Relation between Workflow Interruption and Nurses' Work Functioning at Intensive Care Units

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Abstract

Background: In intensive care units, nurses must eliminate distractions and interruptions to maintain efficient workflow while providing the highest level of care for critically ill patients with life-threatening conditions. **Aim:** To assess the relation between workflow interruption and nurses' work functioning at intensive care units. **Subjects and Method: Research design:** A descriptive correlational research design was utilized to conduct this study. **Setting:** The study's was conducted at Tanta Main University, Emergency, Medical, Pediatric, Chest, and Ophthalmology Hospitals. **Subjects:** The study's subjects consisted of a stratified random sample of nurses (n=378). **Tools:** Two tools were used to collect the data: Workflow Interruption Structured and Nurses Work Functioning Structured Questionnaire. **Results**: Showed that the majority (89.2%) of nurses had a moderate interruption level the vast majority (91.5%) of nurses had a low level of work functioning, and a minor percent of them had moderate level of work functioning. **Conclusion**: showed that there was a negative statistically significant correlation between workflow interruption and nurses' work functioning. **Recommendation**: for hospital administration, needs to invest in dependable medical equipment and set up procedures for regular maintenance and repair to minimize disruptions from technical issues.

Keywords*:* Intensive care unit nurses, Nurses' work functioning, Workflow interruption

Introduction

The Intensive Care Units (ICUs) are a distinct, self-contained zone in a healthcare setting, furnished with advanced specialized equipment for close observation, immediate intervention, and frequently prolonged care for patients with acute organ dysfunction **(Salon, Kurtz, Bastos, Quintairos, Zampieri, & Bozza, 2022)**. The focus is on overseeing and regularly tracking patients with serious medical conditions **(Hua et al., 2021)**. Intensive care nurses care for people who have life-threatening conditions, where they get life support and round-the-clock observation **(Gesi et al., 2020)**. The ICUs are different from regular hospital wards in that they have nurses on duty around-the-clock, fewer beds, tons of equipment to monitor and care for patients who are extremely sick and limited visitor access **(Thibault et al., 2020)**. The medical conditions of these patients are extremely complex, intense, and demanding,

so the nurses need to possess specialized skills along with an in-depth understanding of the human body and medical interactions **(Fernández-Castillo et al., 2021)**. The challenges that IC nurses face is numerous, but most people who join the profession have a higher-than-average mental and physical endurance and they find ways to adapt **(Macey et al., 2022)**. Working well under pressure will be one of the many traits of an IC nurse possesses **(Santana-Padilla et al., 2022)**. Critical care and IC nurses need to be critical thinkers, work as a team, have organizational skills and be able to face difficult situations **(Bergman et al., 2021)**.

Distractions and interruptions are very common in critical care settings, possibly causing patient harm and unfinished tasks. Workflow interruptions are defined as an intrusion of an unexpected task or communication event, causing a discontinuation of the current task and an observable task switch behavior **(Danesh et al., 2022)**. Workflow interruption is caused by organizational interruption, patient related interruption, environmental, internal, and technological interruptions. Thus, interruptions suspend nurses' attention from the focal work **(Weigl et al., 2020)**.

Work is one of the most important pillars upon which a person's life and quality of life are built, along with health, family, and social environment, is not only a critical source of money but also a basis for identity and self-actualization. Thus, productivity at work is critical to general well-being. Health issues are one acknowledged element that jeopardizes productive work performance **(Alkorashy et al., 2023)**. Work functioning has always been a crucial issue in occupational health, as it affects the quantity and quality of production **(Kjørstad et al., 2022)**.

Difficulties in job performance can lead to severe outcomes for both healthcare professionals and the medical facility, as well as for patients' well-being, including mistakes in medication, accidents with needles, close calls, and lower satisfaction levels among patients **(Saleh et al., 2022)**. These difficulties can effect on the cognitive aspects of task execution and general incidents, impaired decision making, causing incidents at work, avoidance behavior, conflicts and irritation with colleagues, impaired contact with patient and their family and lack of energy and motivation of nurse **(Nishimura et al., 2023)**.

