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RELATIONSHIP BETWEEN PERFORMANCE OBSTACLES AND WORKLOAD AMONG INTENSIVE CARE NURSES AT ASSIUT UNIVERSITY HOSPITALS

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ABSTRACT

Background: Relation between performance obstacles and workload.

Aim: To investigate relation between workload and performance obstacles.

Materials and Method: The study was conducted in seven intensive care units at Assiut university hospitals. The study sample consisted of 194 staff nurses.

Tools: Data of the present collected through utilizing the following two tools: performance obstacles questionnaire and workload measurement tool.

Results: Influential performance obstacles items were that the nursing staff was not enough to handle the number of patient.

Recommendations: When planning for a new or renovated critical care unit, in the health care facility should consult an expert in the field of hospital design.

Keywords: ICU, Nurses, Obstacles - workload

INTRODUCTION

Intensive careunits are dynamic environments in which decisions about patients' status can change rapidly, often made under stress and time pressure. The ICU work system can be conceptualized as clinical micro-system that needs to be studied in-depth in order to identify factors contributing to patients' safety (Carayon *et al.*, 2006).

Ulrich *et al.*, (2008), reported that several factors can hinder the activity ICU nurses' work system which includes the following: physical environment, family relations, equipment and supplies, information transfer and communication, record and report, and cooperation. Carayon & Gurses (2009), added that performance obstacles are related to work environment, family relation, information transfer and communication, and getting help from other. **Performance obstacles** can be defined as the work factors in the immediate work setting, that increase nurses workload and negatively affecting their quality of professional life and their performance (Tucker & Edmondson, 2003; Carayon & Gürses, 2005).

Nurses' workload is made up of nursing and non-nursing tasks or activities. Nursing tasks are the number of nursing duties. These are the activities carried out by a nurse during a shift. They include patient assessment, developing care plans and providing comprehensive nursing care. Non-nursing tasks/activities refers to the activities carried out by a nurse during a shift which does not require professional nursing skills and are not related to direct patient care. They include clerical work, housekeeping, dietary services, coordinating ancillary services and transporting patients, (Reis Miranda, 2012).The National Aeronautics and Space Administration, task load index (NASA-TLX) (Hoonakker *et al.*, 2011; Hart, 2006), was used for the assessment of workload. The NASA-TLX is considered to be one of the most effective measures of perceived workload. So far this scale has high reliability (r=0.72). The NASA Task Load Index (NASA-TLX) consists of six subscales that represent somewhat independent

clusters of variables: Mental, Physical, and Temporal Demands, Frustration, Effort, and own Performance satisfaction. This scale provides an overall workload score based on a weighted average of ratings (Stanton *et al.*, 2004).

Significance of the study

During the investigative work of nursing at Assuit University Hospitals, it was observed that many performance obstacles were present which hinder nurse's work.Therefore, the present study investigates the relationship between performance obstacles and workload among ICUs nurses at Assiut university hospitals in 7 ICUs. The study included all staff nurses who worked as bedside nurses (194) that were distributed as follows: neuromedical 10, tropical 15, obstetric 15, pediatric 15, trauma 59, chest 39, and general 41.

Aim of the study: To investigate performance obstacles among nurses in ICU and their effects on workload at Assuit university hospitals.

Objective:

The specific objectives for this study were to:

1-Investigation performance obstacles in ICU among nurses.

2-Identify the effect of performance obstacles on workload.

MATERIAL AND METHODS:

Study Design:

Setting: The study was conducted in seven intensive care units (ICUs) at Assiut University Hospitals.

