EFFECT OF APPLYING GUIDELINES ON NURSES` PERFORMANCE REGARDING FLUID AND ELECTROLYTE IMBALANCE IN

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ABSTRACT

Background: The accurate monitoring of fluid balance activities is a vital part of patients" baseline information, which guides nursing interventions to achieve physiological stability. Inaccurate monitoring of fluid balance especially in critically ill patients can deteriorate patients" conditions. *Aim:* Evaluate the effect of applying guidelines on nurses' performance regarding fluid and electrolyte imbalances in intensive care units. *Subjects and method: Design:* A quasi- experimental research design was utilized. *Setting:* Intensive care unit in Damietta General Hospital. *Subjects:* A convenience sample of **72** nurses working in above mentioned setting. *Tools:* Two tools were used to collect the needed data; nurses' knowledge Questionnaire and nurses' observation checklist. *Results:* The majority of nurses had satisfactory knowledge immediately and after guidelines applications comparing to before. Regarding fluid loss, also more than two thirds of nurses had satisfactory knowledge immediately after guidelines applications and follow up comparing to before guidelines application .There were statistically significant relation regarding scores of nurses' practice regarding fluid & electrolyte imbalances monitor and management pre, immediately after and follow up after guidelines applications   in area of fluid and electrolyte monitor score, fluid and electrolyte management score and total practice .*Conclusion:* improve nurses ' knowledge and practice after application of guidelines regarding fluid and electrolyte imbalance . *Recommendations:*   Continues education for nurses are required to have the knowledge and competence to care for patients, which includes understanding the indications for and importance of fluid balance charts and fluid &electrolyte imbalance management.

Key Words: Fluid and electrolyte imbalance, Guidelines, Intensive care unit, Nurses ' performance.

INTRODUCTION

Body fluid is primarily water and is essential for proper functioning of the body organs. It contains gases (e.g., carbon dioxide and oxygen) and solid substances, called solutes that dissolve in body fluids. Many solutes are electrolytes substances (e.g., sodium, potassium) that develop an electrical charge when dissolved in water. Other solutes are nonelectrolytes. Nonelectrolytes (e.g., glucose, urea) do not conduct electricity (American Medical Association, 2010).

Body fluid is located in two fluid compartments; the intracellular space (fluid in the cells) and the extracellular space (fluid outside the cells). Approximately two thirds of body fluid are in the intracellular fluid (ICF) compartment and are located primarily in the skeletal muscle mass. The extracellular fluid (ECF) compartment is further divided into the intravascular, interstitial, and Trans- cellular fluid spaces (Bunn, F., & Trivedi, 2012).

Electrolytes in body fluids are active chemicals (cations, which carry positive charges, and anions, which carry negative charges). The major cations in body fluid are sodium, potassium, calcium, magnesium, and hydrogen ions. The major anions are chloride, bicarbonate, phosphate, sulfate, and proteinate ions. These chemicals unite in varying combinations (Alberts, 2014).

Fluid and electrolyte disorders are among the most common clinical problems encountered in the setting of intensive care. Critical disorders such as severe burns, trauma, sepsis, brain damage, and heart failure lead to disturbances in fluid and electrolytes homeostasis. Possible mechanisms include reduced perfusion to the kidney due to hypovolemia or hypotension; activation of hormonal systems such as renin-angiotensin-aldosterone system and vasopressin; and tubular damage caused by ischemic or nephrotoxic kidney damage, including renal insult caused by a myriad of medications used in the intensive care. In addition, inappropriate administration of fluid and electrolyte should be considered in the diagnosis and treatment of fluid and electrolyte disturbance (Lee, 2010).

Fluid and electrolyte imbalance is an important everyday performance in the intensive care unit, it's an integrate part of everyday care of the patients (Johnson, 2010). Patients are admitted to intensive care units because a physiological crisis threatens one or more bodily systems, and their life. Critically ill patients are at great risk for fluid and certain electrolyte imbalances. Proper fluid therapy and treatment of electrolyte

abnormalities make a major difference in the survival rate of critically ill (Eckman & lobus, 2010).

The most effective therapy is careful management of fluid balance, which involves thoughtful assessment of hydration, a fluid treatment plan personalized for the specific patient, repeated and frequent reassessment of fluid and electrolyte balance, and appropriate changes in the treatment plan in response to the rapidly changing clinical situation of the critically ill patients (Harbir & Madh, 2009).

The nurse is a vital member in the health care team who assess and identifies changes in fluid and electrolytes balance. Understanding the basic principles of fluid and electrolyte imbalance in the body is essential in assessing the patient, planning interventions, and evaluates the effects of care. Knowledge of which electrolytes can be affected by various disorders and an ability to quickly identify the signs and symptoms of electrolyte imbalance can ensure prompt treatment, thereby circumventing more serious complications (Ignatavicius & Workman, 2010).

