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Assessment of Nurses' knowledge and Performance Regarding Fluid and Electrolyte Management for Cardiac Surgery Patients

(1)Aya Hosny, (2) Wafaa Ismail Sherief, (3) Madiaha Hassan Nabih Mohamed.
1B.Sc.Nursing, Faculty of Nursing, Mansoura University, Egypt.
2Professor of Medical-Surgical Nursing, Faculty of Nursing, Mansoura University, Egypt
3Assist prof of Medical-Surgical Nursing, Faculty of Nursing, Mansoura University, Egypt

1.ABSTRACT

Background: Cardiac surgeries greatly influence the physiologic status of fluid and electrolytes in the body, patients can experience a many of fluid and electrolyte disorders. So, fluid and electrolyte stabilization is one of the corner stones of patient's nursing care. Methodology: A descriptive cross-sectional research design was utilized in this study. Setting: The study conducted at the cardio-thoracic surgery department affiliated to Mansoura University Hospitals. Tools: Tool I Self-administered interview questionnaires and consisted of two parts Part 1: used to address nurses' demographic data Part 2: concerned with nurses' knowledge regarding fluid and electrolyte balance. Tools II Observational checklist fluid and electrolyte therapy. Sample: All available registered nurses in the previously mentioned setting (52 Nurse). Result: more than half of the studied nurses had unsatisfactory level of knowledge (52%) and about two thirds had adequate competent practice (62%) regarding fluid and electrolyte balance in cardiac surgery patients with highly statistically significant correlations between nurses' total knowledge level, and clinical competency scores with their age, gender, educational level, years of experience, and attendance of training program. Conclusion: This study represents that more than half of the studied nurses had unsatisfactory level of knowledge and about two thirds had adequate competent practice with a statistically significant correlations between nurses' total knowledge level, and clinical competency scores with their age, gender, educational level, years of experience, and training program attendance. Recommendation: This study recommended that, continuous educational programs on regular basis to improve nurse's knowledge and practice regarding fluid and electrolyte therapy to achieve high quality of care for cardiac surgery patients.

Keywords: Assessment, Cardiac Surgery Patients, Electrolyte, Fluid, knowledge, Nurses, Performance.

2.Introduction:

Heart disease is the most common cause of death for men, women, and people of most racial and ethnic groups, accounting for more than 17.6 million deaths per year in 2016. One person dies every 37 seconds in the United States from cardiovascular disease. (Heron., 2017). In 2017, emergency medical services-assessed out-of-hospital cardiac arrest occurred in an estimated 356,461 Americans; emergency medical services treatment was initiated in 52% (Benjamin et al., 2019).

In the United States in 2019, coronary events are occurring in about 1,055,000 individuals, including 720,000 new and 335,000 recurrent coronary events a number that is anticipated to increase to > 23.6 million in 2030. (American Heart Association Research. Heart Disease and Stroke Statistics, 2019). WHO specifies that CVD's incidence is fast shifting to the youth and considered the principal cause of death in Egypt, reaching 46% of total deaths. The disease burden in Egypt caused by inappropriate lifestyles and eating habits (WHO 2019).

Coronary artery blockage is commonly managed with open heart surgery to improve blood supply O_2 to the heart muscle, manage chest pain, improving physical activity and generally quality of life. Nevertheless, the survival rate is variable, as it is linked with numerous post intervention complications (Elshamy, Abdelaziz, Gado & Hammed, 2016). The perioperative period is a highly dynamic time with the perturbations of anesthesia, cardiopulmonary bypass, and the surgery itself. Added to this are such variables as the patient's preoperative condition and the effects of the postoperative surgical stress response. As

clinicians, we are faced with much uncertainty (Young 2012).

Patients' assessment of fluid and electrolyte status for early detection of theses complications is an important component of nursing care. Therefore, monitoring of intake and output, weight, hemodynamic parameters, hematocrit levels, distension of neck veins, edema, and electrolyte levels should be carried out regularly by nursing staff (Collins et al., 2013). Although, fluid balance appears a routine daily care, recording of fluid balance was imperfectly done. Recording fluid intake and output continuously considered the important part of patient's care. It is the nursing responsibilities to ensure that fluid balance is managed accurately (Kargul, Wright, Knight, McNichol, & Riggio, 2013).

Significance of the study

Poor documentation of fluid and electrolyte balance or unrecognized /untreated fluid and electrolyte imbalance were reported in cardiac surgery patients. Nurses need to understand the fluid compartments within the body and how fluid moves between these compartments to make a competent assessment and early detection for fluids and electrolytes abnormalities. Registered nurse who practices intravenous therapy must possess a thorough and up to date working knowledge of the intravenous fluids that are administered. This is necessary for safe nursing practice, and essential for excellent quality of patient's care (Jeyapala, Gerth, Patel, and Syed, 2015; & Aslam et al., 2017).

