

Assessment of Nurses' Application of Guidelines for Management of Children Undergoing Hemodialysis

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Abstract

*Chronic renal failure (CRF) refers to progressive, irreversible impairment in renal function in which the body ability to maintain metabolic, fluid and electrolytes balance fails. Hemodialysis (HD) is the most common method used to treat CRF. **Objective:** Assess nurses' application of guidelines for management of children undergoing HD. **Setting:** This study was conducted at the Kidney Dialysis Unit at Smouha University Children's Hospital. **Subjects:** All nurses who are responsible for providing direct care for children undergoing HD admitted to the previously mentioned setting. **Tool:** One tool was used; Nurses' Application of Guidelines for Management of Children Undergoing Hemodialysis Observational Checklist. **Results:** Findings of the present study revealed that all nurses had "satisfactory" application scores about guidelines for management of children before, during and after HD as well as infection control precautions and documentation (100% for each). **Conclusion:** All nurses had "Satisfactory" application score about guidelines for management of children undergoing HD. **Recommendations:** Booklet about recent guidelines for management of children undergoing HD procedure should be available in HD unit.*

Keywords: Nurses' Application; Guidelines; Children; Hemodialysis.

Introduction

Chronic Renal Failure (CRF) is a devastating medical, social, and economic problem for children and their families (Brück et al., 2015). It progresses to End Stage Renal Disease (ESRD). At this stage, life can be sustained only with transplantation or dialysis (Kaspar et al., 2016). Worldwide, there are more than 30 in every 100,000 children are suffering from CRF each year in 2017 (Naritata et al., 2017).

The etiology of CRF in children may be due to congenital malformations as reflux nephropathy and polycystic kidney. Additionally, it can occur secondary to systemic disorders that impair kidney

function as diabetes mellitus and hypertension (Ibrahim et al., 2019).

Chronic renal failure leads to severe complications as renal osteodystrophy, growth retardation, hypertension and cardiac dysfunction (pitman, 2013). It can be managed through transplantation or dialysis. Dialysis has two types; peritoneal dialysis and Hemodialysis (HD) (El Deeb, 2016).

Hemodialysis is the most common method used to treat CRF in children. It refers to a medical procedure that uses a special machine to filter waste products from the blood through a semi-permeable membrane (Kallenbach, 2015). In United States, the International Pediatric Nephrology Association (2018) estimated that 12.9 per million populations among

children less than 19 years were treated by HD.

The success of HD depends on nursing care provided for children. The HD nurses play a pivotal role in providing information, care, support, and therapeutic counseling to the pediatric patients and their families throughout the entire illness (Peimani & Pajouhi, 2010). Being aware of the recent nursing guidelines for management of children undergoing HD will allow nurses to make an appropriate clinical decision (James et al., 2014).

Aim of the Study

The aim of the study is to assess the nurses' application of guidelines for management of children undergoing HD.

Research Question

To what extent do nurses apply the guidelines for management of children undergoing HD?

Materials and Method

Materials

Design: A descriptive research design was used to accomplish the study.

Setting: This study was conducted at the Kidney Dialysis Unit at Smouha University Children's Hospital.

Subjects: All nurses who were responsible for providing direct care for children undergoing HD admitted to the previously mentioned setting during a period of four months comprised the study subjects. Their number was 21 nurses.

Tool:

Tool I: Nurses' Application of Guidelines for Management of Children Undergoing Hemodialysis Observational Checklist

This tool was developed by the researcher guided by the Egyptian Society of Nephrology and Transplantation Hemodialysis Guidelines 2019, Centers for Disease Control and Prevention (CDC) in

2017 and relevant literature (Kimmel & Rosenberg, 2020; Levy et al., 2016).

It was used to assess nurses' practices in the application of guidelines regarding to the management of children with CRF undergoing HD. It included the following:

Part I: Nurses' practices before the initiation of HD: as the preparation of environment, equipment and supplies, HD machine and children.

Part II: Nurses' practices during HD: as intradialytic patient assessment and machine monitoring, offering physical and psychological care.

Part III: Nurses' practices after the termination of HD: as termination of HD regarding environment, equipment and supplies, HD machine and children.