Clinical practice guidelines are "systematically developed statements to assist practitioner decisions about appropriate health care for specific clinical circumstances. Guidelines can be used to reduce inappropriate variations in practice and to promote the delivery of high quality, evidence-based health care (British Society of Gastroenterology, 2012).

However, as noted in the Appraisal of Guidelines for Research & Evaluation (AGREE), the benefits of clinical guidelines are only as good as the underlying quality of evidence used to formulate the recommendations. It is therefore important that guidelines provide the most updated information based on strong evidence, as poor guidelines may be more harmful than helpful (AGREE, 2012).

Borst defines the job performance as "the way and the process how the nurses serve nursing for the patients and other people". Bloch also similarly suggests that "the job performance as the way and process of serving". Thus, the common point of these two definitions is that job performance is regarded as the way the job is performed and its process (Hayajneh, 2000).

AIM OF STUDY:

Evaluate the effect of applying guidelines on nurses' performance regarding fluid and electrolyte imbalances in intensive care units.

Research Hypotheses:

H1- After fluid and electrolytes imbalance guidelines application, the nurses will have higher knowledge score than pre applying guidelines.

H2- The nurses will have higher practice score after application of guidelines compared to pre.

SUBJECTS AND METHOD

Research design:

I- Technical design:

The technical design includes; setting, subjects and tools for data collection.

Design:

A quasi- experimental research design was applied in this study.

Study Setting:

This study has conducted in Intensive Care units in Damietta general hospital at Damietta city.

Study sample.

Convenient sample of available nurses (72 nurses) working in the previous mentioned clinical setting were included in this study.

Tools for data collection:

Tool 1: nurses' knowledge Questionnaire:

This tool developed by the researcher after reviewing the most recent and relevant literature (McCance & Huether 2010) to assess nurses' knowledge in relation to fluid and electrolyte balance and imbalance. It was consisted of two parts:

Part 1: Demographic Data:

Demographic data includes data related to (age, level of education, critical care experience, etc....).

Part 2: Nurses 'Knowledge questions:

Nurses' knowledge assessment to assess nurses' knowledge in relation to fluid and electrolyte balance and imbalance including function of electrolyte, forms of fluids and

electrolyte imbalance and the clinical features of each one, the underlying causes of imbalance and its management, complications and nurse's responsibilities). It composed of (58) MCQ questions and (1) table matching.

Scoring system:

Nurses' knowledge assessment consisted of (59 MCQ questions) and the answer was evaluated using model key answer prepared by the researcher, the score (2) for complete correct answer, the score (1) for incomplete correct answer and the score (0) for incorrect answer. Total knowledge score was (118). Total knowledge was considered as:

- Satisfactory if score $\geq$ 75 % of the maximum score.
- Unsatisfactory if score $<$ 75% of maximum score.

Tool II: Nurses' observational checklist:

Developed by the researcher after reviewing the most recent and relevant literature McCance and Huether (2010), to assess nurses' practice regarding fluid and electrolyte imbalance through the following:

1- Fluid &electrolytes monitoring: assess nurses' practice in relation to fluid and electrolyte balance and imbalance including the clinical features of each one consisted of (12 items).

1- Fluid &electrolytes imbalance management: Including nurse's responsibilities for managing of fluid and electrolyte imbalance consisted of (39 items).

Scoring system:

Practice observational checklist consisted of (51 questions) and the answer was evaluated using model key answer prepared by the researcher, and the score (2) for completely done, the score (1) for partially done and the score (0) for not done. Total practice score was (102).

Total practice was considered as:

- Satisfactory if score $\geq$ 75 % of the maximum score.
- Unsatisfactory if score $<$ 75% of maximum score.

Proposed guideline:

This guideline developed for nurses to enrich them with information and practice related to fluid and electrolyte imbalances in intensive care units. The educational program was presented into lectures in 3 sessions for nurses by using power point, group discussions and giving them booklets after lecture. Every session takes about 45minutes in groups of (5-10) nurses.

II- Operational design:

The operational design includes preparatory phase, content validity, pilot study and fieldwork.

A. Preparatory phase:

It included reviewing of related literature and theoretical knowledge of various aspects of the study using books, articles, internet periodicals and Journals to develop the tools for data collection.

B. Content validity:

Content validity was conducted to test the tool for appropriateness, relevance, correction and clearance through a jury of 15 experts from Nursing Faculty Staff and Medicine Faculty Staff of Ain Shams University, Cairo University, Helwan university, Port said university and Baniswif university, their opinions were elicited regarding the tool format layout, consistency and scoring system.

Reliability:

Testing reliability of proposed tool was done by Cronbach's alpha test. Cronbach alpha value was 0.74 for nurses' knowledge questionnaire sheet and a cronbach alpha value was 0.90 for nurses' practice observational checklist indicating reliability of the developed data collection tools.