Study Aim

The study aimed to assess nurses' knowledge and performance regarding fluid and electrolyte management for cardiac surgery patients.

Study question

What is the level of nurses' knowledge and practice regarding fluid and electrolyte balance in the cardiac surgery patients?

3.Subjects and Method

3.1.Study design

A descriptive cross-sectional research design will be used to achieve the aim of this study.

3.2.Study settings

This study well be conducted in the cardio-thoracic surgery department affiliated to Mansoura University Hospitals

3.3.Study Subjects

All available registered nurses caring for patients who are undergoing cardiac surgeries in the previously mentioned setting (52 Nurse).

3.4.Tools of data collection

Two tools were utilized to collect data for this study.

Tool(I): Self-administered interview questionnaires:

This tool was developed by the researcher based on review of relevant recent literature (Scales & Pilsworth, 2008; & Aslam, et al., 2017), and written in a simple Arabic language. It includes two parts:

Part 1: This part was used to address the personal data of the nurses. It will include. age, level of education, qualifications, years of experience, and attendance of training programs.

Part 2: This part was concerned with (1) nurses 'basic knowledge regarding fluid and electrolyte management (monitoring, preparation, administration, and recording) (2) knowledge regarding fluid balance for cardiac surgery patients (3) knowledge regarding electrolyte balance for cardiac surgery patients.

Scoring system for part (2) nurses' knowledge regarding fluid and electrolyte balance, correct answer was taken "1" and the incorrect were taken "0", the scores were summed-up and the total divided by the total number of questions and converted into percent scores and considered "satisfactory" if the percent score was 60 or higher and "unsatisfactory" if less than 60 %.

Tool (II): performance checklist:

This tool was developed by the researcher based on review of relevant recent literature (Scales & Pilsworth, 2008; & Aslam, et al., 2017) and were used to assess nurses' competencies regarding fluid and electrolyte balance management (preparation, administration, monitoring and documentation) for cardiac surgery patients.

Scoring system for nurses' practice observational checklist: Items were checked as "done," and take score (1) or "not" done and take

score "0". the total score divided by the number of items and converted into percent scores. The nurses' practice was considered "adequate" if the percent score is 75 % or more and "inadequate" if less than 75%.

3.5.Operational Design (Method)

The operational design of the current study presents the data collection methods which included preparatory phase, tool development validity and reliability of the study tools, pilot study, and field of work which includes sampling and data collection phases.

3.6.Preparatory phase

Extensive review of the current national and international literatures related to the research title was done using textbooks, articles and magazines. Implementing this study required the development of two tools for assessment of nurses' knowledge and performance regarding fluid and electrolyte management for cardiac surgery patients.

3.7.Tool development

After reviewing recent related literature, the researcher was acquainted with the actual dimension and magnitude of the problem. Moreover, it was used as a guide for developing study tools.

3.8.Ethical consideration

The agreement of participants was taken after the aim of the study is explained. They were notified that they can withdraw at any stage of the study. Every participant was provided with an explanatory form on the study which includes the purpose of the study, confidentiality of information, and some instructions. All ethical issues were taken into consideration during all phases of the study.

3.9.Validity and reliability

After the study tools were prepared, they were tested by:

3.10.Content validity:

Validity was done for the developed study tools (I, II). They were revised by a panel of five experts in the field of the study, three professors of medical- surgical nursing and two professors from medical field as a jury to test the study tools, to determine whether the tools covered the aim of the current study and appropriately translated and for completeness, feasibility and clarity of the items. Accordingly, all the necessary modifications were done. Also, tools were reviewed by lingual persons to ensure correct Arabic translation. Suggestions of the jury members were followed, and booklet was modified as indicated.

3.11.Reliability:

Reliability was measured to evaluate whether all items on the study instruments measure the same variable, and how well the used items fit together conceptually. Reliability was tested by using Cronbach's Coefficient Alpha test (r =0.865).

3.12.Pilot study:

It was carried out on 10% of nurses to test feasibility, objectivity, simplicity and the applicability of the study tools, as well, identify difficulties that may be encountered, and to estimate the time needed for data collection.

-The data obtained from the pilot study were analyzed, and very simple modification were added and other were rephrased to be clear and understood but not effect on the tool.

-The studied sample for the pilot study was included in the main study sample because of the limited number of nurses in cardiac surgery unite and to strength the result of the study.