Aim of the study

To assess the relation between workflow interruption and nurses' work functioning at intensive care units.

Research questions:

1-What are the levels of workflow interruption among nurses at intensive care units?

2- What are the levels of nurses' work functioning at intensive care units?

3-What is the relation between workflow interruptions and nurses' work functioning at intensive care units?

Subjects and Method

Study design:

A descriptive correlational research design was utilized to conduct this study.

Setting

The study was conducted at Tanta Main University, Emergency, Medical, Pediatric, Chest, Ophthalmology Hospitals, which are affiliated to the Ministry of Higher Education and Scientific Research.

Subjects:

The research subjects consisted of a stratified sample of 378 nurses, chosen from the total number of nurses (878). The technique for selecting the sample from the previous

mentioned setting was proportional according to the number in each department.

Tools of data collection:

Two tools were utilized to gather the required data.

Tool I: Workflow Interruption Structured Questionnaire

This tool consisted of two parts:

Part I: Nurses' personal data including age, gender, education level, years of experience, job title, working shift and, working unit.

Part II: Workflow Interruption structured Questionnaire

The investigator developed this tool while being guided by (**Abdel-Aleem, et al., (2018) and related literature (Santos, 2022; Xie et al., 2020).** It was used to assess level of workflow interruptions among nurses at ICUs. It consisted of 34 items Categorized into five dimensions:

Organizational interruption (10items), internal interruption (5items), environmental interruption (12 items), technological interruption (4items) and patient related interruption (3items).

Scoring system:

Staff nurses were evaluated using a three-point Likert Scale that ranged from 1 to 3.; where never=1 sometimes = 2 and always = 3. The score of each dimension summed up and converted to percent score .The total scores was summing up and classified into levels according to cut off points where:

- High nurses workflow interruption ≥ 80%.
-Moderate nurses workflow interruption 60 - <80%.
-Low nurses workflow interruption< 60%.

Tool II: Nurses Work Functioning Structured Questionnaire

This tool was developed by the investigator guided by (Williams, et al., 2017) and related literature **(**van Dijk, 2022; Magnavita et al., 2020). It was used to assess level of work functioning among nurses at ICUs. It consisted of 39 items categorized into seven dimensions. Cognitive aspects of task execution and general incidents (10items), impaired decision making (3items), causing incidents at work (7items), avoidance behavior (5items), conflicts and irritation with colleagues (5items), impaired contact with patient and their family (4items) and lack of energy and motivation (5items).

Scoring system:

The nurses' reactions were evaluated using a five-point Likert Scale that ranged from 1 to 5; where strongly disagree =1, disagree =2, uncertain =3, agree= 4, strongly agree = 5. The strongly disagree response was added to disagree and the strongly agree response was added to the agree response. The score of each dimension is summed up and converted to a percent score. The total scores were summing up and classified into levels according to cut off points where:

- High level work functioning ≥80 %.
- Moderate level work functioning 60 - <80%.
- Low level work functioning <60%.

Methods

1. Official permission was obtained from the dean of Faculty of Nursing, Tanta University to responsible authorities of hospital to conduct the study.
2. The purpose of the study was explained and made clear to the directors of hospital and managers of each unit to gain their cooperation

3. Ethical consideration was maintained all over the study as the following

a- An approval from the Scientific Research Ethics Committee at the Faculty of Nursing was obtained code no 215-3-2023.

b- The researcher presented herself to the participant and provided a thorough

explanation of the study's objectives and procedures in order to gain their acceptance, cooperation, and informed consent.

c- The right to refuse or stop participation at any point was acknowledged.

d- The researcher ensured that the study did not cause any harm to the entire sample.

4. Assuring the nurses that their collected data will remain confidential and private, and confirming it will solely be utilized for the study's objectives.

5. After reviewing the relevant literature and various studies in this field, the researchers created the tools and translated them into Arabic for data collection from nurses.

6.The supervisors examined the tools and then passed them on to five experts in the same department of administration in the Nursing Faculty of Tanta for evaluation of content and face validity.