C. Pilot Study:

Prior to performing the actual study, a pilot study was carried out on 10% of nurses (8) to test the applicability, visibility, clarity of questionnaire and arrangement of items, and estimate the time needed for each sheet. The nurses included in the pilot study were excluded from study. Some modifications were done to knowledge and practice tools based on the pilot study and opinion of experts.

D. Field work:

The actual field work was 6 month started from Jan, 2016 up to the end of June, 2016 for data collection by using 2 tools whereas Tool I; Structured Questionnaire to assess nurses' knowledge in relation to fluid and electrolyte balance and imbalance, Tool II; nurses' practice observational checklist to assess nurses' practice regarding fluid and electrolyte balance.

The purpose of study was explained by the researcher to nurses who agreed to participate in the study prior to data collection. Data was collected by the researcher over

3 days per week (Sunday, Monday, Tuesday) during day and night shifts by rotation at all ICU wards of Damietta General Hospital.

The study consisted of seven sessions:

- The 1st session included interviewing the nurses regarding to collect demographic characteristics, explaining study aims (Time allowed: from 20- 30 minutes for each nurse).

- The 2nd session included assessment of nurses' knowledge regarding fluids and electrolyte imbalance. (Time allowed: from 30- 45 minutes).

- The 3nd session included assessment of nurses' practice regarding fluids and electrolyte imbalance through participant observation methods. (Time allowed: from 30- 45 minutes).

- From 4 th to 6th session (the educational sessions):

- The guideline was presented in theoretical and practical sessions which aided by using data show and booklets. The theoretical part was conducted through lectures and group discussions where the practical part was conducted through demonstration and re-demonstration. This guideline consisted of 3 sessions including the immediate test.

- Each session lasted about 45minutes and was followed by feedbacks. These educational sessions were done in groups (5-10) nurses each time.

- The 7th session (posttest): This session included reassessment of nurses' knowledge& practice after applying the guideline and evaluated the impact of it on the studied nurses' knowledge and practices were implemented by using posttest (three months after pretest) by using the same tools.

II- Administrative Design:

An official letter has issued from the Faculty of Nursing, Port-said University to the directors of intensive care units of selected hospitals to obtain their permission to conduct the study.

Ethical considerations:

All ethical issues have been taken into consideration during all phases of the study. The ethical research considerations in this study will include the following: The research approval has been obtained orally from the nurses before program implementation .The aim and objectives of the study was explained to the participants.

The researcher has ensured that the maintenance of anonymity and confidentiality of participants. Participants has been allowed to choose to participate or not and they have the right to withdrawal from the study at any time without penalty.

IV- Statistical Design:

The data obtained has organized, categorized, tabulated and analyzed by using

SPSS (Statistical Package for Social Sciences), soft- ware program with suitable version, which will be applied to answer the research objectives and hypotheses.

RESULTS:

Table (1): Illustrate that 56.9% of studied nurses were in age group between 20-<30, with mean age of 27.7±6.5, and 43.1% of them had secondary school diploma. In addition to 70.8% received training in critical care. 65.3% of studied nurses displayed no need for training.

Table (2): Illustrates that, *for general knowledge,* 80.6% of nurses had satisfactory knowledge immediately after guidelines applications comparing to 6.9% before guidelines application and to 75% follow up after with statistical significant increase (P<0.0001).**Regarding hypovolemia**, 97.2% of nurses had satisfactory knowledge immediately after guidelines applications and 72% of them follow up comparing to 27.8% before guidelines application with statistical significant increase (P<0.0001).*Concerning hypervolemia,* 100% of nurses had satisfactory knowledge immediately and follow up after guidelines applications compared to 4% before guidelines application with statistical significant increase (P<0.0001).

Table (3): Represents that, there were statistically significant difference between satisfactory levels of nurses' knowledge about different serum electrolyte imbalances and management among the studied nurses at different timings of the study except knowledge about Phosphorus. There is significant difference between before and immediately after and between before and follow up.

Table (4): Clarifies that, there were statistically significant differences of scores of nurses' practice regarding fluid & electrolyte imbalances monitor and management pre, immediately after and follow up after guidelines applications in area of Fluid and electrolyte monitor score, Fluid and electrolyte management score and Total practice score with P<0.0001.

Table (5): Illustrates that, there were no statistically significant relation between nurses 'total knowledge score and their demographic characteristics at different timings of the study.

Table (6): Illustrates that, there were no statistically significant relation between nurses 'total practice score and their demographic characteristics at different timings of the study except educational level.

Table (7): Illustrates, there were negative correlation between total knowledge and practice scores among the studied nurses before the program regarding Knowledge about Na and Cl, immediately after the program regarding General knowledge, Fluid loss, Knowledge about potassium, Knowledge about Calcium, Knowledge about Magnesium, and Total knowledge score and follow up the program regarding General knowledge. There was no statistically relation between total knowledge and practice scores among the studied nurses at different timings of the study.