Subjects: Included all the nurses who were working as bedside nurses. All of them were females in ICUs at Assuit University Hospitals (n=194). Distributed in the units as following:

Table 1: Distributions of Nurses in the units of Assuit University Hospitals

Name of ICUs	Number of staff nurses No=(194)	%	Bed number
Trauma	**59**	**30.4**	**18**
General	**41**	**21.1**	**18**
Chest	**39**	**20.1**	**20**
tropical	**15**	**7.7**	**10**
pediatric	**15**	**7.7**	**10**
obstetric,	**15**	**7.7**	**12**
Neuromedical	**10**	**5.2**	**10**

Study methods:

Tools:

A structured interview questionnaire was developed (Gurses, 2005) and modified by the researcher in order to make it suitable to carry out the study. It consists of three parts:

The study tool consists of three parts:

Part one:

1- Personal characteristics: It included; data about gender, age, marital status, nurse qualification, job title, years of experience, and shift hours of work.

Part two:

Performance obstacles questionnaire: It consists of two parts a and b,

a-Performance obstacles consisted of five items as follows:-

1. Physical work environment.
2. Family relations.
3. Information transfer and communication.
4. Cooperation by helping others and getting help from others.
5. Records and reports.

The response to each item was on a three points (Yes =1; Sometimes=2; No=3)

Part three:

Workload questionnaire: it consists of three parts a and b,

a-It consisted of six dimensions that deal with the workload nurses experience in their job. (Mental, physical, temporal, frustration levels, efforts and own performance satisfaction).

The scoring system for all dimensions were ranged from (low = 0 to high =100).

b-Rating Scale Mental Effort (RSME): RSME is a one-dimensional subjective workload scale ranging from zero to 150, (horizontal line), the scale has nine descriptive indicators along its axis Scale ranging from **(absolutely no effort = 0) to Extreme effort = 120) and extended to 150.**

Administrative design:

Ethical consideration:

An official approval to carry out the study was obtained from responsible persons in the selected hospitals to collect the necessary data. Ethical consideration was taken through oral agreement from all nurses who participated in the study at the intensive care units.

Pilot study

❖ **Pilot study:** was fulfilled on 20 nurses by using structured interview to test the clarity understandability of the study tool reliability also measured using Cronbach alpha coefficient it was 0.91 for all items.

Fieldwork:

After ensuring the clarity of the tools, the actual data collection started by personal interview with each head nurse. All of them help in the collection of the data. Each interview took about 20 minutes; the data was collected by the head nurses after clarifying the aims of the study. The whole duration of data collection took about four months from June to October, (2016).

Statistical analysis:

The collected data was analyzed, using the appropriate statistical tests utilizing the SPSS statistical package for personal computers. Date entry and data analysis were done using SPSS version 19 (Statistical Package for Social Science). Data were presented as number, percentage, mean, standard deviation. Chi-square test was used to compare between qualitative variables. Mann-Whitney test was used to compare quantitative variables between two groups. Spearman correlation was done to measure the correlation between quantitative variables. *P*-value considered statistically significant when $P<0.05$. Multiple regressions were used to compare quantitative variables between two groups

RESULTS

The present study was a descriptive and analytical study, a cross-sectional study.

Table 2: Description and characteristics of the studied nurses (no= 194)

Items	No. (n= 194)	%
Age:		
< 25 - < 35 years	188	96.9
35 - < 45 years	5	2.6
≥ 45 years	1	0.5
Sex:		
Male	0	0.0
Female	194	100.0
Marital status:		
Single	95	49.0
Married	97	50.0
Widow	1	0.5
Divorced	1	0.5
Education:		
Secondary Nursing School	96	49.5
Technical Health Institute	67	34.5
Nursing Bachelor	31	16.0
Job:		
Bed side nurse (direct care)	**194**	**100%**
Years of experience:		
< 1 year	**65**	**33.5**
1 - < 5 years	**61**	**31.4**
5 - < 10 years	**29**	**14.9**
10 - < 15 years	**32**	**16.5**
15 - < 20 years	**4**	**2.1**
≥ 20 years	**3**	**1.5**
Shift type when questionnaire was filled out:		
Morning	**73**	**37.6**
Evening	**55**	**28.4**
Night	**66**	**34.0**
Working hours per shift:		
7 hours	**73**	**37.6**
6 hours	**55**	**28.4**
12 hours	**66**	**34.0**

Table 2 showed that the vast majority (97%) of studied nurses were in the age group ranged between 25<35 years. All of them (100%) were female nurses; half of them (50%) were married. In addition, this table showed that nearly half of them (49.5%) have diploma from secondary nursing School (five years curriculum). About 64.9% of them have less than 5 years of experience in nursing. Regarding, distribution of

working hours, 37.6 % of them were working 7 hours morning shift, 28.4% of them were working 6 hours evening shift, and 34.0% of them were working 12 hours night shift, and all of them were working as bedside nurses giving direct care.