-The five experts were professors of the nursing administration department from the nursing faculty of Tanta University. All jury was from the Nursing Faculty of Tanta.

-The specialists were requested to make changes concerning grammatical language and to reformulate certain sentences. Experts' opinions were used to calculate the face validity of the tools, with a content validity index of 92.6% for tool (I) and 93.6% for tool (II).

7. After developing the tools, a pilot study was conducted with a sample size of 38 subjects, representing 10% of the total. The pilot study aimed to assess the order of items, clarity, applicability, and relevance of the questions. Changes were made, such as clarifying, removing some questions, adding new ones, and using straightforward work terms.

8. The tools were assessed for reliability using Cronbach's Alpha, obtaining a value of 0.768 for 34 items in tool (I), and 0.773 for 39 items in tool (II).

9. Data collection phase: The investigator gathered the data from the participants at Tanta University Hospitals. The researcher gathered the staff nurses in small clusters while they were working to hand out the survey. The participants wrote down their responses while the researcher was there to ensure all questions were answered, and some were asked to complete it and return it.

-The suitable timing for gathering data differed depending on the department's workload and type of work; occasionally, it occurred midway through the shift, while other times it was before the shift's conclusion. It was estimated that it would take the nursing staff 10-15 minutes to complete the questionnaire items.

- Data was accumulated between June 2023 and October 2023, spanning a four-month timeframe.

Statistical analysis:

Data was input into the computer and then examined through the utilization of IBM SPSS software package version 20.0. Armonk, NY: IBM Corp. stated quantitative data were expressed using numerical values and percentages. The normality of distribution was tested with the Kolmogorov-Smirnov test. Quantitative data were presented using range (minimum and maximum), mean, standard deviation, and median. Findings were evaluated at a significance level of 5%. The correlation between two normally distributed quantitative variables was determined using Pearson’s correlation coefficient. The Student t-test was used to compare two studied categories. While F-test (ANOVA) was used for comparing between more than two categories.

Results

Table (1): Shows that about half (49.5%) of staff nurses' were in the age group 26-30 years old with a mean age of 27.21 ± 3.63 and about two-thirds (63.0%)of them were female. Regarding the educational level, more than two-thirds (68.5%) of staff nurses had a bachelor of Sciences and around two-thirds (64.3%) had experience less than five years old with a mean score of 4.11 ± 3.05.About three-quarters (74.3%) were staff nurses and more than half (53.4%) of them worked the morning shift.

Figure (1): Shows that the highest percent (23%) of staff nurses worked in cardiac intensive care unit followed by anesthesia intensive care unit (19.3%) and pediatric intensive care unit (18.8%) and the lowest percent (1.9%) of them worked in traumatology intensive care unit.

Table (2): Shows that the most common source of interruption (59.8%) was from visitors, and the most common frequency of interruption (47.1%) was 1-3 times. The highest percent (27.5%) consequences of interruption were delay in achieving the task and the most environment /places for interruption occurrence (49.2%) was the patient room.

Figure (2): Shows that the majority (89.2%) of nurses experienced a moderate level of interruption, while a minor percentage (10.8%) reported a low level of interruption.

Table (3): Shows that the total score range (34-102) of workflow interruption domain, total score of min – max (55.0-84.0) of them, total score of Mean ± SD (67.43 ±5.42) of them, total score of median (68.0) of them and total average score (1.98± 0.16). The highest (M±SD) workflow interruption was related to patient related interruption with average score (2.04 ± 0.49), followed by technological interruption (2.03 ± 0.43). While the lowest workflow interruption was environmental interruption with a mean average (1.94 ± 0.29).

Figure (3): Shows that the majority (91.5%) of nurses had low level of work functioning and a minor percent (8.5%) of them had a moderate level of work functioning.

Table (4) : Shows that the total score range of work functioning domain (39-195),total score of min – max (104.0-142.0) of them , total score of mean ± SD (121.1± 7.98) of them , total score of median (122.0) of them and total average score(3.11± 0.20) of them . The highest (M±SD) work functioning was to impaired decision making with an average score 4.17 ± 0.53 ,followed by cognitive aspects of task execution and general incidents with an average score of 3.68 ± 0.33 , while the lowest (M± SD) work functioning was conflicts and irritation with colleagues with an average score (2.24 ± 0.47).