Table (1): Percentage distribution of demographic characteristics of the studied nurses (n=72):

Demographic characteristics	Studied nurses (n=72)	
	No.	**%**
Age (years)		
Less than 20	7	9.7
20-<30	41	56.9
30-<40	21	29.2
40-<50	3	4.2
Min-Max	18.0-45.0	
Mean±SD	27.7±6.5	
Educational level		
Secondary school diploma	31	43.1
Technical institute diploma	16	22.2
BSCH in nursing science	22	30.6
Master degree in nursing science	3	4.2
Received training in critical care		
No	21	29.2
#Yes	51	70.8
Needed training		
No	47	65.3
#Yes	25	34.7
Duration of nursing experience (years)		
1<5	41	56.9
5-<10	16	22.2
10- or more	15	20.8
Min-Max	1.0-16.0	
Mean±SD	5.1±4.3	

Table (2): Satisfactory scores of general nurses' knowledge, hypo and hypervolemia pre, immediately after and follow up after guidelines applications (n=72).

Knowledge Scores (%)	Before		Immediately after		Follow up		Sig 1 (before/ immediately after)	Sig 2 (immediately after/ follow up)	Sig 3 (before/ follow up)
	No.	%	No.	%	No.	%			
General knowledge									
Unsatisfactory (<75%)	67	93.1	14	19.4	18	25.0			
Satisfactory (≥75%)	5	6.9	58	80.6	54	75.0			
Min-Max	0.0-83.3		50.0-100.0		41.7-100.0		t=13.394	t=2.699	t=11.601
Mean±SD	47.2±19.8		83.4±14.4		80.2±13.2		P<0.0001*	P=0.009*	P<0.0001*
Hypovolemia									
Unsatisfactory (<75%)	52	72.2	2	2.8	0	0.0			
Satisfactory (≥75%)	20	27.8	70	97.2	72	100.0			
Min-Max	0.0-91.7		58.3-100.0		41.7-100.0		t=13.487	t=4.768	t=9.151
Mean±SD	53.7±19.9		87.9±8.4		81.9±12.8		P<0.0001*	P<0.0001*	P<0.0001*
Hypervolemia									
Unsatisfactory (<75%)	69	95.8	0	0.0	0	0.0			
Satisfactory (≥75%)	3	4.2	72	100.0	72	100.0			
Min-Max	0.0-83.3		75.0-100.0		25.0-91.7		t=24.159	t=6.469	t=14.544
Mean±SD	35.2±18.6		89.6±6.5		76.6±17.6		**P<0.0001***	**P<0.0001***	**P<0.0001***

Table (3): Distribution of satisfactory of nurses' knowledge level of different electrolyte imbalances management among the studied nurses at different timings of the study [n=72]

Knowledge Scores (%)	Before		Immediately after		Follow up		Sig 1 (before/ immediately after)	Sig 2 (immediately after/ follow up)	Sig 3 (before/ follow up)
	No	%	No.	%	No	%			
Knowledge about Na and Cl									
Unsatisfactory (<75%)	72	100.0	41	56.9	57	79.2			
Satisfactory (75%≤)	0	0.0	31	43.1	15	20.8			
Min-Max	0.0-72.2		38.9-100.0		33.3-94.4		t=19.858	t=7.520	t=18.001
Mean±SD	23.1±14.7		72.8±14.1		65.6±13.3		P<0.0001*	P<0.0001*	P<0.0001*
Knowledge about potassium									
Unsatisfactory (<75%)	72	100.0	0	0.0	22	30.6			
Satisfactory (75%≤)	0	0.0	72	100.0	50	69.4			
Min-Max	0.0-46.2		76.9-100.0		53.8-96.2		t=50.366	t=9.726	t=42.492
Mean±SD	12.7±10.9		91.1±6.3		80.7±9.6		P<0.0001*	P<0.0001*	P<0.0001*
Knowledge about Calcium									
Unsatisfactory (<75%)	72	100.0	13	18.1	48	66.7			
Satisfactory (75%≤)	0	0.0	59	81.9	24	33.3			
Min-Max	0.0-50.0		56.3-100.0		25.0-93.8		t=32.912	t=9.731	t=17.413
Mean±SD	19.2±11.8		85.8±10.2		65.7±16.3		P<0.0001*	P<0.0001*	P<0.0001*
Knowledge about Magnesium									
Unsatisfactory (<75%)	72	100.0	22	30.6	45	62.5			
Satisfactory (75%≤)	0	0.0	50	69.4	27	37.5			
Min-Max	0.0-50.0		50.0-91.7		25.0-91.7		t=25.200	t=5.937	t=16.014
Mean±SD	23.5±13.9		77.2±10.6		66.5±16.0		P<0.0001*	P<0.0001*	P<0.0001*

Sig: P-value for paired t- test of significance   *significant at P<0.05

Table (4): Scores of nurses' practice regarding fluid & electrolyte imbalances monitor and management pre, immediately after and follow up after guidelines applications (n=72)

