Pediatric Nurses' Practice towards Reporting of Intravenous Infusion Therapy Errors among Surgical Children

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Abstract

Background Children have a advanced risk of being exposed to intravenous infusion errors and are more predisposed to harm. **So the aim of this study** was to determine pediatric nurses' practice towards reporting of intravenous infusion therapy errors among surgical children**. Design** A descriptive research design was carried out. **Subjects.** A Convenience sampling of 30 nurses working at pediatric surgical unit in Assuit University Children Hospital. **Tools** two tools were used for example. A structured interview questionnaire sheet and an observational checklists. **Result**, revealed that mean± SD of the studied nurses practice scores through implementing standard infusion therapy (2.57±1.14,7±3.16 and4.3±1.39 respectively).Statistically significant relationship were shown between personal data such as age and qualification of the studied nurses' and their total score of practice related to intravenous infusion therapy P<0.035&0.023 respectively. **Conclusion** the study concluded that the studied nurses had unsatisfactory practice associated intravenous infusion therapy. **So the researchers recommended that**. Implementing educational training program for nurses' about intravenous infusion therapy to update their practice.

Key words: Pediatric nurses' practice, Intravenous infusion therapy errors, Children

Introduction

Medication administration errors arise regularly and are more likely to root serious harm and death than other types of medication errors. Intravenous medications pose certain hazards because of their greater complication and the several steps essential in their preparation, administration and monitoring**(Westbrook. et al., 2010).**Peripheral intravenous cannulation is the peak common source of infection due to the migration of skin flora on the site of insertion into the cutaneous region of cannula with outer surface of catheter due to great risk of infection and embolism**(O'grady. et al., 2011 and Dougherty & Lamb., 2009).**

Prevalence of local or blood stream infections are related to IV therapy. A considerable overall of deaths occur because of blood stream infections. This problem arises from the poor practices of intravenous cannulation or therapy. Furthermore, may effect the universal infection which can be mechanical or infectious similar to Occlusion, thrombosis, dislodgment, infiltration, leakage, phlebitis and scar formation are the mechanical

complication while fungal and bacterial sepsis are involved in infectious complication**(Ahmed et al.,2016 and Tuffaha,2014].**

Blood stream infections are too associated with peripheral or else intravenous tubes through contamination of microorganisms on the venous perforation site. Organisms include staphylococcus epidermis's, staphylococcus aureus, candida species and enterococci which introduced within contaminated infusion fluids **(Higginson., 2011 and Salgueiro et al.,2012).**

Nurses play an important role for provision of safe, children centered and effective care to the children and to minimize the severity of complications, puncture site must be constantly monitored for early identification of signs. Moreover, hands should be disinfected properly before collecting equipment, palpation of the veins, cannulation and insertion gloves on hand, repeat it when removing gloves before and after the contact with children **(Mogileeswari and Ruth M, 2016).**

Significance of the study

Fluid managing of the pediatric surgical patient denotes an essential aspect of medical care, mainly for primary treatment of the ill child. Prescribed intravenous (IV) fluids establish an significant treatment in hospital inpatients. As inpatient healthcare becomes more complex, in terms of examination and treatment, and as inpatient care develops busier with rapid throughput of patients, there are many opportunities for error in administration of prescribed treatments. inpatient healthcare becomes more complicated, in terms of investigation and treatment, and as inpatient care becomes busier with rapid throughput of patients, there are numerous opportunities for error in administration of prescribed treatments. Errors in administering prescribed drugs are well documented. Pediatric nurses' actions are complex and need constant awareness in providing quality care to the children. The nurses converted inadequate time to upgrading their knowledge and expertise with recent development in technology. Preventable medication errors not only harmfully affect human health but also increase the cost of healthcare. Intravenous (IV) fluids are commonly used in hospitalized children, primarily to sustain hydration and haemodynamic stability (**OngWoonMay., 2013**). So this study was designed in a trial to improve nurses' practices regarding care offered to children with intravenous infusion therapy.

Aim of the study:-

This study aimed to assess pediatric nurses' practice towards reporting of intravenous infusion therapy errors among surgical children

Research question

The study answered the question:

1. Does the nurses may have satisfactory practice about intravenous infusion?

2-What is the relationship between practice and personal data of pediatric nurses'?

Materials and Method

Research design: A descriptive research design was used in this study.

Setting: This study was carried out at children surgery unit in Assuit University Children Hospital which served the upper Egypt from Beni-Suef to Aswan .