Figure (4): shows that a negative statistically significant correlation between workflow interruption and nurses' work functioning (where r = -0.364*, p value = < 0.001*).

Table (1): Distribution of nurses' according to their personal data (n=378)

Demographic Data	No.	%
Age (years)		
<25	107	28.3
26-<30	187	49.5
30-35	75	19.8
≥35	9	2.4
Min. – Max.	22.0 – 74.0	
Mean ± SD.	27.21 ± 3.63	
Median	27.0	
Gender		
Male	140	37.0
Female	238	63.0
Education level		
Technical Nursing institute	90	23.8
Bachelor in Science of nursing	259	68.5
Post graduate	29	7.7
Years of experience		
<5	243	64.3
5-<10	111	29.4
10-<15	17	4.5
≥15	7	1.9
Min. – Max.	1.0 – 15.0	
Mean ± SD.	4.11 ± 3.05	
Median	3.0	
Job title		
Nursing supervisor	86	22.8
Head nurse	11	2.9
Staff nurse	281	74.3
Working shift		
Morning shift	202	53.4
Evening shift	73	19.3
Night shift	103	27.2

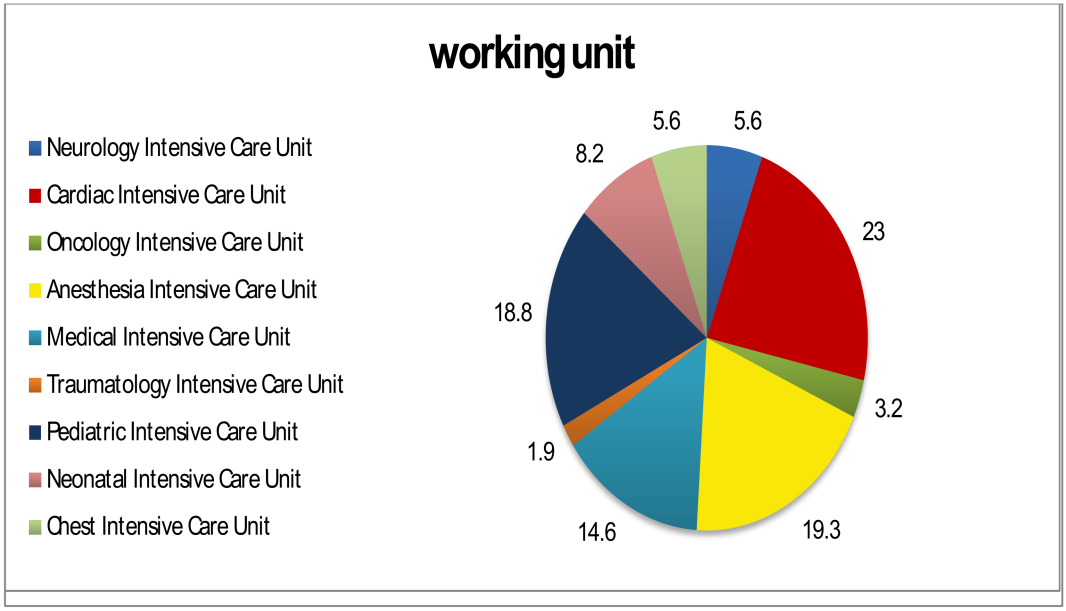

Figure (1): Distribution of staff nurses according to working unit

Table (2): Workflow interruption axis among staff nurses'(n=378)

Workflow interruption axis	No.	%
Most common Sources of interruptions		
Personal mobile	161	42.6
Physician	138	36.5
Nurse student	59	15.6
Pagers	117	31.0
Visitor	226	59.8
Frequency of interruption		
1–3	178	47.1
3–5	121	32.0
>5	79	20.9
Consequences of interruption		
Poor time management	71	18.8
Lower productivity	66	17.5
Difficulty moving ahead with task	90	23.8
Stressful situation	47	12.4
Delay in achieving the task	104	27.5
Most likely environment /places for interruption occurrence		
Nursing station	153	40.5
Patient room	186	49.2
Nursing staff room	39	10.3