Score (%)	Before		Immediately after		Follow up		Sig 1 (before/ immediately after)	Sig 2 (immediately after/ follow up)	Sig 3 (before/ follow up)
	No.	%	No.	%	No.	%			
Fluid and electrolyte monitor score									
Unsatisfied (<75%)	70	97.2	69	95.8	69	95.8			
Satisfied (≥75%)	2	2.8	3	4.2	3	4.2			
Min-Max	29.2-79.2		50.0-79.2		50.0-79.2		t=6.179	t=0.0	t=6.1719
Mean±SD	56.3±11.3		61.6±7.5		61.6±7.5		P<0.0001*	P=1.0	P<0.0001*
Fluid and electrolyte management score									
Unsatisfied (<75%)	70	97.2	67	93.1	69	95.8			
Satisfied (≥75%)	2	2.8	5	6.9	3	4.2			
Min-Max	39.3-79.8		50.0-85.7		50.0-82.1		t=9.476	t=5.638	t=6.211
Mean±SD	57.6±7.5		63.7±7.5		62.2±7.2		P<0.0001*	P<0.0001*	P<0.0001*
Total practice score									
Unsatisfied (<75%)	70	97.2	69	95.8	70	97.2			
Satisfied (≥75%)	2	2.8	3	4.2	2	2.8			
Min-Max	39.8—77.8		50.0-82.4		50.0-76.9		t=9.457	t=5.648	t=6.861
Mean±SD	57.3±7.5		63.3±6.8		62.1±6.5		P<0.0001*	P<0.0001*	P<0.0001*

Sig: P-value for paired t- test of significance   *significant at P<0.05

Table (5): Relation between nurses 'total knowledge score and their demographic characteristics at different timings of the study (n=72)

Demographic characteristics	N	total knowledge score					
		Before program		Immediately after		Follow up	
		Mean±SD	Significance	Mean±SD	Significance	Mean±SD	Significance
Age (years)							
Less than 20	7	27.5±4.7	F=0.063	81.6±5.0	F=0.601	72.4±6.0	F=0.673
20-<30	41	26.7±6.2	P=0.939	83.2±3.6	P=0.551	73.1±4.3	P=0.514
30 or more	24	26.9±4.8		82.5±45		74.4±6.1	
Educational level							
Nursing diploma	31	26.5±4.7	F=1.388	82.5±4.1	F=0.796	74.8±5.1	F=1.984
Nursing institute	16	28.8±6.7	P=0.269	82.2±3.7	P=0.455	72.1±4.7	P=0.145
Faculty of nursing or higher	25	25.9±5.8		83.6±4.2		72.7±5.1	
Received training							
No	21	27.0±5.2	t=0.527	82.7±3.9	t=0.178	73.2±4.9	t=0.642
Yes	51	26.3±6.5	P=0.600	82.9±4.5	P=0.859	74.1±5.5	P=0.523
Duration of nursing experience (years)							
1-<5	41	26.8±5.6	F=0.103	83.2±3.7	F=0.472	73.1±4.6	F=0.798
5-<10	16	26.4±6.5	P=0.903	82.5±5.1	P=0.626	73.1±6.5	P=0.454
10- or more	15	27.3±4.7		82.1±3.8		74.9±4.6	

t: Student t-test   F: ANOVA test   *significant at P<0.05

Table (6): Relation between nurses' total practice scores and their demographic characteristics at different timings of the study (n=72)

Demographic characteristics	N	Total practice score					
		Before program		Immediately after		Follow up	
		Mean±SD	Significance	Mean±SD	Significance	Mean±SD	Significance
Age (years)							
Less than 20	7	56.1±6.4	F=1.176	61.6±4.7	F=2.171	61.2±4.5	F=1.729
20-<30	41	56.4±7.6	P=0.315	62.2±6.9	P=0.122	61.1±6.6	P=0.185
30 or more	24	59.2±7.6		65.6±6.9		64.1±6.5	
Educational level							
Nursing diploma	31	58.4±7.4	F=1.492	65.9±6.8	F=6.832	64.7±6.4	F=6.970
Nursing institute	16	58.4±7.8	P=0.232	63.8±5.8	P=0.002*	62.5±5.6	P=0.002*
Faculty of nursing or higher	25	55.2±7.3		59.6±6.1	(D,F)*	58.6±5.9	(D,F)*
Received training							
No	21	56.8±7.1	t=0.380	64.9±6.3	t=1.317	63.8±6.1	t=1.481
Yes	51	57.5±7.7	P=0.705	62.6±6.9	P=0.192	61.4±6.6	P=0.143
Duration of nursing experience (years)							
1-<5	41	56.4±7.6	F=0.753	62.4±6.5	F=0.854	61.6±6.3	F=0.418
5-<10	16	57.7±6.6	P=0.473	63.7±8.2	P=0.430	62.1±8.1	P=0.660
10- or more	15	59.2±8.2		65.1±6.3		63.4±5.4	

t: Student t-test   F: ANOVA test   *significant at P<0.05

(D, F) *: Significant difference between nurses with diploma and faculty graduates using Bonferroni Post Hoc test