3.13. Field work:

Data collection:

After obtaining the administrative approval, data collection was started and continued for period of 3 months from the beginning of November 2019 to the end of January 2020.

- The researcher started by introducing herself to the nurses and giving them a brief idea about the aim of the study
- Verbal consent approval was obtained from each participant prior to his /her inclusion into the study. Clarification of the nature and purpose of the study was done on the interview with each patient.
- The researcher emphasized participation was absolutely voluntary and confidential. Anonymity, safety and confidentiality were absolutely assured throughout the whole study as well as the right to withdraw from the study at any time.
- Assessment of nurses' demographic characteristics performed using **Tool I (part I)**
- Assessment of nurses' level of knowledge performed using **Tool I (part II)**, provided to all selected nurses and asking them to answer these questions regarding fluid balance and electrolyte balance in cardiac surgery patients during pre-operative and postoperative phases.

- Assessment of nurses' performance carried out by the researcher using **Tool II** (Observational checklist) regarding preparation and administration of fluid and electrolyte therapy, monitoring of fluid and electrolyte therapy, and documentation of procedures (intake and output chart, abnormalities, interventions,etc)during morning and afternoon shift alternatively for two weeks.

3.14. Statistical Design:

After data collection it were revised, coded, processed and then analyzed using the statistical software IBM SPSS version 21. The given diagrams were constructed through Microsoft excel software. The quantitative data were presented in mean and standard deviation (SD), while the qualitative data were presented as number (N) and percent (%). Pearson correlation was done between variables and Cronbach's alpha was used to measure internal consistency.

4.Results

Table (1): Presents that, more than three fourth (80.8%) of studied nurses are females. about half (46.2%) of them aged 26- 30 years and more than one third (40.4%) aged 20-25 years with mean age was 29.6 years. About two thirds (65.4%) were highly educated (bachelor's degree). Years of experience ranging from 5 to 9 years in most of them (36.6%). The same table denotes that, more than two thirds (67.3%) attending fluids and electrolyte related workshops, of them 30.7% attending only one workshop.

Table (2): Represents that about two thirds (64%) of studied nurses have poor knowledge level including basic knowledge, fluid and electrolyte balance with total mean score 45.24, 40.94, and 32.34 respectively.

Figure (1) Illustrates that, the majority of the studied nurses had poor levels of knowledge regarding basic knowledge (44%), fluid balance (51%) and electrolyte balance (66%) in cardiac surgery patients.

Table (3): Show Nurses' level of knowledge and competencies regarding fluid and electrolyte balance in cardiac surgery patients. It is clear that the average knowledge score of the studied nurses were low regarding basic knowledge (11.48 ± 1.32), knowledge regarding fluid balance (10.47 ± 4.32) and knowledge regarding electrolyte balance (15.43 ± 5.48) with total average score 37.38 ±8.62. Moreover, they have low competency level as their average score recorded 11.44 ± 4.48

Table (4) Reflects that, there were negative, statistically significant correlations between nurses' total knowledge level with their educational level, years of experience, and training program attendance. Whereas highly statistically significant correlations appear between nurses' clinical competency scores and their age, gender, educational level, years of experience, and training program attendance.

Table (1): Distribution of nurses according to their demographic Characteristics (N = 52 nurses).

Demographic data	Studied group (n = 52)	
	%	No
Gender		
Female	80.8	42
Male	19.2	10
Age		
20<25	40.4	21
26<30	46.2	24
31<35	5.8	3
> 35	7.6	4
Mean ± SD	29.6	
Education level		
Secondary school diploma	13.5	7
Technical Diploma Nurses	15.4	8
Bachelor degree	65.4	34
Others (MSc, PHD)	5.8	3
Years of Experience		
<1	21.1	11
1-4	25	13
5-9	36.6	19
10 & more	17.3	9
Workshop attendance		
Yes	67.3	35
No	32.7	17
Workshop attendance		
one	30.7	16
two	21.2	11
three & more	15.4	8