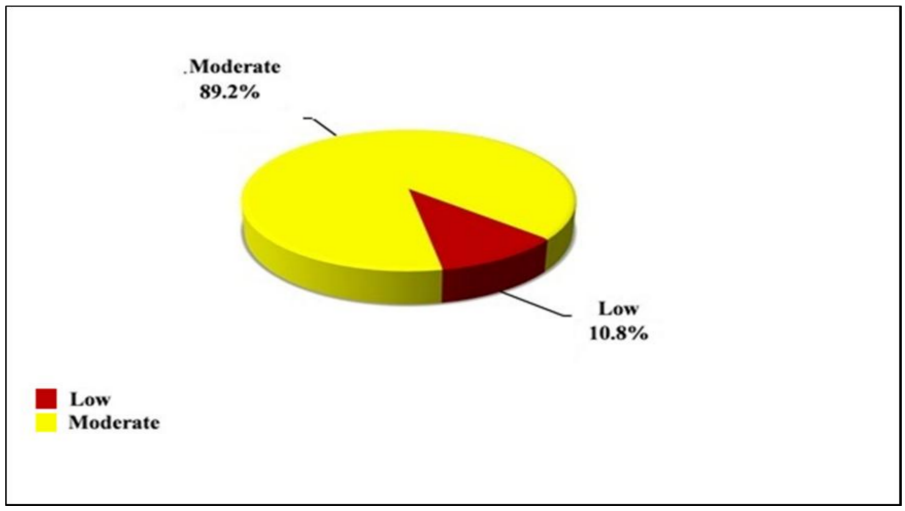

Figure (2): Levels of overall nurses' workflow interruption

Table (3): Standard deviation, mean score and rank of workflow interruption among staff nurses (n=378)

Workflow interruption domain	Score Range	Total score of workflow interruption domain			Average Score (1 – 3)	Rank
		Min. – Max.	Mean ± SD	Median	Mean ± SD.	
Organizational interruption	**(10 – 30)**	16.0 – 26.0	20.15 ± 1.86	20.0	2.01 ± 0.19	**3**
Internal interruption	**(5 – 15)**	7.0 – 14.0	9.75 ± 1.68	10.0	1.95 ± 0.34	**4**
Environmental interruption	**(12 – 36)**	15.0 – 35.0	23.29 ± 3.54	23.0	1.94 ± 0.29	**5**
Technological interruption	**(4 – 12)**	4.0 – 12.0	8.13 ± 1.70	8.0	2.03 ± 0.43	**2**
Patient related interruption	**(3 – 9)**	3.0 – 9.0	6.11 ± 1.46	6.0	2.04 ± 0.49	**1**
Total	**(34-102)**	55.0-84.0	67.43 ±5.42	68.0	1.98± 0.16	**--**

