staff nurses current work in ICU expected doing frequent error because of the unusual situation, and also disclosing errors more than other staff nurses. Also, there is no association between one's years of experience and performance level.

On the other line with, Cheragi, Manoocheri, Mohammadnejad & Ehsani, (2013), who showed that there was no association between medication errors and experience by years, age, and working shifts. However, positive association between error rate and intravenous injections and sex.

Secondly, the present study shows that there is positive association between documentation errors and level of education of studied nurse. This may be due to the more educational level of staff nurses, the more can write incidence report and explain occurrence of error accurately. Nursing records must express staff nurses' ability to criticism which help in decision making process and improving intervention.

On the same hand with, Audet, Bourgault & Rochefort, (2018), who reported that higher percent of staff nurses with bachelor level are related to decrease death average and fail to life saving, and this congruent with recent meta-analysis of six studies by (Liao, Sun, Yu & Li (2016).

In contrast to, Elsayad ,etal (2017), who reported that related to educational qualification of studied staff nurses, two third of them had bachelor of nursing degree. Also, Alghamdi (2016) who reported that educational qualification of majority of studied staff nurses were bachelor degree and their work experience up to 10 years.

The present study showed there was statistical relationship between documentation errors and presence of workloads and increases your perspective. This may be because of staff nurses can't deal with workload related to recording of nursing intervention leading to inaccurate data recording. So, the quantity of staff nurses at health care setting must be double to reduce massive workload. That mean, if there is small time in the shift, staff nurses prefer to give care to patient rather than write in nursing notes.

On the same line with, Blair & Smith, (2012), who reported that nurses work in ICU may waste up to (25-50%) of their time on documentation, that lead to reduce in period consumed with patient or need extra time to write nursing notes.

In contrast to, Krishna, & G.V, (2017), who reported that staff nurses waste only 7% of their time in documentation. Also, they spent many of their time in nursing care intervention with patient and thus perceive documentation is time consuming and unnecessary.

Regarding to relationships between workflow interruptions and nursing errors. There is statistical relationship between overall nursing errors and overall workflow interruptions. This may be because of interruption happen more frequent in ICU because it includes variety of patient diagnosis and changeable in nursing intervention, and also communications between ICU staff personnel. Also, the outcome of interruption can lead to devastating result as effect on cognitive process, increase the task completion time and increase the work pressure that causing occurrence of errors.

In the same line study done by Johnson, Sanchez, Langdon, Manias, Levett-Jones, Weidemann & Everett, (2017), who confirmed that interruptions occur repeatedly and are related with procedural failures and clinical errors. So, they added that training courses must be concentrate on the significance of interruptions, their association with practical mistakes and medical fault.

On the other line with, Abdel-Aleem et al., (2018), these result suggest that there is no association between the whole interruptions and the occurrence of whole errors, they suggest that effect of interruption was very difficult to determine because there was many other factor with the interruptions that could cause nursing errors such as workload, shortage of staff, nature of emergency hospital, also personal factor such as fatigue, personal problem all of this factor can contribute to occurrence of nursing errors so we cannot say that interruption alone contribute to occurrence of errors.

6.Conclusion:

Based on the study findings, there was statistical relationship between overall nursing errors and overall workflow interruptions between staff nurses work in ICU at oncology center Mansoura University. It can be concluded that increase rate of interruption occurrence causing increase incidence of errors.

6.Recommendations:

Based on the findings recommended to:

- 1- Design a training schedule for staff nurses to modernize their information and expertise so

as to improve patient's outcome for evading error occurrence related to interruption.

- 2- Provide staff nurses a clearly defined responsibilities and given feedbacks on their performances and their inputs are considered in the process of developing health care system in order to reducing negative effect of interruption.
- 3- Align staff nurses' behavior, rights, duties, and values with the health care system policies, goals, and objectives to reduce effect of internal interruption.

7.Reference:

- Abbasi, R. U., Abe, M., Abu-Zayyad, T., Allen, M., Azuma, R., Barcikowski, E., ... & Telescope Array Collaboration. (2018).** Study of muons from ultrahigh energy cosmic ray air showers measured with the Telescope Array experiment. *Physical Review D*, 98(2), 022002
- Abdel-aleem, e. M. A. N., & fatma, a. (2018).** Relationship between Workflow Interruptions on the Occurrence of Nursing Errors Among the Nursing Staff in the Intensive Care Units. *The Medical Journal of Cairo University*, 86(September), 3307-3313.
- Alghamdi, M. G. (2016).** Nursing workload: a concept analysis. *Journal of nursing management*, 24(4), 449-457.
- Alvarez n.:** Interruptive communication patterns in the intensive care unit ward round): 224-519. <http://doi.org/10.1016/j.org/10.1016/j.aucc.2014.04.002>, 2015.
- Audet, L. A., Bourgault, P., & Rochefort, C. M. (2018).** Associations between nurse education and experience and the risk of mortality and adverse events in acute care hospitals: A systematic review of observational studies. *International journal of nursing studies*, 80, 128-146.
- Berg, L. M., Källberg, A. S., Ehrenberg, A., Florin, J., Östergren, J., Djärv, T., ... & Göransson, K. E. (2016).** Factors influencing clinicians' perceptions of interruptions as disturbing or non-disturbing: a qualitative study. *International emergency nursing*, 27, 11-16.
- Blair, W., & Smith, B. (2012).** Nursing documentation: frameworks and barriers. *Contemporary nurse*, 41(2), 160-168.