Table (2): Nurses' knowledge scores (%) regarding fluid and electrolyte balance in cardiac surgery patients(n= 52)

knowledge items	*Poor*		*Fair*		*Good*	
	N	*(%)*	*N*	*(%)*	*N*	*(%)*
Basic knowledge						
Meaning of fluids and electrolytes imbalance	27	51.9	13	25	12	23.1
Calculation of fluid intake and output	19	36.5	22	42.3	11	21.2
Fluid charting in right way	18	34.6	22	42.3	12	23.1
Importance of fluid and electrolyte balance	29	55.8	15	28.8	8	15.4
Mean ± SD	**45.24 ± 6.37**					
Knowledge regarding fluid balance						
Fluid intake and out put	33	63.4	12	23.1	7	13.5
Regulations of body fluids	41	78.8	6	11.6	5	9.6
Problems of imbalanced body fluids	39	75	10	19.2	3	5.8
S & S of imbalanced body fluids	25	48.1	15	28.8	12	23.1
Management of fluid imbalance	34	65.4	12	23.1	6	11.5
Mean ± SD	**40.94 ± 8.71**					
Knowledge regarding electrolyte balance						
Normal range	40	76.9	9	17.3	3	5.8
Causes of electrolyte imbalance	42	80.8	5	9.6	5	9.6
S & S of electrolyte imbalance	39	75	4	7.7	9	17.3
Nursing intervention of electrolyte imbalance	42	80.8	8	15.4	2	3.8
Mean ± SD	**32.34 ± 2.52**					
Total knowledge score	**64%**		**22%**		**14%**	

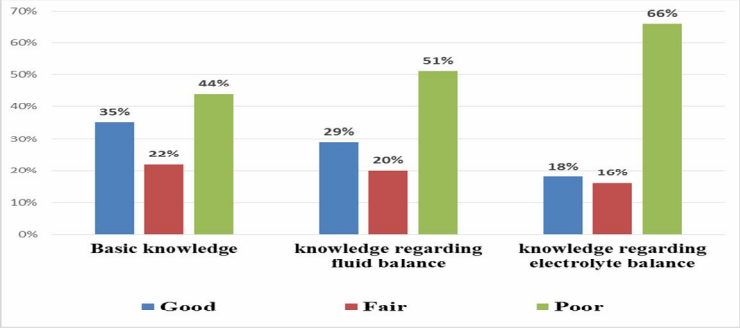

Figure (1): Nurses' knowledge scores (%) regarding fluid and electrolyte balance in cardiac surgery patients.

Table (3): Distribution of the studied nurses in relation to their competencies and knowledge regarding fluid and electrolyte balance in cardiac surgery patients (n= 52).

Knowledge	Average Score	Mean± SD
A. Basic knowledge regarding fluid and electrolyte balance	11.48 ± 1.32	45.24 ± 6.37
B. knowledge regarding fluid balance	10.47 ± 4.32	40.94 ± 8.71
C. knowledge regarding electrolyte balance	15.43 ± 5.48	32.34 ± 2.52
Knowledge total mean Score	37.38 ±8.62	39.50 ± 3.38
Skills total mean Score	11.44 ± 4.48	23.86 ± 4.32

More than one response

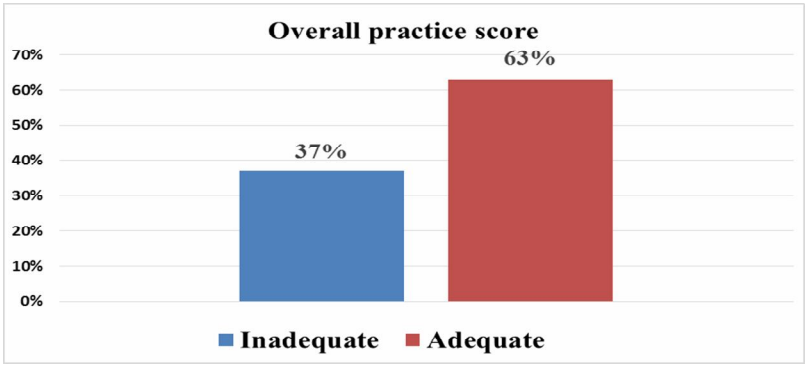

Figure (2) Total practice score among studied nurses

Table (4): correlation between studied nurses' knowledge level and practice competency with different variables

	Knowledge				Practice			
	Satisfactory		Unsatisfactory		Adequate		Inadequate	
	R	*p*	*r*	*P*	*r*	*p*	*r*	*p*
Age	0.337	**0.083**	0.261	**0.062**	0.292	**0.000***	0.163	**0.001***
Gender	0.143	**0.071**	0.131	**0.741**	0.274	**0.000***	0.235	**0.001***
Experience	0.243	**0.042***	0.231	**0.054***	0.374	**0.002***	0.235	**0.001***
Educational level	0.250	**0.032***	0.254	**0.011***	0.321	**0.003***	0.217	**0.000***
Attending training programs	0.316	**0.042***	0.272	**0.053***	0.257	**0.002***	0.154	**0.001***

R: Pearson's correlation coefficient. **P: value by Pearson's correlation test.**

5.Discussion:

Proper monitoring and administration of fluids and electrolyte are critical. So, attention to body fluid and electrolyte management is significant (Kayilioglu, etal., 2015), to Achieve optimal hydration and avoid complications such as dehydration and overhydration, both of which can have serious clinical consequences (Aslam et al., 2017). Few studies have examined the level of knowledge and practice for nurses working in cardiothoracic surgery unit over the course of their work. Therefore, the current study concentrated on assessment of nurses' knowledge and performance regarding fluid and electrolyte management for cardiac surgery patients.