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Sample

A Convenience sampling of 30 nurses who participated in the study at the previous setting, divided into 2 Baccalaureate nursing, 8 technical institute nursing and 16 diploma nursing .

Tools of data collection:-

Two tools were utilized to collect the pertinent data of the study:-

Tool I: A structured interview questionnaire sheet for nurses. It consists of Personal data include age, qualification, years of experience and attended previous training program about standard for infusion therapy.

Tool II: Observational Checklists: it was adopted from standards for infusion therapy **2018,** to evaluate nurses' practices given to child with intravenous infusion therapy through indirect observation. It includes steps before procedure, during procedure and after procedure

Scoring system of nurses' practice was developed by the researcher. The total grade of practice equal 72 grads, each item done scored 2 grads and zero if not done. The score was classified as:

Satisfactory 60% (69 marks and more).

Unsatisfactory< 60% (less than 69 marks).

Reliability and validity of the tools:

Tools concurred to a panel of five experts in the field of Pediatric Nursing and Medicine to experiment the content validity. No Modifications were carried out according to the panel judgment on the clarity of the sentences and appropriateness of the content. The content validity was 93%. Reliability analysis was conducted to investigate the instrument internal consistency, which used in the study; Cronbach alpha coefficients was calculated to examine the measurement reliability with multipoint items and its result was R=0.79.

Data collection:

An official letter was obtained from the Dean of the Faculty of Nursing to the Heads of the surgical units, as well as the Head of Nursing Services Administration Department, asking the necessary approvals to conduct the research. The aim and method of the study was clarified to administrators, and as well as potential participants.

Pilot study:

After developing the tools, a pilot study was implemented on three nurses (10%)of nurses in Surgical Unit at Assuit University children Hospital. A pilot study was achieved for objective to testing clarity, completeness, and to determine the time involvement. According to the results of pilot study. No modification, omissions, and/or additions were done. A jury acceptance of the final forms was secured prior to actual study work and the reliability was assessed in a pilot study. In the pilot study nurses participated not excluded from the sample.

Ethical considerations:

Ethical agreement was assumed of the Ethical Committee at the Faculty of Nursing Assiut University. The aim of the research was clarified by the researcher during direct personal communication earlier beginning to their participation in the study. Also the nurses told that they had the right to agree or disagree to join in the study. The written agreement was taken from wholly nurses participates in the study and they were informed that data was trustworthy between them and the researcher and used for the objective of the study only.

Field of the work

Data collection was done by the researchers during two months period from the beginning of January until the end of March 2019. It was finished through the routine work of the hospital. The researchers indirect observed each participated nurse to obtain the necessary information. The surgery department were working all days in the week. The sheet required about 10-20 minutes for filling it; about 2-3 cases were collected per day. The teaching guidelines were implemented for nurses in the form of brochures

Data analysis:

Data were analyzed using the statistical package for social science (SPSS) version 20 (Windows Microsoft). Statistics were presented using descriptive statistics in the form of frequencies and percentages for qualitative variables, means and standard deviations for quantitative variables. Quantitative continuous data were compared using Chi. Square to decide significance for non-parametric variable. Probability (p-value) less than 0.05 was measured significant.

Results

Table 1: Number and Percentage distribution of pediatric nurses' related to their personal data (n= 30)

Variable	No.	%
Age (in years)		
< 24	3	10.0
24 <28	6	20.0
28 < 33	10	33.3
≥33	11	36.7
Mean ±SD (range)	**32.3±7.62(21-49)**	
Years of experience		
<5	3	10.0
5 <10	12	40.0
≥ 10	15	50.0
Mean ±SD (range)	**13.9±8.53(2-32)**	
Qualification		
Secondary school of nursing	20	66.7
Technical Institute of nursing	8	26.7
Baccalaureate degree of nursing	2	6.6
Did attended previous training program about standard for infusion therapy		
Yes	0	0.0
No	30	100.0

Table 2:Number and percentage distribution of pediatric nurses' practice regarding intravenous infusion before insertion(n= 30).

Variable	Not Done		Done	
	No.	%	No.	%
Before procedure				
Adhere to Standard Precautions container	30	100	0	0
Identify the patient and explain the procedure to the caregiver(s) and patient, if age appropriate.	30	100	0	0
Explain the importance of protecting the IV site	6	20	24	80
Verify IV solution label with order for accuracy and read medication label	21	70	9	30
Temporarily stored the medication prior to administration	5	16.7	25	83.3
Selection of appropriate vascular access device and other supportive equipment (such as dressings and pumps, for Example).	20	66.7	10	33.3
Pharmacological issues (use of local aesthetics, management of anxious patients, and management of hematoma, phlebitis, pharmacology and pharmaceutics related to reconstitution and administration and drug administration).	5	16.7	25	83.3
Perform venipuncture	29	96.7	1	3.3

Table(3)Number and percentage distribution of pediatric nurses' practice during intravenous infusion therapy(n= 30).