Table 3: Distribution of the mean ± SD of items of performance obstacles by ICU specialty as perceived by the studied nurses (no= 194)

Items of Performance obstacles	Neuro	Tropical	Obstetric	Chest	Trauma	General	Pediatrics
	Mean ± SD						
Physical work environment	7.50 ± 3.10	15.33 ± 3.98	9.07 ± 5.50	4.72 ± 2.99	9.31 ± 3.65	9.02 ± 3.70	13.40 ± 2.59
Family relations	4.60 ± 3.13	6.93 ± 2.12	3.33 ± 2.47	4.10 ± 3.24	2.41 ± 2.07	3.17 ± 2.39	1.47 ± 1.60
Supplies equipment	6.20 ± 3.58	14.53 ± 2.33	9.33 ± 4.19	7.41 ± 5.16	8.12 ± 4.94	10.80 ± 4.31	5.93 ± 3.88
Information transfer and communication	5.70 ± 4.00	11.60 ± 3.72	3.60 ± 3.79	5.38 ± 4.13	3.76 ± 3.02	6.10 ± 3.29	2.00 ± 2.00
Cooperation	9.70 ± 2.58	9.20 ± 5.44	9.20 ± 2.81	9.15 ± 3.41	10.44 ± 3.30	9.15 ± 3.50	10.13 ± 2.70
Records and reports	3.80 ± 1.69	6.00 ± 2.27	4.40 ± 2.64	4.21 ± 2.74	3.39 ± 2.80	4.71 ± 2.40	4.27 ± 2.60
Total obstacles	37.50 ± 10.92	63.60 ± 17.06	38.93 ± 15.91	34.97 ± 13.51	37.42 ± 10.48	42.95 ± 10.20	37.20 ± 5.87

Table 3 showed the mean and standard deviation, of physical work environment obstacles was 15.33 ± 3.98 for tropical ICU compared to 4.72 ± 2.99 for chest ICU. In addition, the mean and standard deviation of family relations obstacles was 6.93±2.12, supplies and equipment was 14.53 ± 2.33 and information transfer and communication was 11.60 ± 3.72 for tropical ICU compared to 1.47 ± 1.60), 5.93 ± 3.88 and 2.00 ± 2.00 for pediatrics nurses. In addition, the mean and standard deviation for records and reports were 6.00 ± 2.27 in case of tropical ICU compared to 3.39 ± 2.80 for trauma ICU and the mean of total performance obstacles was 63.60±17.06 for tropical ICU compared to 34.97±13.51 for chest ICU nurses.

Table 4: Mean and standard deviation of the six dimensions of workload and the overall workload, by the studied nurses (n=194)

Items	Mean ± SD	**Range**
Mental demand	65.64±38.73	0.0 - 100.0
Temporal demand	72.8 9 ± 37.06	0.0 - 100.0
Physical demand	79.15 ± 31.74	0.0 - 100.0
Frustration level	70.41 ± 38.42	0.0 - 100.0
Efforts	85.10 ± 25.19	0.0 - 100.0
Own Performance satisfy	75.85 ± 29.25	0.0 - 100.0
Overall workload (OW)	74.84 ± 33.40	0.0 - 100.0

Table 4 illustrated that the highest mean of the six dimensions of workload was for efforts (85.10 ± 25.19),while the mean and standard deviation for overall workload was 74.84 ± 33.40.