Table (7): Correlation between total knowledge and practice scores among the studied nurses at different timings of the study (n=72)

Knowledge scores	Nurses' Total practice					
	Before program		Immediately after		Follow up	
	r	P	r	P	r	P
General knowledge	0.152	0.202	-0.139	0.245	-0.099	0.408
Fluid loss	0.126	0.290	-0.210	0.077	0.052	0.662
Increased fluids	0.129	0.280	**0.253**	**0.032***	0.185	0.119
Knowledge about Na and Cl	-0.170	0.153	0.003	0.982	0.013	0.913
Knowledge about potassium	0.086	0.474	-0.130	0.276	0.067	0.573
Knowledge about Calcium	0.200	0.092	-0.131	0.274	0.007	0.957
Knowledge about Magnesium	0.004	0.975	-0.081	0.501	0.086	0.473
Knowledge about Phosphorus	0.051	0.672	0.145	0.223	0.038	0.751
Total knowledge score	0.180	0.130	-0.132	0.268	0.124	0.298

r: Pearson correlation coefficient   *significant at $P<0.05$

DISCUSSION:

Inaccurate fluid balance monitoring and recording can result in complications with respect to on-going patients" management. Inaccurate fluid balance data may result in inappropriate administration of diuretic therapy, resulting in fluid imbalances that affect the patients" hemodynamic stability. It is essential that critical care nurses implement appropriate correct recording, accurate calculation and fluid balance monitoring, to provide safe patient care (Boyd et al., 2011).

The effective management of critically ill patients requires accurate assessment of their fluid balance status. This assessment includes appropriate monitoring of fluid intake and output, as well as the accurate calculation and correct recording of this data (Shepherd, 2011). Therefore, fluid balance monitoring requires close attention to provide comprehensive data, upon which patient management decisions can be based (Diacon & Bell, 2014).

Demographic characteristics of the studied group in the current study showed that more than half of the studied nurses were at age 20-<30, less than half of them were diploma nursing, more than two third of them were received training courses, more than half of them said that they didn't need any training courses.

Regarding to the duration of nursing experience, half of them have experience from 1<5years ago, which mean that the most of them are fresh graduated. According to the

current study results, in addition that most of them are not highly qualified nurses so the diploma nurses should seek to obtain a more advanced qualification and training. In this respect, the American Association of colleges of nursing (AACN) encourages lifelong learning and offer incentives for nurses seeking to advance their education (AACN, 2014).

The current study showed that, the majority of nurses had satisfactory knowledge immediately and at follow up after guidelines applications compared to before guidelines application. Regarding their knowledge about hypovolemia, also the majority of nurses had satisfactory knowledge immediately after guidelines applications and all of them got a satisfactory level at follow up compared to less than one third before guidelines application. Concerning hypervolemia, more than two thirds of nurses had satisfactory knowledge immediately and follow up after guidelines applications compared to before guidelines application.

This sustained improvement might be referred to that, the majority of the studied nurses are fresh graduated which makes them welling to learn and understanding, also the majority of them were nursing diploma and want to be more qualified to be at the same level with the bachelor nursing degree, which made them concerned about the program and asked about more and more programs.

Respectively was similar to Mogileeswari and Ruth, 2016, who conducted a study to assess nurses" knowledge and practice regarding fluid therapy. However, Diacon and Bell, 2014, reported that critical care nurses are equipped with theoretical and practical knowledge about fluid balance monitoring.

The current study represented that, there were statistically significant difference between satisfactory nurses' knowledge about fluid & electrolyte imbalances management among the studied nurses at different timings of the study except knowledge about Phosphorus.

In relation to phosphorus imbalance, this might be referred to, it is not common imbalance among critically ill patients in the ICU, and it might be due to the environmental causes as the current study was conducted in Damietta which is a rich environment with phosphorus.

As well as a study to assess the effectiveness of structured teaching program on care of patient with central venous access device among staff nurses in selected oncology

hospital of Bangalore" stated that the overall mean percent of pretest knowledge score was unsatisfactory and posttest knowledge score was satisfactory. The data further support that posttest knowledge scores were greater than the pretest knowledge scores. So, there is an enhancement in overall knowledge after the structured teaching program (Lee, (2010).

However, Pegram and Bloomfield (2015) study illustrated that the mean score of nurse knowledge was less than half of the satisfactory knowledge scores before starting the guidelines.

These data prove the first research hypothesis that" after fluid and electrolytes imbalance guidelines implementation, the nurses will have higher posttest knowledge score compared to pretest score".