Demographic background represented that, about half of the studied nurses in the third decade of age. Highest percent of the current study sample were females, highly educated (bachelor's degree), years of experience ranging from five to nine years and attending fluids and electrolyte related workshops, of them about half attending only one workshop.

In relation to knowledge level of our studied nurses the majority of them had unsatisfactory level of knowledge regarding fluid and electrolyte balance in cardiac surgery patients.These results may be explained by attendance of limited number of training program. Our results come hand on hand with the study done in the United States by Mahramus et al., (2013) among clinical specialist nurses revealed a low level of knowledge.The authors concluded that there is a need to develop interventions to improve nursing knowledge, since these nurses provide care to critical cases, and thus should possess enough knowledge background to be able to provide a quality care for these patients.

Mogileeswari and Ruth., (2016) and Mohamed et al., (2018) represented that unsatisfactory knowledge level regarding fluid balance monitoringmostly prominent in their studies in pre- educational protocol. Also, study by AbdElalem and Fouad., (2018) they assess critical care nurses′ knowledge and practice regarding the assessment of fluid balance and they found that the majority of the studied nurses had poor level of knowledge regarding the fluid balance assessment.

Moreover, results by Aslam., (2017) reported that, nurses' knowledge and practices regarding fluid and electrolytes administration is overall low which should be considered to lessen the quality care among the public hospitals. As well, Ajani and Moez., (2011) confirmed that if nurses are not well equipped theoretically, the image of nurses being doctors' hand maidens is

promoted. On the other hand, if they do not exhibit proficient hands-on skills, their credibility is questioned, leading to frustration and de-motivation.

In the same line with our results Ajani and Moez., (2011) emphasized that nursing is considered as caring for a person in a variety of health-related situations, hence, nurses play a key role in promoting higher standards of health. To maintain a proper balance between theory and practice, a nurse, has to be updated with current knowledge and practice in the field.

Contrary to our results, findings by Asfour., (2016) which documented moderately adequate level of knowledge regarding fluid balance monitoring between studied nurses and emphasized that nurse's knowledge and skills regarding assessment and monitoring of body fluids should be enhanced and evaluated to prevent severe problems in body homeostasis especially for those suffering serious diseases.

The gap between nurse's knowledge and practice is the discrepancy between knowledge and what they experience in the clinical setting. (EL Hussein & Osuji, 2017). If all the nurses are placed with competence in theory and practice forming the either ends of the continuum most nurses are likely to find themselves at the either ends of the continuum. There is evidence to suggest that nurses who are proficient in theory are able to write the best care plans, discuss pathophysiology, treatment rational, etc, however, they struggle with hands on practice (Ajani and Moez., 2011).

In our study about two thirds of studied nurses had adequate competent practice regarding fluid and electrolyte balance in cardiac surgery patients, this may be due to increased years of experience that help in improving nurses' skills regarding monitoring fluid intake and electrolyte levels and its related complications. These results certified by Sheta, Mahmoud., (2018) he mentioned that highest percentage of their studied sample calculate fluid intake and output properly.

As well, Mogileeswari and Ruth., (2016) found that the majority of their studied nurses had safe practice regarding fluid therapy. However, (Diacon, 2012) reported that nurses caring for cardiac surgery patients are equipped with practical skills about fluid balance monitoring.

In agreement with the current study finding was that of Vijayan., (2011) who stated that the majority of his studied nurses have competent practice regarding the estimation and documentation of the amount and type of fluid and checked against doctor's prescription. Furthermore, knowledge and practices of nurses about fluid monitoring and electrolyte administration in cardiac surgery patients is necessary to provide the good quality of care and helps to reduce the morbidity and mortality rate (Aslam 2017).

