

Factors affecting performance of critical care nurses regarding enteral tube flushing

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Abstract: Flushing of an enteral tube is essential for maintaining hydration, nutrition and enteral tubes patency in enterally tube-fed patients. Improper or lack of enteral tube flushing (ETF) increases the risk for malnutrition and dehydration that may increase the risk for both morbidity and mortality in critically ill patients. In addition, tube occlusion that it's unclogging wastes time, effort, and resources. There is a lack of study on factors affecting performance of critical care nurses regarding ETF in intensive care units (ICUs). Therefore, this study was conducted.

Aim of the study: to identify factors affecting performance of critical care nurses (CCNs) regarding ETF.

Design: A descriptive research design was used to conduct this study

Settings: The study was conducted at the ICUs of Alexandria Main University Hospital, Health Insurance Hospital (Gamal Abd-Elnaser), and the Royal Hospital.

Subjects: A convenience sample of 60 CCNs who are providing direct care for adult critically ill patients with nasogastric tube in the previous setting were included in the study.

Tools of data collection: Two tools were used for data collection: tool one: "Enteral tube flushing questionnaire" and tool two: "Enteral tube flushing performance observational checklist".

Results: It was observed that the majority of CCNs (90%) had poor knowledge and 88.3% of CCNS had unsatisfactory performance regarding ETF. Critical care nurses' age, educational level, years of experience, place of work and knowledge had statistically significant effects on CCNs' performance regarding ETF. While, organizational and patients' related factors had no statistically significant effects on CCNs' performance regarding ETF.

Conclusion: CCNs had poor knowledge and unsatisfactory performance regarding ETF in ICUs of AMUH. **Recommendations:** Enteral tube flushing should be done before and after each use.

Keywords: Nursing performance – Enteral flushing- Critically ill patients.

I. INTRODUCTION

Continuous water flushing is very important for maintaining hydration in enterally tube-fed patients and for the patency of enteral tubes for continuous nutritional support. However, improper enteral tube flushing may be lead to tube occlusion which is a common problem of enteral nutrition, its incidence ranged between 9% to 20% of tube-fed patients⁽¹⁾. Flushing of enteral tube (keeping it free of buildup) is too necessary as unclogging the enteral tube wastes time, effort, and resources. In addition, occluded tubes may take a long time to be replaced and consequently placing patients at risk for malnutrition and dehydration. Moreover, lack of ETF leads to dehydration which increases patient's risk for decubitus ulcers, constipation, urinary and respiratory infections, medication toxicities, and falls. Enteral tube flushing is a nursing responsibility^(1,2).

Critical care nurses are responsible for administer safely and effectively ordered nutrition, medication and fluid (Yoon2018 and, Khalatbari et al. 2018) ^(3,4). Maintaining the enteral tubes, preventing and detecting its complications are nurses' roles ⁽⁵⁾. However, variances in nursing practice share in developing serious deficiencies and complications resulting from poor nutritional care ⁽⁶⁾. Patient safety is a national and international priority in all health care and promoting it in enterally fed patients is dependent on ongoing surveillance and identification risks of patients harm. Identifying areas for potential human error, administrative and organizational conditions that are contributory to error need to be recognized by the healthcare practitioners ⁽⁷⁾.

Improving the productivity and performance of health care providers continues to be a major challenge for African countries ⁽⁸⁾. Performance is a multidimensional constructs that affected by many factors such as personal, organizational and environmental factors ⁽⁹⁾.

Significance of the study

It was observed by researcher in our ICUs that CCNs did not flush the enteral tube before feeding, before and during administration of medications. In addition, there is inconsistency regarding the practice of ETF and nursing practice regarding enteral tube flushing differ from health care institution to another and even within the same institution from nurse to another. At the same time, little is known about the nurses' knowledge regarding ETF in our ICUs.

Currently, nursing practice related to EN is largely carried out by rituals and personal opinions rather than research based interventions. Therefore, many problematic issues as well as serious complications from EN tubes could be minimized and corrected ⁽¹⁰⁾. So identifying the reasons of these variances in performance is very important to improve critical care nurses performance and hence the quality of patients care will be improved. Therefore, this study was conducted.

Aim of study: to identify factors affecting performance of critical care nurses regarding enteral tube flushing.