The current study clarified that, almost all nurses were performed unsatisfactorily regarding monitoring and managing of fluid and electrolyte abnormalities. The result of the pre-test, might be related to a main cause of inaccurate fluid balance monitoring was a shortage of nursing staff and workload in ICU. Also might be because fluid balance monitoring is considered a routine nursing measure; nurses might think that they are competent in fluid balance calculation and monitoring and do not look forward updating their knowledge.

The current study clarified that, there were statistically significant difference regarding scores of nurses' practice regarding fluid & electrolyte imbalances monitor and management pre, immediately after and follow up after guidelines applications in area of fluid and electrolyte monitor score, fluid and electrolyte management score and Total practice, which mean that the guidelines have a positive effect on the nurse's performance.

Complete a fluid balance chart accurately, recognizing when fluid intake or urine output is abnormal, and formulate a plan to resolve this. Reflect on nurses' practice, identifying areas for development in relation to fluid balance documentation and demonstrating insight into the professional importance of fluid balance records (Shahin et al., 2012).

The results of the current study are in the same line with Vincent and Mahendiran, (2015) used e-Learning and verbal presentation in their study to raise nurses" awareness around fluid balance, after intervention, the researchers found that to improve nursing

practice, adequate knowledge is needed.

Also the Nursing and Midwifery Council (NMC) has issued clear guidance on the importance of record keeping and states that:' Nurses are required to have the knowledge and competence to care for patients, which includes understanding the indications for and importance of fluid balance charts. Fluid management should be accorded the same status as a drug prescription (McGloin, 2015).

These data prove the second research hypothesis that "The nurses will have higher posttest performance score compared to pre implementation of the guidelines".

The current study illustrated that, there was no statistically significant relation between nurses 'total knowledge score and their demographic characteristics at different timings of the study, which mean that there was no significant relation between their age, level of education, training courses or duration of experience and total knowledge score.

These findings might be due to there are no specific training courses about fluid and electrolyte imbalance management in the hospital for the nurses or due to shortage of nurses and lack of nurses' perception about the importance of training courses or importance of upgrading their knowledge regarding such subject.

The current study findings were inconsistent with study findings of Pancorbo-Hidalgo, et al (2007) who reported a negative relationship between years of experience, nurses with more years of working experience (21-30 years) had lower levels of knowledge than those with less years of working experience (1-10 years) and explained these result due to nurses with more years of working experiences may have had less chance to gain access to up-to-date information. So finally there was a negative relation between nurse's work experience and their knowledge.

On the other hand, this finding is in disagreed with Hammed, (2009) who reported that the female Bachelor degree nurses scores were significantly better than diploma nurses possibly because of the basic knowledge received during academic years, which is different than that received by diploma nurses, which is not proved by the current study findings as their mean scenes were always lower than diploma nurses through a three phases of the study.

The current study illustrated that, there were no statistically significant relation

between nurses 'total practice score and their demographic characteristics at different timings of the study except educational level. This finding might be due to nurses were just obeying doctor orders which making them the same at practice no matter how old are them or how many years of experience or even their level of education.

However, there is another disagree with the current study by Miran & Gyeongae, (2014) who said that there was highly significant positive correlation between age and nurse's knowledge, as well, a positive correlation between years of experience and nurses' knowledge and practices.

The current study showed that, there were negative correlation between total knowledge and practice scores among the studied nurses before the guidelines regarding knowledge about Na and Cl, immediately after the guidelines regarding general knowledge, fluid loss, knowledge about potassium, knowledge about Calcium, knowledge about Magnesium, and total knowledge score and follow up the program regarding General knowledge. There was no statistically relation between total knowledge and practice scores among the studied nurses at different timings of the study.

In the researcher point of view this result was because there is no continuous training program for the nurses in the hospital which based on an educational plan for the basic courses and other courses according to work field needs. Also the only training courses at the hospital were about infection control and CPR as nurses mentioned.

Other studies said that the completion of fluid balance charts and found that fluid balance charts on different wards, none were completed appropriately. Staff shortages, lack of training and lack of time were cited as the reasons for incomplete and inaccurate charts (Asfour**, 2016).**

So from the researcher point of view, it must be a continuous training course for the staff nurses to improve their knowledge and competence which will effects well in patient care, there was an agreement of this point of view from Thomas et al., (2015) as their findings evidenced that patients are at risk of becoming dehydrated and/or developing an infection unnecessarily. Simple factors, such as increasing clinical staff's aware-ness, education and training may reduce these risks. Also newly registered graduate nurses should have the knowledge and skills which make them able to be nurses in ICUs are also important (Njung'e, Mbithi, & Okova, 2017).

CONCLUSION:

Based on the results of the present study, there was significant improvement in nurse's knowledge and practice related to fluid and electrolyte imbalance.

RECOMMENDATIONS:

I- Recommendations for improving nursing science:

- Hospital should provide the ICUS with high qualified nurses who holed a bachelor degree in nursing.