On the other hand, nurses favor to take experience from colleague's peer group in the field, but it lacks an effective vehicle for transferring knowledge from laboratory to practice setting (Considine, Khaw and Currey., 2011). The same as, Risjord., (2010) declared that the gap between theory and practice occurs if theory is not converted to practice, that results from increased workload on nurses, which limit time and energy to study

Our study results revealed that there were, statistically significant correlations between nurses' total knowledge level with their educational level, years of experience, and training program attendance. Whereas highly statistically significant correlations appear between nurses' clinical competency scores and their age, gender, educational level, years of experience, and training program attendance. In this regards Alwutaib et al (2012) revealed that older age is an important determinant of lower knowledge levels.In agreement with this, Numminen et al., (2014) & Eldsouky, Taha & Saleh., (2016).demonstrated a statistically significant positive correlation between practicing nurses' age and their knowledge and competence

In relation to training programs, from a researcher point of view attending continuing nursing education courses and training programs have the benefits of keeping nurses up-to-date and refining their practices. Consequently, unsatisfactory knowledge was noticed in the current study as half of studied nurses attending only one training program related to fluid and electrolyte balane. The studies of Ajani and Moez., (2011) and Rozina and Tazeen,. (2011) support that knowledge must be provided with continuous monitoring to clinical practice confirm that required knowledge and skills for effective practice are attained from the educational program

In the same line with our results Mohamed et al., (2018) revealed that frequent updating of nurse's knowledge coupled with regular surveillance, help to give the most recent and best care to the patients. This could direct the attention toward continuing education of nurses about fluid and electrolyte balance particularly those with numerous educational backgrounds, and experience

of less than ten years, so they need continuous knowledge update.

Also, a further validation by Kol, İlaslan, & Turkay., (2017) who concluded that periodical training programs for nurses is needed to provide nursing staff with updated knowledge to enhance nursing practice. In addition, Duarte SCM et al. (2016) stated that nurses are the primary responsible person for fluid balance, so, their knowledge should be enhanced. Nursing care to patients focuses on interventions to prevent or treat complications, and the nurse's knowledge about these risks, provide a better direction in nursing diagnoses and systematization of assistance.

Regarding years of experience the study of Tiwaken et al., (2015) illustrates, that development of nursing skills, knowledge, and professional socialization are affected by clinical setting because it improves nurses learning and participating as role models. The same as **Abu Salah et al., (2018)** supports those clinical areas allows nurses to receive experience and practice the clinical skills in the real situation, and be aware about general nursing routines and responsibilities. Golden et al., (2017) proposed that, health care organizations have the responsibility to improve patient's care by developing competent, integrated approaches to delivering this care.

Another study by Mohamed et al., (2018) demonstrated a positive correlation between nurses' years of experience and their knowledge score. This means that the relation between nurses' experience years and their knowledge score was confounded by their age, which was identified as an independent positive predictor of this score. However, the study by Ajani & Moez (2011) noted that increase in the clinical hours can overcome the gap between theory and practices. Furthermore, the collaboration and involvement of the nurses who are more experienced in the clinical practice may also help in decreasing the gap between theory and practice.

6.Conclusion

This study represents that the more than half of the studied nurses had unsatisfactory level of knowledge and about two thirds had adequate competent practice with a statistically significant correlations between nurses' total knowledge level, and clinical competency scores with their age, gender, educational level, years of experience, and training program attendance.

7.Recommendations

This study recommended that, continuous educational programs on regular basis to nurses for improving knowledge and practice regarding fluid and electrolyte therapy to achieve high quality of care for cardiac surgery patients and motivating them to update their knowledge and performance.

8.Limitation of the Study

Workload of the nursing staff in cardiothoracic surgery uniteLimited number of nurses in cardiothoracic surgery unite.

9.Reference

AbdElalem S, Fouad N, (2018), Effect of an instruction intervention about body fluid balance assessment on knowledge and practice among nurses in Intensive Care Unit International Journal of Novel Research in Healthcare and Nursing; 5 (1): 94-105.https://www.iosrjournals.org/iosr-jnhs/papers/vol7-issue5/Version-11/G0705117483.pdf

Abu Salah A., Aljerjawy M., Salama A. (2018)Gap between Theory and Practice in the Nursing Education: the Role of Clinical Setting. JOJ Nurse Health Care. 7(2) DOI: 10.19080/JOJNHC.2018.07.555707

Ajani, K., & Moez, S. (2011). Gap between knowledge and practice in nursing. *Procedia-Social and Behavioral Sciences, 15*, 3927-3931https://doi.org/10.1016/j.sbspro.2011.04.396

Alwutaib A.H., Abdulghafour Y.A., Alfadhli A.K., Makboul G., El-Shazly M.K. (2012). Knowledge and attitude of the physicians and nurses regarding blood borne infections in primary health care, Kuwait. Greener Journal of Medical Sciences., 2(4): 107-114.DOI: 10.15580/GJMS.2012.5.10011268