Research Questions:

What are the current nurse's practices regarding enteral tube flushing in the intensive care units?

What are the factors affecting performance of critical care nurses regarding enteral tube flushing?

II. MATERIALS & METHOD

Study design:

A descriptive research design was used in the current study.

Settings: -

The study was conducted at the ICUs of Alexandria Main University Hospital namely; the Casualty Intensive Care Unit (Unit I) and the General Intensive Care Unit (Unit III), Health Insurance Hospital (Gamal Abd-Elnaser), and the Private Royal Hospital.

Subjects:

A convenience sample of 60 CCNs working in the ICUs of above mentioned settings and providing direct care for critically ill patients was included in the study.

Tools:

Two different tools were used for data collection. **Tool one: "Enteral tube flushing questionnaire"**: This tool was developed by the researcher after reviewing the relevant literatures ^(9, 11-13) to assess the factors affecting performance of CCNs regarding ETF: it consisted of two parts. The first part consisted of CCNs' socio-demographic data including age, sex, level of education, years of experience and place of work. The second part of the questionnaire included the factors affecting CCNs performance regarding ETF which consisted of 3 parts. The first part consisted of nurse's knowledge related factors (16 items) including knowledge related to flushing time(7 items), flushing volume(2 items), type of flushing liquids(2 items), importance of flushing(3 items) and consequences of lack of flushing(2 items). The second part included the organizational factors (16 items). The third part included patients' related factors (3items).

Tool 2: "Enteral tube flushing observational checklist": This tool was developed by the researcher after reviewing the relevant literatures⁽¹²⁻¹⁶⁾ to assess performance of CCNs regarding ETF. This part consisted of 14 items as assessment of patients' chart, hand washing, explanation the procedure, documentation, flushing liquid, flushing volume and time.

Scoring system of the tools:

Regarding enteral flushing questionnaire in relation to nurses' knowledge, score of one was given to the right answer to each question and the score of zero was given to wrong answer. The overall score of knowledge ranging from (0-16) degrees. Poor knowledge (<50%), fair knowledge (50 %- 75%) and good knowledge (>75%).

Nurses were also asked to indicate on a three-point Likert scale their agreement about organizational and patients' related factors that may affect their performance regarding ETF where 0 = disagree, 2 = agree, 1= neutral. The total score of this scale was obtained by summing up responses for 16 items and range from 0 to 32 for organizational factors, and 0 to 3 for patient's factors. Low agree (<50%), neutral agree (50 %- 75%) and highly agree (>75%).

The observational checklist was scored in the form of (Done =2 degrees, Not done = 1 degree and not applicable (= 0 degree). Accordingly, the overall score of the observational checklist ranging from (0- 28) degrees. Satisfactory performance ($\geq 60\%$) and unsatisfactory performance (<60%).

Method:

An official letter from the Faculty of Nursing was taken to the hospital responsible authority to collect the data of this study and permission was obtained from hospitals and unit managers to conduct the study after the contextual framework of the study was explained. Tools were developed after reviewing the related literatures. The validity of tools was done by 5 experts in critical care nursing and medicine and their comments and remarks were considered. Reliability of the tools were measured using Cronbach Alpha test and the values of Cronbach's alpha were ($r = 0.9, 0.85$) respectively. The questionnaire was then distributed to a pilot group of 10 critical care nurses in the ICUs of public and private hospitals to test the feasibility and applicability of the tools and some modifications were done in the tools.

Data collection:

The questionnaire was distributed to all CCNs who are providing direct patients' care. Questionnaires were collected after nurses had been completed it and after explanation the research purpose to nurses and asking them to respond to each item in questionnaire. Critical care nurses who are involved in the care of critically ill patients were observed during their shift work before, after administering feeding, and or before, during and after enteral medication administration and or before and after gastric residual check for performance of enteral tube flushing using (tool 2).

Ethical considerations:

The present study was approved by the Scientific Research Ethics Committee of the faculty of nursing- Alexandria University. Informed written consent was obtained from CCNs before conducting the study after explaining the aim of the study and the right to refuse to participate in the study was emphasized to subjects. Critical care nurses' anonymity, confidentiality and privacy were maintained during implementation of the study.