Variable	Not Done		Done	
	No.	%	No.	%
During procedure				
Two nurses checked the preparation of a dangerous drug or intravenous infusion	17	56.7	13	43.3
Two nurses witnessed the administration of a dangerous drug	17	56.7	13	43.3
Mathematical calculations related to medications and administration	12	40	18	60
Observe flow rate, absorbed volume, insertion site and patient's general condition	28	93.3	2	6.7
Type of intravenous-related error				
a. Wrong rate	24	80	6	20
b. Wrong volume	23	76.7	7	23.3
c. Wrong mix	21	70	9	30
d. Drug incompatibility	23	76.7	7	23.3
If continuous IV therapy is prescribed, transfer drip chamber to new container when solution is completed from existing	10	33.3	20	66.7
Tape Very securely but not occluding vein so that you can easily check site for signs and symptoms of complications. A sterile; transparent dressing maybe used to rover the insertion site directly	12	40	18	60
Discard soiled supplies in appropriate containers	29	96.7	1	3.3
Donot allow bag to run dry and ah to enter tubing. if air should enter tubing				
a : Stop drip rate	0	0	30	100
b : Disconnect infusion from patient	1	3.3	29	96.7
c : Prime tubing by gravity until air is cleared	28	93.3	2	6.7
d: Clean injection pert with alcohol	3	10	27	90
e : Reconnect infusion with needle less adapter	15	50	15	50
Document in patient's record:				
a. Amount of solution /medication infused from previous container	30	100	0	0
b. Type and appearance of venous access site	19	63.3	11	36.7
c: Patient's response to procedure side effects and management	15	50	15	50
d:Communication with physician.	17	56.7	13	43.3

Table(4): Number and percentage distribution of pediatric nurses' practice regarding intravenous infusion after insertion (n= 30).

Variable	Not Done		Done	
	No.	%	No.	%
After Care :				
Documentation				
A : insertion site description, including location and any problems, such as redness, swelling leaking and treatment	30	100	0	0
B : Base of flushing catheter	9	30	21	70
D : Type of IV pump, if used, and all settings used' for .infusion, time started	11	36.7	19	63.3
c : Teaching done and patient caregivers response to teaching	24	80	6	20
D: patient /caregiver/s(s'} response to procedure, side effects and management	20	66.7	10	33.3
E : Instructions given tocaregiver	14	46.7	16	53.3
F : Patient / caregiver return demonstration of administration of IV medication started	17	56.7	13	43.3
G : Type and appearance of venous access site	26	86.7	4	13.3

Table(5): Mean scores of pediatric nurses' throughout standard infusion therapy(before, during and after intravenous infusion therapy).

Variable	Score	Range	Mean±SD
Pre procedure	6	1-6	2.57±1.14
During procedure	20	4-16	7±3.16
After procedure	12	0-6	4.3±1.39
Total Practice	38	5-26	13.87±4.71

Table 6 : Relationship between personal data of the studied nurses' and their total score of practice related to intravenous infusion therapy (n= 30)

Items	Un Satisfactory		Satisfactory		P .value
	No.	%	No.	%	
Age(in years)					
<24	1	3.85	2	50.00	
24< 28	6	23.08	0	0.00	0.035*
28 <33	9	34.62	1	25.00	
≥33	10	38.46	1	25.00	
Years of experience(in years)					
< 5	2	7.69	1	25.00	
5< 10	11	42.31	1	25.00	0.522
≥ 10	13	50.00	2	50.00	
Qualification					
Secondary school of nursing	16	61.5	0	0	
Technical Institute of nursing	8	30.8	2	50.0	0.023*
Baccalaureate degree of nursing	2	7.7	2	50.0	