American Heart Association Research. Heart Disease and Stroke Statistics-2019 At-a-Glance. Retrievedfrom:https://professional.heart.org/idc/groups/ahamahpublic/@wcm/@sop/@smd/documents/downloadable/ucm_503396.pdf .Accessed at 27-1-2018

Asfour, H. I. (2016). Fluid balance monitoring accuracy in intensive care units. IOSR J Nur Heal Sci, 5(4VI), 53-62.DOI: 10.9790/1959-0504015362

Aslam, S., Afzal, M., Kousar, R., Waqas, A., & Gilani, S. A., (2017). The Assessment of Nurses' Knowledge and Practices about Fluid and Electrolytes Monitoring and Administration among Cardiac Surgery

Patients: A Case of Punjab Institute of Cardiology. International Journal of Applied Sciences and Biotechnology, 5(2), 208-215.DOI: https://doi.org/10.3126/ijasbt.v5i2.17626

Benjamin EJ, Muntner P, Alonso A, Bittencourt MS, Callaway CW, Carson AP, et al. Heart disease and stroke statistics (2019) update: a report from the American Heart Association. Circulation. 2019;139(10):e56–528.doi: 10.1161/CIR.0000000000000659.

Collins, S. A., Cato, K., Albers, D., Scott, K., Stetson, P. D., Bakken, S., & Vawdrey, D. K. (2013). Relationship between nursing documentation and patients' mortality. ***American Journal of Critical Care****, 22*(4), 306-313.doi: 10.4037/ajcc2013426

Considine J, Khaw D, Currey J (2011) Clinical nurse research consultant: A clinical and academic role to advance practice and the discipline of nursing. Journal of Advanced Nursing 67(10): 2275-2283. doi: 10.1111/j.1365-2648.2011.05687.x.

Diacon, A., & Bell, J. (2014). Investigating the recording and accuracy of fluid balance monitoring in critically ill patients. Southern African Journal of Critical Care (Online), 30(2), 55-57.DOI: 10.7196/SAJCC.193

Duarte SCM et al. (2016) ocuidado de enfermagem no pós-operatório de cirurgia cardíaca: um estudo de caso. Esc Anna Nery. 16 (4):657 - 665. Avaliable from: http://www.scielo.br/pdf/ean/v16n4/03.pdf

EL Hussein M., & Osuji, J. (2017). Bridging the theory-practice dichotomy in nursing: The role of nurse educators. Journal of Nursing Education and Practice 7(3): 20-25.DOI: https://doi.org/10.5430/jnep.v7n3p20

Eldsouky S., TahaN., & Saleh M. (2016) Nurses' knowledge and practice concerning fluid and electrolyte balance among patients with congestive heart failure. Zagazig Nursing Journal January,12(1). DOI: 10.12816/0029286

El-Shamy,N., Abdelaziz, S., Gado, A., and Hammed, A. (2016): The Preoperative Nutritional and Psychosocial Health Status among Patients Undergoing Open Heart Surgery: A Cross-Sectional Correlational Study. ***International Journal of Nursing Science***, *6*(2), pp. 48-57. doi:10.5923/j.nursing.20160602.03

Golden S., HagerD., Gould L., Mathioudakis n., Pronovost p. (2017) A Gap Analysis Needs Assessment Tool to Drive a Care Delivery and Research Agenda for Integration of Care and Sharing of Best Practices Across a Health System. Journal on Quality and Patient Safety 2017; 43:18–28. doi: 10.1016/j.jcjq.2016.10.004. Epub 2016 Oct 13.

Heron, M. Deaths: Leading causes for 2017 pdf icon[PDF – 3 M]. National Vital Statistics Reports;68(6). Accessed November 19, 2019. Available at https://www.cdc.gov/nchs/data/nvsr/nvsr68/nvsr68_06-508.pdf Accessed 1/6/2020

Jeyapala,S., Gerth, A., Patel, A., and Syed,N.. (2015). Improving fluid balance monitoring on the wards. ***British Medical Journal of quality improvement reports***,*4*(1), u209890.w204102. doi:10.1136/bmjquality.u209890.w4102. Retrieved from:https://pdfs.semanticscholar.org/9855/be6d87e6ff7a7633181cd678621daf4ea465.pdf .Accessed at30-10- 2018.