Statistical Analysis:

The raw data were coded and transformed into coding sheets. The results were checked. Then, the data were entered into SPSS system files (SPSS package version 18) using personal computer. Output drafts were checked against the revised coded data for typing and spelling mistakes. Finally, analysis and interpretation of data were conducted. Chi square test, Monte Carlo for Chi square test, Fisher Exact for Chi square test were used.

III. RESULTS

Results of current study revealed that majority of the study sample (75%) was female and 45% of the sample aged between 20 to less than 25 years old. Moreover, 41.7% of nurses had been working in ICUs for less than 5 years. This reflects the younger age of the study sample. In addition, the result of the current study revealed that 40 % of the study sample had diploma degree and more than two thirds of the sample (68.3 %) working at governmental hospital.

Table (I) shows distribution of CCNs' performance regarding ETF. It was observed that majority of the CCNs (80%, 68.3%, 78.3%) respectively did not perform ETF before feeding, before and during administering medications. While, majority of them (78.3%, 60% respectively) flushed the tube after feeding and after administering enteral medications and only 3.3% of nurses flushed the enteral tube after GRV check.

Table (II) represents distribution of CCNs' knowledge regarding ETF. It was observed that majority of CCNs answered incorrectly the questions related to flushing time, type of flushing solution, consequences of lack of flushing and flushing volume. While, the majority of nurses had knowledge about importance of flushing. These results generally reflect that CCNs had poor or lack of knowledge about ETF.

Table (III) shows distribution of CCNs' responses in relation to organizational factors that affect their performance regarding ETF. It was found that most of CCNs reported that the following organizational factors affecting their performance regarding ETF including: lack of formal policy and written guidelines on flushing enteral tubes, and absence of a clinician's order for flushing fluid types and volume, lack of nutritional team, lack of administrative support, motivation, supervisor feedback, educational program, continuous education, adequate training, and team work, job dissatisfaction, time restriction, workload, lack of team work and availability of resources. These findings reflect that this area of practice is neglected from the organization itself. Also it can be observed from this table that there were no statistically significant relations between CCNs percent score of ETF performance and percent score of organizational and patient's related factors.

Regarding the patients' related factors, it was found that about 90% of nurses reported that instability of patients' condition, high demanding patients and relatives, and increased number of assigned patients were among factors affecting the practice of enteral tube flushing.

Table (IV, V): show distribution of CCNs according to their knowledge and performance' scores regarding ETF. It was found that majority of CCNs (90%) had a poor knowledge about ETF and the mean average score of knowledge was (0.30 ± 0.13) . Moreover, it was found that majority of the CCNs (88.3%) had unsatisfactory performance in ETF and the mean average score of performance was (0.32 ± 0.21) .

Table (VI): shows relation between CCNs' demographic and work related characteristics and their percent score of ETF performance. It was found that there were statistically significant relations between ages of nurses, level of education, years of experience and type of hospital and enteral flushing performance' percent score.

Table (VII): presents relation between CCNs percent score of performance with percent score of knowledge regarding ETF. It can be seen that there were statistically significant relations between CCNs' percent score of performance and knowledge in ETF.

Table (I): Distribution of the critical care nurses' performance regarding ETF.

Items	Not Done (1)		Done (2)		Not applicable (0)	
	No.	%	No.	%	No.	%
1.Flush the enteral tube before GRV check	11	18.3	0	0.0	49	81.7
2. Flush the enteral tube after GRV check	10	16.7	2	3.3	48	80.0
3.Flush the enteral tube before Feeding	48	80.0	1	1.7	11	18.3
4.Flush the enteral tube after feeding	3	5.0	47	78.3	10	16.7
5.Flush the enteral tube before medications administration	41	68.3	9	15.0	10	16.7
6.Flush the enteral tube between medications	47	78.3	3	5.0	10	16.7
7.Flush the enteral tube after drug administration	14	23.3	36	60.0	10	16.7

Table (II): Distribution of the critical care nurses' knowledge regarding ETF.