- A guideline handout for fluid and electrolyte imbalance intervention should be placed in a clear and reachable site for all nurses.

- Hospital and ICU administrators should pay more attention for staff competency through regular staff evaluation to determine their knowledge level and performance to improve it.

- Hospital and ICU administrators should pay more attention for covering the unit with the suitable number of competent nurses to ensure high quality of patient care.

- A fundamental standard of practice for every nurse practicing in an ICU.

- Fluid balance chart should be updated and a system for monitoring continuous infusions and a more accurate tool should be established.

II-Recommendations for improving nursing education:

- Continues education for nurses are required to have the knowledge and competence to care for patients, which includes understanding the indications for and importance of fluid balance charts and Fluid &electrolyte imbalance management.

- In-service education should be conducted for all nurses in the ICUS regarding assessment and monitoring of fluid balance.

- Novice nurses should be trained adequately regarding assessment and monitoring of fluid balance.

III- Recommendations for improving nursing research:

- Encourage nurses for upgrading themselves by having more degrees after bachelor degree such as master degree.

- Encourage nurses to use technology in searching for the new researches, new books, and also the new guidelines in nursing.

Further Studies:

- Further research studies should be emphasizing on the shortage of staff nurses in the critical areas such as ICUs, its effect on the quality of patient care and how to solve this shortage.
- Further studies may assist in refining the particular challenges of accurate fluid balance monitoring accuracy in Intensive Care Units
- Further research studies on how to prepare a good clinical instructors or educators in the hospital to help staff to be competent and more qualified.

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تـأثير تطبيق الإرشــادات علي معلومــات وأداء المـمـرضـــات تجـاه اختـلال الـسوائل و الشوارد في وحدات العناية المركــزة

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الـخـلاصـة

تعتبر المتابعة والرصد الدقيق لتوازن السوائل والشوارد في جسم الانسان هي جزء حيوي ومهم من المعلومات الأساسية الخاصه بالمريض ، والتي توجه التدخلات الطبية والتمريضية لتحقيق الاستقرار الفسيولوجي. واذا كانت هذه المتابعة غير دقيقة وخاصة في المرضى الذين يعانون من أمراض خطيرة فإنه من الممكن أن يؤدي ذلك الي تدهور الحالة الصحية للمرضى. **هدفت هذه الـدراسـة** إلى تقييم تأثير تطبيق الإرشادات التوجيهية على أداء الممرضات فيما يتعلق باختلال السوائل والشوارد في وحدات العناية المركزة عن طريق استخدام تصميم بحثي شبه تجريبي في الدراسة الحالية.وقد أخذت العينة من جميع التمريض العامل بوحدات الرعايه الحرجه بمستشفي دمياط العام وهم حوالى (72) ممرضه، واستخدمت أداتين لجمع البيانات اللازمة؛ ورقة استبيان منظم لتقييم المعرفة لدي الممرضات، و ورقه ملاحظه لتقييم ممارسات التمريض والإرشادات التوجيهية المقترحة. وقد كشفت **نـتـائـج الـدراسـة** الحالية أن غالبية الممرضات كان لديهن معرفة مرضية مباشرة بعد تطبيق الارشادات التوجيهية مقارنة مع قبل تطبيق الارشادات التوجيهية ومتابعتهن بعد. وفيما يتعلق بفقدان السوائل، كان هناك لدي أكثر من ثلثي الممرضات معرفة مرضية مباشرة بعد تطبيق الإرشادات واتباعها مقارنة مع قبل تطبيق الإرشادات التوجيهية. وقد كانت هناك علاقة ذات دلالة إحصائية فيما يتعلق بدرجات ممارسة الممرضات وأيضا فيما يتعلق بالخلل في السوائل والشوارد قبل ومباشرة بعد تطبيق الارشادات التوجيهيه ومتابعة بعد تطبيقات الإرشادات التوجيهية في مجال رصد السوائل والشوارد والممارسة التمريضية. **.الاستنتاج:** كان هناك ارتباطا سلبيا بين مجموع المعرفة ودرجات الممارسة بين الممرضات قبل تطبيق الإرشادات المتعلقه بالمعرفة، ومباشرة بعد الإرشادات المتعلقه بالمعارف العامة وفقدان السوائل والمعرفة حول البوتاسيوم والمعرفة حول الكالسيوم والمعرفة حول المغنيسيوم والنتيجة الكلية للمعارف ومتابعة الارشادات المتعلقه بالمعارف العامة. **وأوصت نتـائـج الـدراسـة** الحالية بأن يستمر تعليم التمريض في الحصول على المعرفة وتحسين كفاءة الرعاية التمريضية المقدمة للمرضى، والتي تشمل فهم مؤشرات وأهمية مخططات توازن السوائل والشوارد وعدم توازنها.

الكلمات المرشدة: اختلال السوائل و الشوراد، اداء الممرضين ، إرشادات، العناية المركزة