Variables	**Physical work environment**	**Family relations**	**Supplies equipment**	**Information transfer and communication**	**Cooperation**	**Records and reports**
Mental demands	0.083	0.123	0.196	0.274	-0.019	0.087
	0.251	0.087	**0.006***	**0.000*****	0.796	0.230
Temporal demands	0.020	0.121	0.259	0.320	**-0.074**	0.046
	0.780	0.092	**0.000*****	**0.000*****	0.305	0.521
Physical demands	0.002	0.044	0.100	0.187	-0.041	0.009
	0.972	0.543	0.167	0.009*	0.567	0.902
Frustration level	0.125	0.139	0.259	0.297	-0.280	-0.005
	0.083	0.053	**0.000*****	**0.000*****	**0.000*****	0.945
Efforts	0.062	0.103	0.063	0.076	0.011	0.074
	0.391	0.153	0.382	0.295	0.881	0.307
Own Performance satisfy	0.021	**-0.088**	**-0.160**	**-0.137**	0.142	0.012
	0.770	0.224	**0.026***	0.057	**0.048***	0.873
RSME	0.153	0.091	0.057	0.181	-0.132	0.159
	0.033*	0.207	0.427	**0.012***	0.066	**0.027***

Table 5 reveals the correlation analysis among subitems of performance obstacles and the six dimensions of workload and RSME.As shown in the table, there was statistically significant positive correlation between physical work environment and RSME (*p<0.033) and high statistically significant positive correlation between supplies and equipment and mental demands, and very high statistically significant positive correlation between temporal demands and level of frustration level (*p<0.006, ***p<0.000 and p<0.000) respectively. Meanwhile, there was statistically significant negative correlation between supplies and equipment along withown performance satisfaction (*p<0.026). Moreover, there was statistically significant positive correlation between information transfer and communication and mental demands, Temporal demands, physical, demands frustration level and RSME (***p<0.000, p<0.000***, p<0.009, p<0.000***, p<0.012*) respectively. In addition, there was statistically significant positive correlation between cooperation and own performance satisfaction (*p<0.048), while, there was statistically significant negative correlation between cooperation and frustration level (***p<0.000). Finally, there was statistically significant positive correlation between records and report and RSME (*p<0.027).

Table 6: Result of multiple regression analysis to assess the effect of Performance obstacles on overall workload

	Overall Workload		
Performance obstacles	Beta	Order	P. value
Information transfer and communication	0.23	1	**0.017***
Supplies equipment	0.11	2	0.258
Records and reports	0.10	3	0.182
Cooperation	-0.06	4	0.421
Family relations	-0.01	5	0.944
Physical work environment	0.00	6	0.999

Table 6 revealed the results of multiple regression analysis to assess the effect of performance obstacles (independent factor) on overall workload (dependent factor). There was a positive effect from Information transfer & communication, supplies and equipment, records and reports and physical work environment on overall workload while there was a negative effect of cooperation and family relations on workload. Moreover, there was a statistically significant difference between information transfer & communication and workload (p<0.017*).

DISCUSSION

Performance obstacles can be used to study work system design. Performance obstacles are "the work system characteristics that inhibit performance and are closely associated with the immediate work setting" of ICU nurses that increase their workload beyond what is expected (Tucker & Edmondson, 2003; Carayon & Gürses, 2005). High workload has been identified as a major concern in health care, particularly in intensive care units (ICUs). Patient care in the ICU is characterized by highly demanding tasks that need to support urgent therapeutic intervention. High workload is one of the most important job stressors reported by ICU nurses (Kiekkas *et al.*, 2008).

According to the present study findings, the highest percent of nurses' age ranged between < 25 to < 35 years old. This result agreed with Kotzer *et al.*, (2006) who stated that respondents primarily ranged in age of 20 to 35 years, while others (Kim *et al.*, 2008), found that most of nurses were aged from 35 to 53 years. All of the studied nurses were females, which indicates that the nursing in ICU still depends on women rather than men because hospitals in Upper Egypt prefer women nurses than men nurses in intensive care units. This is consistent with the work of Keshk, Qalawa & Aly (2012), who had investigated performance obstacles among ICU Nurses in Damanhur Teaching Hospital. On the contrary, Seada & El Banan (2016), who had investigated performance obstacles found that only about half of nurses were females.