Nurses' related factors	Incorrect answer (0)		Correct answer (1)	
	No.	%	No.	%
Nurses knowledge				
Flushing time				
1. Before enteral feeding	51	85.0	9	15.0
2. After enteral feeding	40	66.7	20	33.3
3. Before administration of medications	47	78.3	13	21.7
4. After administration of medications	50	83.3	10	16.7
5. Between each enteral medications	49	81.7	11	18.3
6. Before checking gastric residual	48	80.0	11	18.3
7. After checking gastric residual	59	98.3	1	1.7
Type of flushing solution				
8. Free water	47	78.3	13	21.7
9. Any liquid fluid	33	55.0	27	45.0
Consequence of lack of flushing				
10. Dehydration	42	70.0	18	30.0
11. Tube occlusion	31	51.7	29	48.3
Importance of flushing				
12. Maintaining adequate nutrition	50	83.3	10	16.7
13. Maintaining hydration	23	38.3	37	61.7
14. Maintaining tube patency	13	21.7	47	78.3
Flushing volume				
15. Flushing volume in fluid restricted patients	41	68.3	19	31.7
16. Recommended flushing volume	46	76.7	14	23.3

Table (III): Distribution of critical care nurses' responses in relation to organizational factors that affect their performance regarding ETF.

Organizational related factors	Disagree (0)		Agree (2)		Neutral (1)	
	No.	%	No.	%	No.	%
1. Formal policy on flushing enteral tubes	4	6.7	56	93.3	3	5.0
2. Written guidelines regarding flushing enteral tubes	6	10.0	51	85.0	3	5.0
3. Clinician's orders for flushing fluid types and volume	6	10.0	50	83.3	4	6.7
4. Nutritional team	8	13.3	42	70.0	10	16.7
5. Administrative support	5	8.3	52	86.7	3	5.0
6. Motivation	5	8.3	51	85.0	4	6.7
7. Job dissatisfaction	4	6.7	56	93.3	0	0.0
8. Time restriction	6	10.0	51	85.0	3	5.0
9. Supervisor feedback (staff shortage)	6	10.0	50	83.3	4	6.7
10. Workload	8	13.3	42	70.0	10	16.7
11. Educational programs	5	8.3	52	86.7	3	5.0
12. Lack of continuous education	5	8.3	51	85.0	4	6.7
13. Inadequate training	5	8.3	48	80.0	7	11.7
14. lack of team work	7	11.7	42	70.0	11	18.3
15. Environmental factors (physical environment)	5	8.3	48	80.0	7	11.7
16. Availability of resources	7	11.7	42	70.0	11	18.3
Patients related factors						
1. Unstability of patients' condition	7	11.7	53	88.3	0	0.0
2. High demanding patients and relatives	6	10.0	54	90.0	0	0.0
3. Increased number of assigned patient	7	11.7	53	88.3	0	0.0

Table (IV): Distribution of critical care nurses' according to their knowledge' scores regarding ETF.

	No.	%
Level of knowledge		
Poor (<50%)	54	90.0
Fair (50 %- 75%)	6	10.0
Good (>75%)	0	0.0
% Score of knowledge		
Min. - Max.	12.0 – 59.0	
Mean ± SD.	30.15 ± 12.64	
Average score of knowledge		
Min. - Max.	0.12 – 0.59	
Mean ± SD.	0.30 ± 0.13	

Table (V): Distribution of critical care nurses according to their ETF performance' scores.

	No.	%
Level of performance		
Satisfactory (≥60%)	7	11.7
Unsatisfactory (<60%)	53	88.3
% Score of performance		
Min. - Max.	0.0 – 80.0	
Mean ± SD.	32.33 ± 20.78	
Average score of performance		
Min. - Max.	0.0 – 0.80	
Mean ± SD.	0.32 ± 0.21	

Table (VI): Relation between CCNs' demographic and work related characteristics and their percent score of ETF performance.

Demographic and work related characteristics	% Score of performance				χ ²	MC p
	Satisfactory (≥60) (n = 7)		Unsatisfactory (<60) (n = 53)			
	No.	%	No.	%		
Sex						
Male	1	14.3	14	26.4	0.485	0.668
Female	6	85.7	39	73.6		
Age (years)					13.207*	0.002*
< 20	4	57.1	2	3.8		
20 - < 25	3	42.9	24	45.3		
25 - <30	0	0.0	10	18.9		
30 - <35	0	0.0	15	28.3		
>35	0	0.0	2	3.8		
Level of education					8.868*	0.004*
Associated degree	5	71.4	10	18.9		
Diploma degree	0	0.0	24	45.3		
Baccalaureate degree	2	28.6	19	35.8		
Years of experience(years)					8.180*	0.024*
< 1	1	14.3	3	5.7		
1 - <5	6	85.7	19	35.8		
5 - <10	0	0.0	23	43.4		
>10	0	0.0	8	15.1		