-Chi-square test ,*Statistically Significant deference at P. value <0.05

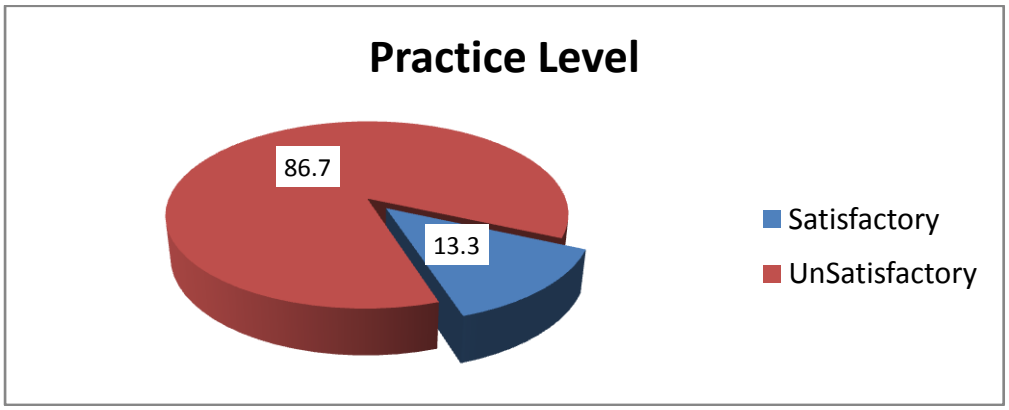

Figure1:Total practice scoreof the studied nurses' related to intravenous infusion therapy

Table (1): Show that, percentage distribution of pediatric nurses' related to personal data, It was found that one third of the nurses (36.7%) their age were ≥ 33 years. As regard to the years of experience it was noticed that 50 % of them ≥ ten years. Two thirds of nurses (66.7%) were proceeded after secondary school of nursing.

Table 2 Indicated that, percentage distribution of pediatric nurses' practice regarding intravenous infusion before insertion. It was noticed that more than two third (70%) of them not verify IV solution label with order for accuracy and read medication label. 100 % of them not clarify the technique to the caregiver(s) and patient, if age applicable.

Table (3): Represents percentage distribution of pediatric nurses' practice regarding intravenous infusion during insertion. It was noticed that vast majority 93.3% of the studied nurses' not observe flow rate, absorbed volume, insertion site and patient's general condition. While there was four error types (wrong mixture, wrong volume ,wrong rate and drug incompatibility (80%, 76.7%, 70.0%&76.7% respectively). 96.7% of them not remove soiled supplies in correct containers.

Table (4): Illustrate percentage distribution of pediatric nurses' practice regarding intravenous infusion after insertion. It was found that no one of the studied nurses record insertion site description, including location and any problems, such as redness, swelling leaking and treatment. Two thirds (66.7%) of them not record patient /caregiver/s (s'} response to procedure, side effects and management. The majority of them (86.7%) don't documented type and appearance of venous access site.

Table (5): Illustrated that, mean scores of pediatric nurses' throughout standard infusion therapy (before, during and after intravenous therapy).It was found that mean± SD practice scores of the studied nurses (2.57±1.14, 7±3.16 and 4.3±1.39 respectively).

Table (6): Indicated that relationship between pediatric nurses' practice level and personal data. It pointed to statistically significant

relationship were shown between personal data such as age and qualification of the studied nurses' and their total score of practice related to intravenous infusion therapy (P< 0.035* &P < 0.023* respectively).

Figure (1): Shows total practice score of the studied nurses' related to intravenous infusion therapy, the study revealed that majority of the studied nurses (86.7%) had unsatisfactory practice related intravenous infusion therapy.

Discussion

Administration of drugs is part of the skillful acts authorized to nursing. Intravenous therapy is an vital part of the treatment of many hospitalized children. It is the nurse's responsibility to confirm that the children receives the ordered solution and additives at the ordered rate. The extravasation of any IV fluid can reason serious permanent harm. Hourly checks are necessary in order to identify an extravasation early **(Graveto et al.,2016).**

As regarding the nurses' practice before intravenous insertion the present study showed that highest percentage of nurses' don't follow standards for infusion therapy. This is in the same line with **Cooper, (2019) who found that nurses not** follow standards for infusion**,** and our results contrasted by **Babu et al., (2016)**who mentioned that nurses' using standards for infusion therapy include (aseptic technique, prepare equipment and supplies, appropriate selection of catheter site) are very important steps must be taken in consideration before inserting of intravenous fluid In our opinion the nurses' not attained training program about standards for infusion therapy also may be attributed to nursing staff shortage and nursing work overload.

The present study revealed that no statistically significant difference between nurse experience and intravenous insertion in the same line with **Diacon, and Bell (2014),** who found that no relationship between experience and intravenous administration errors while disagree with **Asfour.,(2016)** who stated that nurses increased experience up to 6 years consequently their rates and severity of errors declined significantly this is an significant finding and clearly suggests that inexperienced nurses should be a target for training and supervision with a emphasis on correct intravenous rates.