- Cabilan, C. J., & Kynoch, K. (2017).** Experiences of and support for nurses as second victims of adverse nursing errors: a qualitative systematic review. *JB Evidence Synthesis*, 15(9), 2333-2364.
- Cheragi, M. A., Manoocheri, H., Mohammadnejad, E., & Ehsani, S. R. (2013).** Types and causes of medication errors from nurse's viewpoint. *Iranian journal of nursing and midwifery research*, 18(3), 228.
- Craker, N. C., Myers, R. A., Eid, J., Parikh, P., McCarthy, M. C., Zink, K., & Parikh, P. J. (2017).** Nursing interruptions in a trauma intensive care unit: a prospective observational study. *JONA: The Journal of Nursing Administration*, 47(4), 205-211.
- Cwiek, M., Kikano, G., Klaus, J., Novaretti, M., & Weil, D. (2017).** Critical steps taken in the United States, Brazil and around the world to improve patient safety: Global implications for hospitals and medical organizations. *READINGS BOOK*, 120.
- Dyab, E. A., Elkalmi, R. M., Bux, S. H., & Jamshed, S. Q. (2018).** Exploration of nurses' knowledge, attitudes, and perceived barriers towards medication error reporting in a tertiary health care facility: a qualitative approach. *Pharmacy*, 6(4), 120.
- Elsayad, H. S. A. E. A., Shazly, M. M., & Mahmoud, S. I. (2017).** Nurses Perception toward Nursing Workloads and its Effect on Nurses Errors at Benha University Hospital. *Egyptian Journal of Health Care*, 8(1), 53-64.
- Eltaybani, S., Mohamed, N., & Abdelwareth, M. (2019).** Nature of nursing errors and their contributing factors in intensive care units. *Nursing in critical care*, 24(1), 47-54.
- Fairbanks I. Walters j. Potter p., wolf l.f Tucker a. And spear g** :Emergency department communication links and patterns *Clinical Nursing Research*16 (1): 72-8. 6 (2): 70-86, 2014.
- Guchait, P., Zhao, X., Madera, J., Hua, N., & Okumus, F. (2018).** Can error management culture increase work engagement in hotels? The moderating role of gender. *Service Business*, 12(4), 757-778.
- Hoogendoorn, M. E., Margadant, C. C., Brinkman, S., Haringman, J. J., Spijkstra, J. J., & de Keizer, N. F. (2020).** Workload scoring systems in the Intensive Care and their ability to quantify the need for nursing time: A systematic literature review. *International journal of nursing studies*, 101, 103408.
- Johnson, M., Sanchez, P., Langdon, R., Manias, E., Levett - Jones, T., Weidemann, G., ... & Everett, B. (2017).** The impact of interruptions on medication errors in hospitals: an observational study of nurses. *Journal of nursing management*, 25(7), 498-507.
- Kingstone M., Evans S., Smith B., and Berry J:** Attitudes of doctors and nurses towards incident reporting : A qualitative analysis. *Medical Journal of Australia*, 181(1): 36-39
- Poirrier P.& Sossong A.(2010).** Oncology patients' and nurses' perceptions of caring. *Candian Oncology Nursing Journal*, 20 (2):pp. 62-65,2014.
- Krishna, R., & Khyati, G. V. (2017).** Nursing errors in documentation: a review. *Ruas-Uas JMC*, 3(2), 1-5
- L.M. Liao, X.Y. Sun, H. Yu, J.W. Li 2016:** The association of nurse educational preparation and patient outcomes: systematic review and meta-analysis.
- Li SY, Magrabi F, Coiera E. A** systematic review of the psychological literature on interruption and its patient safety implications. *J Am Med Inform Assoc*2012;19:6e12
- Mehrabifar, A., Mansouri, A., Gholami, K., Ghaeli, P., & Javadi, M. (2017).** Investigation of medication errors in a teaching psychiatric hospital using chart reviews. *Medbiotech Journal*, 1(02), 57-61.
- Nasrabadi, A. N., Peyrovi, H., & Valiee, S. (2017).** Nurses' Error Management in Critical Care Units. *Critical care nursing quarterly*, 40(2), 89-98.
- ReidSearl, K., Moxham, L., & Happell, B. (2010).** Enhancing patient safety: The importance of direct supervision for avoiding medication errors and near misses by undergraduate nursing students. *International journal of nursing practice*, 16(3), 225-232.
- Sanderson, P., McCurdie, T., & Grundgeiger, T. (2019).** Interruptions in health care: assessing their connection with error and patient harm. *Human factors*, 61(7), 1025-1036.
- Simões, JFFL (2020).** Analysis of the nursing workload of an intensive care unit (Doctoral dissertation). We are a family owned and operated business.

Trinier, R. (2016). Nursing workload and its relationship to patient care error in the paediatric critical care setting.

Valice, S, Peyrovi, H, & Nasrabadi, A: Critical care nurses' perception of nursing errors and its causes: A qualitative study. *Contemporary Nurse*, 46 (2): 206-213.

Verklan k.: Malpractice and the neonatal intensivecare nurse: Anobservational study. *Australian CriticalCare*, 28 (1): 19-23. <http://doi.org/10.1016/j.aucc> . 2014.04.002, 2015

Westbrook, J. I., Raban, M. Z., Walter, S. R., & Douglas, H. (2018). Task errors by emergency physicians are associated with interruptions, multitasking, fatigue and working memory capacity: a prospective, direct observation study. *BMJ quality & safety*, 27(8), 655-663.

Yao, S., Wang, X., Yu, H., & Guchait, P. (2019). Effectiveness of error management training in the hospitality industry: Impact on perceived fairness and service recovery performance. *International Journal of Hospitality Management*, 79, 78-88.