Place of work						
Governmental hospital						
ICU1	2	28.6	18	34.0	6.243*	0.060
ICU 3	1	14.3	20	37.7		
Ministry of health ICU	0	0.0	8	15.1		
Royal hospital ICU	4	57.1	7	13.2		

χ^2 , p: χ^2 and p values for **Chi square test** for comparing between the two groups

^{MC}p: p value for **Monte Carlo** for Chi square test

*: Statistically significant at $p \leq 0.05$

Table (VII): Relation between CCNs' percent score of performance with percent score of knowledge regarding ETF

	% Score of performance				Test of sig.	P
	Satisfactory (≥ 60)		Unsatisfactory (< 60)			
	No. (n = 7)	%	No. (n = 53)	%		
% Score of knowledge						
Poor (< 50)	4	57.1	50	94.3	□□□□.506*	^{MC} p=0.017*
Fair (50 - 75)	3	42.9	3	5.7		
Good (> 75)	0	0.0	0	0.0		
Min. - Max.	23.0 – 53.0		12.0 – 59.0		t=2.305*	0.025*
Mean \pm SD.	40.14 \pm 12.69		28.83 \pm 12.14			

χ^2 , p: χ^2 and p values for **Chi square test** for comparing between the two groups

^{MC}p: p value for **Monte Carlo** for Chi square test

t, p: t and p values for **Student t-test**

*: Statistically significant at $p \leq 0.05$

IV. DISCUSSION

Although delivering prescribed nutrition, fluid and medication safely and effectively are the responsibility of CCNs^(3,4), it was noted that there was inconsistency and poor performance of CCNs regarding ETF practices. To improve performance of CCNs regarding ETF, the performance itself and factors affecting it should be evaluated. Therefore, this study was conducted to identify factors affecting CCNs' performance regarding ETF.

In carrying out nursing care there are many factors that affect the performance of nurses. This needs to be proven by research⁽⁹⁾. Knowledge in tube feeding management issues is a prerequisite to effective provision of this care. Mula (2011)⁽¹⁷⁾ states that people who understand the reason why they are doing something do a better job. This implies that having adequate knowledge improves practice. hence, lack of nursing knowledge in regard to artificial nutrition in intensive care can prohibit accomplishing a unified nursing care and drive nurses to malpractice⁽⁶⁾.

Enteral tube flushing with 30 ml of water before and after any using of the tube is necessary to avoid accumulation of acids in enteral tube inner wall, which could occlude the enteral tube (Thomson 2019 , Kalaldehy 2017, . Parrish et al. 2019)⁽¹⁸⁻²⁰⁾.

Results of current study revealed that majority of CCNs answer incorrectly the questions related to flushing time, flushing liquid, flushing volume and consequences of lack of flushing. This may be due to lack of knowledge sources such as reading journals, books, and guidelines. Moreover, there is no educational program regarding ETF and most of CCNs had diploma degree and even who had BSc degrees forget knowledge about tube flushing. Although the majority of CCNs had a poor knowledge regarding enteral tube flushing. They knew the importance of ETF. This is supported by Sajeewani et al (2015)⁽²¹⁾ who reported that all participants of their study identified the importance of flushing tubes with water to prevent occlusion.

Wei et al. (2015)⁽²²⁾ state that before improving practice related to nutritional support, it is important to find out first what is in practice. Therefore, performance of CCNs regarding enteral tube flushing before and after feeding, before, during and after medications administration, and before and after GRV check were observed and assessed. Results of the current study revealed that majority of critical care nurses did not perform enteral tube flushing before enteral feeding while; majority of them flushed the enteral tube after feeding. This may be related to lack of knowledge about flushing of enteral tube, lack of knowledge sources such as reading journals, books, and guidelines, workload, lack of guidelines and policy regarding ETF. This result in agreement with Mustafa 2016⁽²³⁾ who found that majority of CCNs did not flush enteral tubes before feeding in spite they flushed it after feeding in both control and study groups of her study.