Regarding nurse's qualification and marital status, the current study showed that nearly half of the studied nurses had diploma of secondary nursing school (5 years) and were married. On the contrary another study (Keshk, Qalawa & Aly, 2012), found that more than two thirds of the studied nurses had nursing diploma and 98.3% of them were married. This may be due to the system followed by nursing administration department since 5 years ago diploma degree nurses were replaced by bachelors' degree and technical health institute nurses, as they were more qualified and knowledgeable. In addition, the result revealed that two thirds of nurses have experience ranged between 1-<5 years in their job. From the researcher's point of view, this may be caused by the fact that the system of nursing administration was undergoing change as 15% nurses in intensive care unit were shifted annually according to seniority **Table 2** This is inconsistent with Keshk, Qalawa & Aly, (2012), in Damanhur Teaching Hospital who stated that the experience of one third of the study nurses in the ICU worked for 4-6 years. At the sometimes it is in agreement with the study conducted by Kotzer *et al.*, (2006), who stated that the experience of nurses in ICU unit was less than 6 years experience.

The present study findings revealed that the highest mean of performance obstacles for physical environment from **Table 3** From researcher's point view, these findings indicated that nurses did not find space to sit and lack of space between beds lead to improper proper ventilation in certain places.

The present study findings revealed that level of workload was six dimensional as perceived by studied nurses. These can be arranged according to the following descending order: suffering from excessive efforts, high physical workload, high temporal workload, deficiency of performance satisfaction, high frustration level and high mental workload. Therefore this indicated that the overall workload of nurses in ICUs was high **Table 4** This result is similar to previous studies, which found that workload could be very high in health care, especially in intensive care units (ICUs) (Van Bogaert *et al*., 2013).

Table 5 showed that there was a positive correlation between performance obstacles and all of the six dimensions of workload, expect cooperation which had negative correlation with mental demands, temporal demand, physical demands, frustration level and RSME. At some time, family relations, supplies and equipment and information transfer and communication had a negative correlation with own performance satisfaction. These results supported the hypothesis (2) of the research. From the researcher's point view, cooperation between nurses leads to low workload. Meanwhile, the distraction from patient family during the shift, decreased supplies, bad conditions of equipment and bad communication between physicians' and nurses lead to lower their performance satisfaction.

Gurses, Carayon & Wall, (2009) found that there was a positive correlation between performance obstacles and physical environment, family relations along with supplies and equipments, and workload. Carayon & Alvarado (2007) identified nursing performance obstacles and categorized them into 9 groups including physical work environment tools and equipment, materials, and supplies, inter-provider communication, information, intra-hospital transport of patients, patient-related factors, and other similar factors related to patients.

Table 6 showed the effect of performance obstacles on overall workload. It was clear that the performance obstacles related to information transfer and communication had a high positive effect on overall workload according ordering.

These results are supported by Gurses, Carayon, and Wall 2009). They tested relationships among performance obstacles and workload; they concluded that performance obstacles had positive effect on workload.

CONCLUSIONS

The nurses in this study were suffering from high workload. In this respect it was found that performance obstacles related to physical environment was the most crucial reason for increased workload. Moreover, there was a statistically significant difference between the performance obstacles related to information transfer and communication related with mental, temporal, physical and frustration level. The performance obstacles related to cooperation had negative effect on mental workload, temporal workload, frustration level and efforts. While cooperation had a positive effect on physical workload and own performance satisfaction.

The present study recommended that:

1.When planning for a new or renovated critical care unit, the health care facility should consult an expert in the field of hospital design, taking in consideration nurses' and patients needs related to the infrastructure of the unit.

2. Further studies should be done about studying the effect of various ICU work systems and design characteristics on nurses' work and outcomes.

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