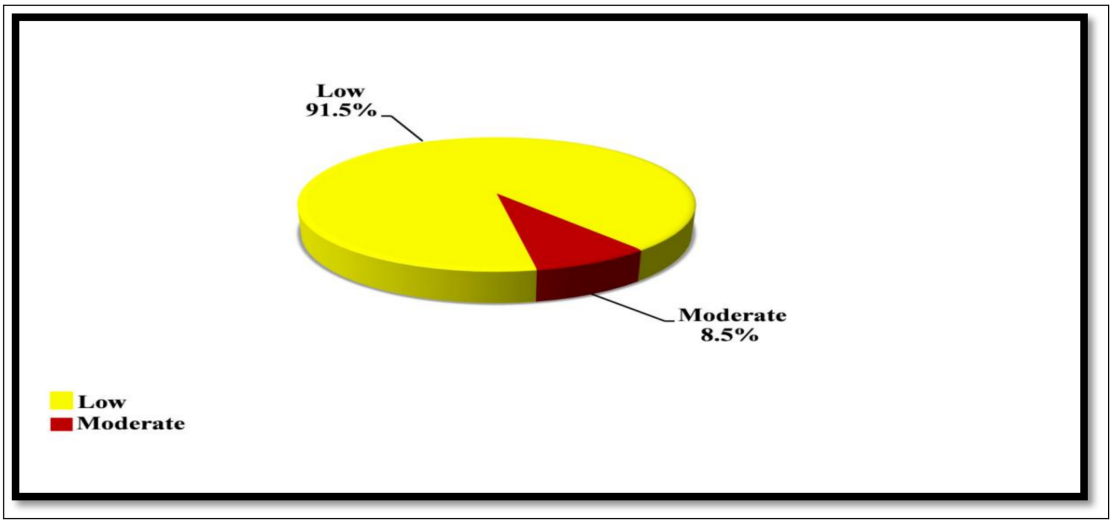

Figure (3): Levels of overall nurses' work functioning

Table (4): Standard deviation, mean score and rank of work functioning among staff nurses

Nurses Work Functioning Domain	Score Range	Total score of nurses' work functioning domain			Average Score	Rank
		Min. – Max.	Mean ± SD.	Median	Mean ± SD.	
-cognitive aspects of task execution and general incidents	**(10 – 50)**	29.0 – 45.0	36.84 ± 3.27	37.0	3.68 ± 0.33	**2**
-Impaired decision making	**(3 – 15)**	8.0 – 15.0	12.52 ±1.60	12.0	4.17 ± 0.53	**1**
-Causing incidents at work	**(5 – 25)**	8.0 – 22.0	15.40 ± 2.38	15.0	3.08 ± 0.48	**4**
-Avoidance behavior	**(7 – 35)**	7.0 – 28.0	17.18 ± 3.84	17.0	2.45 ± 0.55	**6**
-Conflicts and irritation with colleagues	**(5 – 25)**	5.0 – 16.0	11.21 ± 2.37	11.0	2.24 ± 0.47	**7**
-Impaired contact with patient and their family	**(5 – 25)**	8.0 –22.0	17.11 ± 2.02	17.0	3.42 ± 0.40	**3**
-Lack of energy and motivation	**(4 – 20)**	6.0 – 19.0	10.84 ± 2.09	11.0	2.71 ± 0.52	**5**
Total	**(39- 195)**	104.0-142.0	121.1± 7.98	122.0	3.11± 0.20	**--**

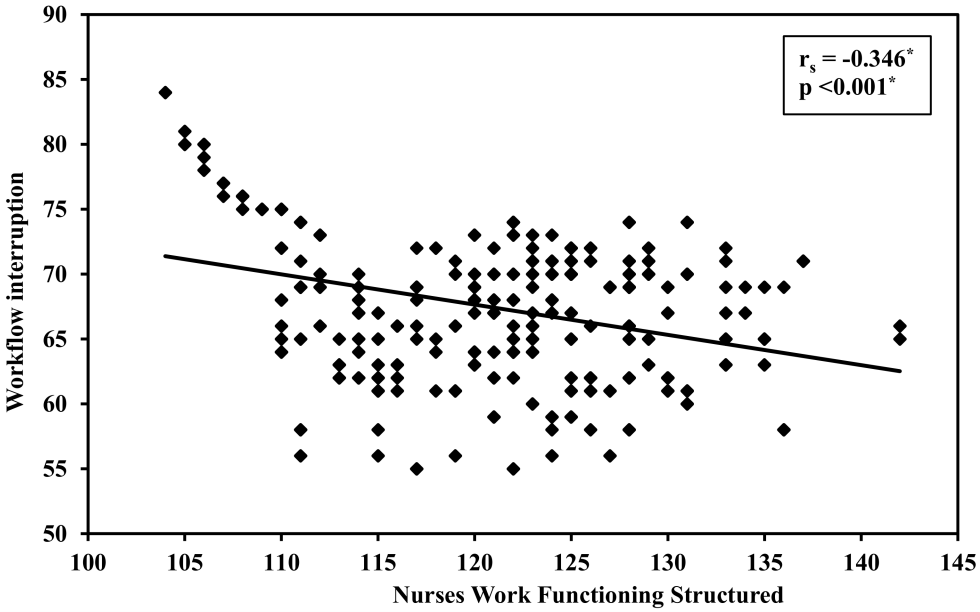

Figure (4): Correlation between workflow interruption and nurses work functioning