Administering medication via enteral tube is complex application and it is imperative for nurses to have knowledge and skills for this application⁽²⁴⁾. The result of the current study revealed that majority of CCNs did not flush enteral tube before and during enteral medications administration. This is supported by Mustafa 2016⁽²³⁾ who found that CCNs did not flush enteral tube before medications administration, while tube flushing was done between and after each medication administration in the majority of the studied sample. Mateo 1996⁽²⁵⁾ found that the vast majority of nurses flushed the enteral tube after medications administration. While, about one half of the nurses flushed the enteral tubes before medication administration and, more than one third of them did so between medications. This is also against Uysal et al (2016)⁽²⁴⁾ stated that 69.6% of the nurses flushed the feeding tube prior to medications administration, but they used different amounts of water for flushing and 81.5% perform ETF between medications.

Regarding GRV check, results of the current study showed that all CCNs did not perform ETF before GRV check and only 3.3% of CCNs perform ETF after GRV check. This may be related to lack of knowledge which lead to malpractice and may be due to lack of educational programs in this area of practice. This is supported by Mustafa 2016⁽²³⁾ who revealed that CCNs did not flush enteral tube after GRV check in the majority of both study and control groups of her study.

Moreover, the result of current study revealed that majority of CCNs (88.3%) had unsatisfactory performance in ETF. This may be due to shortage of nursing staff, and dependence of hospital administrative authorities on the intern nurses and diploma nurses who are less experienced, moreover this result may be related to workload, stress, fatigue of critical care nurses and also lack of formal policy and guidelines on enteral tube flushing. This is on contrary to the result of Mula (2011)⁽¹¹⁾ that indicates good practice of enteral tube flushing by the majority of the sample where 74.5% indicating that enteral tube flushing is 'always' done.

Albrecht (2000)⁽¹⁶⁾ assert that guidelines are unlikely to change practice without an active implementation strategy, and that organizational factors also play key roles. Therefore, CCNs were asked about the organizational factors that may affect their performance in this area of practice.

The majority of CCNs reported that formal policy and written guidelines related to ETF, clinician's order for flushing fluid types and volume. In addition to, nutritional team, administrative support, motivation, supervisor feedback, educational program, continuous education, adequate training, and team work, job dissatisfaction, time restriction, workload, team work and availability of resources are organizational factors affecting their performance regarding ETF. These findings reflected that this area of practice is neglected in our ICUs, not only from CCNs but also from the organization itself.

Regarding guidelines, and nutrition committee, results of current study revealed that majority of CCNs agree that lack of guidelines and nutrition committee are among the organizational factors that affecting negatively on their performance. This may be due to that written guidelines improve and update CCNs ' knowledge regarding ETF which reflected positively on their performance and nutritional committee guides health care providers about this aspect of care. These results are in agreement with MULA (2011)⁽¹¹⁾ who found that majority of nurses stated that there are no guidelines in the units; there is no nutritional committee or team. On contrary to Mahdy et al (2019)⁽²⁶⁾ found that the majority of nurses reported the presence of written guidelines about enteral nutrition. . Rezae et al. (2018)⁽²⁷⁾ reported that only 36.1 % of respondents indicated that their ICU was supported by a nutrition support team.

The results of present study revealed that most of CCNs agree that lack of formal policy and clinician's orders are among the organizational factors that affecting negatively on their performance. This may be related to that policies focused on application of guidelines, protocols and research evidence into practice and hence lack of policies reflected negatively on knowledge and performance of CCNs. This is supported by Mateo (1996)⁽²⁵⁾ who reported that of the 19 Indiana surveyed hospitals, 10 had no formal policy on ETF, two required a clinician's orders for fluids and volumes.

The results of current study revealed that majority of nurses agree that lack of administrative support affect their performance. Administrative support improves performance of CCNs via acknowledging their roles, their motivation, and effective communications with nurses. This is supported by khalden et al who reported that the nurses' perspectives, institutional support is also essential for developing nursing care through acknowledging nurses' contributions and suggestions in that field⁽⁶⁾. The results of present study revealed that majority of nurses agree that lack of teamwork affect their performance regarding enteral tube flushing. These results reflect importance of team work. This is supported by Persenius et al. (2009)⁽²⁸⁾ who state that nurses reported the importance of teamwork and nurses indicated that despite having limited knowledge and experiences; an open mind to inquiry helped them to look for new solutions through dialogue with others.