Kargul, G. J., Wright, S. M., Knight, A. M., McNichol, M. T., & Riggio, J. M. (2013). The hybrid progress note: Semi automating daily progress notes to achieve high-quality documentation and improve provider efficiency. ***American Journal of Medical Quality,****28*(1), 25-32.DOI: 10.1177/1062860612445307

Kayilioglu,S., Dinc,T.,Sozen,I., Bostanoglu ,A., Cete,M.,and Coskun, F. (2015): Postoperative fluid management, ***World Journal of Critical Care Medicine*****;***4*(3), pp. 192–201.doi:10.5492/wjccm.v4.i3.192 Retrieved from:https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4524816 . Accessed at 6-12-2018.

Kol, E., İlaslan, E., & Turkay, M. (2017). Training needs of clinical nurses at an university hospital in Turkey. Nurse education in practice, 22, 15-20.doi: 10.1016/j.nepr.2016.11.004.

Mahramus T.L., Penoyer D.A., Sole M.L., Wilson D., Chamberlain L., and Warrington W. (2013). Clinical nurse specialist assessment of nurses' knowledge of heart failure. Clin Nurse Spec .2013 ;27(4):198-204 . 24. doi: 10.1097/NUR.0b013e3182955735.

Mogileeswari P, Ruth M., (2016) Knowledge and practice regarding fluid and electrolyte replacement therapy for patient with burns. International Journal of Multidisciplinary Research and Development; 3(4):217-20.bibliomed.org/mnsfulltext/157/157-1456722419.pdf?1608308443

Mohamed M., Mohammed I., Taha S (2018). Effect of Educational Protocol Regarding Accurate Monitoring Fluid Balance on Critical Care Nurses' Knowledge and Practice. Minia Scientific Nursing Journal (Print) (ISSN 2537-012X) 4(1) 2018. http://main.eulc.edu.eg/eulc_v5/Libraries/Thesis/BrowseThesisPages.aspx?fn=PublicDrawThesis&BibID=12557775

Numminen O., Laine T., Isoaho H., Hupli M., Leino-Kilpi H., and Meretoja R. (2014) : Do educational outcomes correspond with the requirements of nursing practice: educators' and managers' assessments of novice nurses' professional competence; Scand J Caring Sci. 2014 ;28(4):812-21.doi: 10.1111/scs.12115.

Paul S., and Hice A. (2014). Role of the acute care nurse in managing patients with heart failure using evidence-based care. Crit Care Nurs Q.2014 ;37(4):357-76. doi: 10.1097/CNQ.0000000000000036.

Risjord M. (2010). Nursing knowledge: Science, Practice and Philosophy. Oxford: Wiley-Blackwell. Rozina E, and Tazeen A. (2011). Knowledge and Practice Gaps among Pediatric Nurses at a Tertiary Care Hospital Karachi Pakistan 1-8.

Rozina E, Tazeen A (2011) Knowledge and Practice Gaps among Pediatric Nurses at a Tertiary Care Hospital Karachi Pakistan.International Scholarly Research Network Volume 2011, https://doi.org/10.5402/2011/460818

Scales, Katie, & Pilsworth, Julie. (2008). The importance of fluid balance in clinical practice. ***Nursing Standard*** *22*(47): 50- 57. DOI: 10.7748/ns2008.07.22.47.50.c6634

Sheta & Mahmoud M. (2018). Effectiveness of Structured Educational Program on Knowledge and Practice among Nurses Regarding Body Fluid Balance Assessment for Critically Ill Patients IOSR Journal of Nursing and Health Science (IOSR-JNHS) 7(5). PP 74-83 e-ISSN: 2320–1959.p- ISSN: 2320–1940

Tiwaken S, Caranto, L, David J. (2015). The Real World: Lived Experiences of Student Nurses during Clinical Practice. International Journal of Nursing Science 5(2): 66-75.Caranto/83eda76cce99d9492599bbfc4596a428b3ee9749

Vijayan, A. (2011). A study to assess the knowledge and practices staff nurses regarding fluid and electrolyte administration in post-operative cardiac surgical patients admitted in cardiac surgical ICU and cardiac surgical ward, SCTIMST, Trivandrum. project report. Retrieved from: http://dspace.sctimst.ac.in/jspui/bitstream/123456789/1603/1/477.pdf Accessed at 27-5-2020

WHO 2019. Pedal it out to bring Egypt's heart beat back. 2019. Available at https://www.philips.com.eg/aw/about/news/archive/standart/news/press/2018/20180919-pedal-it-out-to-bring-egypt-s-heart-beat-back.html Accessed 25/6/2020

Young R. (2012). Perioperative Fluid and Electrolyte Management in Cardiac Surgery: A Review. The Journal of Extra Corporeal Technology, JECT. 2012;44:P20–P26. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4557443/