Discussion

Regarding workflow interruption among staff nurses Results of the study showed that the most common source of interruption was from visitors, and the most common frequency of interruption was 1-3 times. The highest percent consequences of interruption were delay in achieving the task, this can be attributed to the time needed for return to the task and regain focus to go with the task. Similarly, **(Reed et al. (2018)** study showed that delayed task completion was the most common consequence of repeated nurse interruption.

This result is contradictory with **(Abdel-Aleem et al., (2018)** ,who showed that the highest nursing errors category of observed staff nurses was related to various nursing intervention error, The most environment /places for interruption occurrence was the patient room, this can be due to patient room is the main site of drug administration and care of patients. Similarly, (**Eid et al., (2022)** reported that corridors and patient rooms were the most common sites of nurse interruption.

Regarding overall workflow interruption

Results of the study showed that the majority of nurses had a moderate interruption level, and the highest workflow interruption was related to patient related interruption, followed by technological interruption, while the lowest workflow interruption was environmental interruption. From the investigator point of view, this result may be due to patients' conscious conversations initiated by them as patients asking about their diagnosis and expected waiting time in the hospital, conversations initiated by patients' family members as relatives asking nurses about their patient

diagnostic result and the patient finds themselves separated in a room alone, connected by devices, so they keep the nursing staff busy with them by talking so that they do not feel lonely and bored.

This result is contradictory with **(Shan et al., (2023)** ,who showed that the top three sources of interruption events were: nursing colleagues, patients and nurses themselves. Also **(Drews et al., (2019)** showed the interruptions originated mostly from humans, alarms and others.

Regarding overall nurses' work functioning.

The results of the study showed that the majority of nurses had a low level of work functioning and a minor percentage of them had a moderate level of work functioning. From the investigator point of view, this result may be due to the negative consequences of interruptions on nurses' cognitive, decision making and ability to achieve tasks effectively in a good quality nursing intervention.

This result is along with **(Kalakoski et al., (2020)** study, showed that interruptions negatively affect the overall quality of work on a content production task. On the contrary, the study of **(Mohamed and Ghalab, (2022)** According to a study, approximately half of the staff nurses showed a moderate level of overall job performance. In contrast, **Safarpour et al. (2018)** found that nurses exhibited a high level of job performance.

Correlation between workflow interruption and nurses' work functioning

The results of the current study showed that there was a negative statistically significant correlation between workflow interruption and nurses' work functioning. This can be explained by the moderate workflow interruptions that lead to low work functioning of nurses. This result agreed with (**Zohaib et al. (2022)**, who found that study subjects had a low level of total work effectiveness. Conversely, this result disagreed with **(Cardoso et al. (2021)** ,who found that the study subjects had a high level of total work effectiveness.

Conclusion

Based on the findings of the present study it was concluded that:

The majority of nurses had a moderate interruption level and a minor percent of them had a low interruption level. The majority of nurses had a low level of work functioning and a minor percent of them had a moderate level of work functioning. There was a negative statistically significant correlation between workflow interruption and nurses' work functioning.

Recommendations

In the light of the findings obtained from the present study, the following recommendations were suggested:

The hospital administration:

Need to invest in dependable medical equipment and set up procedures for regular maintenance and repair to minimize disruptions from technical issues.

Regulate around from quality and infection control team during shift.

The nurse director:

Design a program to teach people how to manage various interruptions. Conduct a monthly nursing committee meeting is essential for staff nurses to

identify areas for practice improvement.

The head nurse:

Train regular sessions for nurses are essential to help them manage interruptions effectively and maintain focus on patient care tasks.

Further research:

Many research studies are needed to know the impact of interruption in healthcare organizations different aspects as effect on nursing staff work function and performance, patient outcome, organizational cost and reputation.

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