Working overload may directly affects nursing performance and can also indirectly exacerbate patients' condition and produce fatal side effects. ⁽⁶⁾ Result of present study indicated that majority of nurses agree that working overload had negative effect on their performance. This is due to that staff shortage which is a general trait of ICU nurses in the worldwide, leading to increase workload of nurses which increase stress, fatigue and time restriction and consequently has negative impact on nurses' performance. This is in agreement with Gurse (2009)⁽²⁹⁾ who stated that as workload increased, nurses reported providing lower quality and less safe care and experiencing increased fatigue and stress.

The result of the current study revealed that majority of nurses agree that lack or inadequate supplies affecting negatively on the practice of enteral tube flushing in ICUs. It was observed that some ICUs have inadequate resources such as sterile water and other supplies and CCNs had no time to search about supplies and hence this is reflected on their performance and mandate nurses to neglect this area of practice toward enteral tube flushing. This is consistent with Mula (2011)⁽¹¹⁾ that Adequate resources are a prerequisite to effective enteral nutrition practice.

Regarding supervisor feedback, the results of the current study revealed that majority of nurses agree that improper supervisor feedback affecting negatively the practice of enteral tube flushing in ICUs. This due to that feedback reflects the result of health care provider's action and through the given feedback, CCNs identify their strength points and also their weak points and consequently they can improve their performance. This is supported by Safei et a (2011)⁽⁹⁾ that feedback is used as a means to follow up on achievements of employees and immediate feedback can improve their performance. According to staff motivation, results of present study revealed that majority of nurses agree that lack motivation affecting negatively the performance of ETF in ICUs. This is normal as everyone need to be encouraged or motivated to do its better and consequently this affecting their performance quality of patients care. This is congruent with Safei et al (2011)⁽⁹⁾ that Motivation provides a foundation for a person to act in ways that are directed to a specific destination. Hence, it has positive impact on the performance of CCNs.

The present study findings revealed that most of CCNs agree that lack of educational programs, continuous education and adequate training affect negatively on their performance. Theses may be due to lack of information resources, low educational level of nurses in these aspects that affect CCN's knowledge and skills and hence affect their performance. Mota (2010)⁽³⁰⁾ related the inadequate nurses' knowledge to the deficient in academic education which does not address items related to enteral feeding and medication administration techniques. This also is similarly to shahin et al(2012)⁽³¹⁾ who revealed that nurses at the critical care department at Al- Manial university hospital had no resources of information about enteral feeding and medications.

Majority of CCNs in the current study agree that job dissatisfaction affect their performance and this may be due to lack of motivation which affect directly on their performance. This is supported by Moneke et al (2014)⁽³²⁾ who reported that job satisfaction affect on patient satisfaction, safety, productivity , performance and quality of care.

Regarding patients' related factors, the result of current study revealed that most of CCNs agree that increased number of assigned patients affect their performance regarding tube flushing. Glette et al (2017)⁽³³⁾ suggested that the more assigned patients per nurse the higher rates of complications. Moreover, these results showed that majority of CCNs agree that patient's condition especially unstable and highly demanding patients affecting their performance regarding tube flushing. This may be explained as unstable patients need more observation and monitoring, medication administration, more speed, more time, more, all of these exposed CCNS to a lot of stress and hence, affect negatively on their performance and may result in a undesirable outcomes for the patient. This is similarly to Joynt et al. (2019)⁽³⁴⁾ found that patients exposed to high ICU workload were more likely to die than those exposed to lower workload.

V. CONCLUSION

From the results of this study, it can be concluded that CCNs had poor knowledge and unsatisfactory performance regarding ETF. Demographic characteristics and knowledge of CCNs were the factors that affect significantly on CCNs' performance regarding ETF. While, organizational and patients' related factors had no statistically significant effects on CCNs' performance regarding ETF.

VI. RECOMMENDATIONS

It can be recommended that ETF should be done before and after any use. Education programs should be conducted for nurses for safe enteral feeding, safe medication administration, and enteral flushing. Critical care nurses should follow-up the written guideline of the enteral tube flushing. Team work and cooperation between physicians, nurses, and hospital administrators should be ensured for safe practice.

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