Conclusion

Based on the results of the present study; it was concluded that studied nurses at pediatric surgical unit in Assiut University Children Hospital, majority of them had unsatisfactory practice related intravenous infusion therapy. There were statistically significant relationship were shown between personal data such as age and qualification of the studied nurses' and their total score of practice related to intravenous infusion therapy.

Recommendations:

In the light of the study results, the following recommendations are recommended.

- Educational programme for nurses can increase awareness about intravenous infusion therapy errors and other medication-related to safety issues

- Pediatric nurses should update their information and practice through continued nursing education, training, and frequently attending seminars and conferences especially in infection control skills.

- Educational guidelines, posters, pamphlets and manuals about intravenous infusion therapy should be provided and being available at each nursing stations in intensive care unit .

- Encourage the nurses to participate in training courses and conferences held by specialists in intravenous infusion therapy to update their knowledge and practice.

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Reference

Ahmed, B., Khan, I. M., & Beg, M. A. (2016): Frequency of Central Venous Catheter Related Infections and their Culture and Sensitivity Pattern. *Journal of Islamabad Medical & Dental College (JIMDC), 5*(2), 63-66.

Al Kubati SA, Ahmed N, Mohamed O, Fayed A, and Asfour A (2015): Health care workers' knowledge and practices regarding the prevention of central venous catheter-related infection. Am J Infect Control 43: 26–30.

Al Salmi SI and Kadium MG (2013): An education intervention to improve nurses' knowledge to reduce catheter-related bloodstream infection in Hemodialysis Unit Walden University. Int J Sci Res 438:2015.

Asfour H(2016): Fluid balance monitoring accuracy in Intensive Care units, *Volume 5, Issue 4 Ver. I (Jul. - Aug. 2016), PP 53-62v*www.iosrjournals.orgDOI: 10.9790/1959-0504015362 www.iosrjournals.org 53 | Page

Babu S, Bennett J, Binks R, Fee P, Fox B, Johnston A. , and Tighe S, (2016): Association of Anesthetists of Great Britain and Ireland: Safe vascular access 2016. Anesthesia, 71(5), 573-585.

Cooper, M. (2019): Improving Nurses' Knowledge of Central Line-Associated Bloodstream Infection., Walden Dissertations and Doctoral Studies, Walden University scholar orks)p>p. 40, 47

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

Dougherty, L., & Lamb, J. (Eds.).(2009):*Intravenous therapy in nursing practice*. John Wiley & Sons.

Graveto, J. M., Vidal Santos, D., Oliveira, S., & de Sousa, A: (2016): Nursing Care in Peripheral Intravenous Catheter: Impact on Microbiological Profile

Higginson, R. (2011): IV therapy and infection control in patients in the community. *British Journal of Nursing*, *20*(3).

Mohsen M. M., Safaan N. A., and Okby, O. M., (2016): Nurses' Perceptions and Barriers for Adoption of Evidence Based Practice in Primary Care: Bridging the Gap. American Journal of Nursing Research, 4(2), 25-33.

O'grady, N. P., Alexander, M., Burns, L. A., Dellinger, E. P., Garland, J., Heard, S. O., ... &Raad, I. I. (2011): Guidelines for the prevention of intravascular catheter-related

infections. *Clinical infectious diseases*, *52*(9), e162-e193.

Ong W. M: (2013): Medication errors in intravenous drug preparation and administration Jaya Med J Malaysia Vol 68, No(1) Pp 52-57

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.

Rosenthal J, Maki D, Jamulitrat S, Medeiros E, Todi S, and Gomez D, et al. (2010): International Nosocomial Infection Control Consortium (INICC) report, datasummaryfor2003–2008, issuedJune2009.AmJInfectControl38: 95–104.

Salgueiro-Oliveira, A., Parreira, P., &Veiga, P.(2012): Incidence of phlebitis in patients withperipheral intravenous catheters: the influence of some risk factors. *Australian Journal of Advanced Nursing, The*, *30*(2), 32.

Tuffaha, H. W., Rickard, C. M., Inwood, S., Gordon, L., & Scuffham, P. (2014). The epic3 recommendation that clinically indicated replacement of peripheral venous catheters is safe and cost-saving: how much would the NHS save?. *The Journal of hospital infection*, *87*(3), 183

Westbrook JI, Woods A, Rob MI, et al.,(2010): Association of interruptions

with increased risk and severity of medication administration errors.