Part IV: Nurses' practices concerning infection control precautions: as washing hands, wearing personal protective equipment, discarding sharp items in appropriate container, disinfecting HD machine, dialyzing child with hepatitis B or C virus in a separate room with a separate machine.

Part V: Documentation before, during and after HD: Before HD as vital signs, investigations done, machine's data and body weight. During HD as vital signs, medication given. After HD as vital signs and body weight.

Nurses' characteristics, such as, age, level of education, years of experience, and attendance of training program about HD were attached to the tool.

Method

- Approval from the Ethical Research Committee of the Faculty of Nursing at Alexandria University was obtained.
- Official letter was directed to responsible authorities to take their permission to conduct the study after explaining its purpose.

- The tool was developed and was tested for its content validity by five experts in Pediatric Nursing field.
- Reliability of the tool was asserted using Cronbach Coefficient Alpha Test, where $r = 0.724$.
- A pilot study was conducted on 3 nurses to test the clarity and feasibility of the tool. Accordingly, the necessary modifications were done. Those nurses were excluded from the subject.
- Every nurse was asked individually about her characteristics in nurses' office during the break time.
- Every nurse was closely observed four times (two observations in the morning and two observations in the afternoon shifts) while performing HD (before, during and after HD).
- The mean of the four observations was taken.
- Data was collected over a period of four months starting from the beginning of July 2020 to the end of October 2020.

Ethical considerations:

- A formal witness written consent was obtained from the head nurse after explanation of the aim of the study.
- Confidentiality of participants' data was considered and privacy was ensured.

Statistical Analysis

Data were analyzed using the statistical package for social science SPSS (version 20). The level of significance selected for this study was ≤ 0.05 .

Results

Table (1) shows nurses application of guidelines according to their performance before HD. Regarding preparation of machine, all nurses primed lines and dialyzer with prescribed solution, set

dialysate flow, heparin infusion time and rate, session length as well as blood pump (100% of observations for each). Regarding preparation of the children, all nurses measured the children's body weight, blood pressure and assessed access site for signs of infection (100% of observations for each). Regarding initiation of the HD, all nurses cleansed each catheter exits with 70% alcohol or 10% povidone iodine and withdraw previously injected heparin from them (100% of observations for each).

Table (2) portrays nurses' application of guidelines according to their performance during HD. It all nurses measured blood pressure as well as observed and reported for occurrence of complications (100% of observations for each). While, none of them checked clotting time in 100% of their observations.

Table (3) shows nurses' application of guidelines according to their performance after HD. Concerning children, all nurses flushed lumens of catheters with 10 ml normal saline 0.9%, instilled heparin into lumens of each catheter as well as measured blood pressure and body weight (100% of observations for each). Regarding HD machine, all nurses cleansed the outer surface of machine with a bleach solution and performed chemical disinfection using citric acid after each session (100% of observations for each).

Table (4) clarifies the nurses' application of guidelines according to infection control precautions before, during and after HD. All nurses washed their hands before and after performing HD in addition to after removal of gloves. All nurses wore sterile gloves before performing or terminating HD (100% of observations for each). Conversely, none of them wore face shield before, during or after HD in 100% of their observations.

Figure (1) reveals that all nurses had "Satisfactory" application score about guidelines for management of children undergoing HD (100%).

Table (5) shows that there were no statistically significant differences between nurses' application total percent score of guidelines for management of children undergoing HD and their characteristics except concerning their years of experience.

Discussion

Chronic renal failure is a major health problem encountered among children worldwide. Hemodialysis is a widely used mode of RRT in infants and children with ESRD (Madiha et al., 2017). It is a highly stressful situation that requires specific skills to achieve optimal outcomes.

The present study revealed that all nurses prepared HD machine according to guidelines. This could be attributed to that the machine is considered the core of HD procedure and without its preparation, no HD could be delivered. This result is consistent with the result of Ahmed (2007) who found that all nurses attained good score in the preparation of HD machine.

It was found from the current study that all nurses in their observations measured blood pressure before, during and after HD. These findings might be due to the nurses' awareness about the occurrence of intradialytic complications as hypotension. These findings were in the same line with the findings of Ibrahim et al. (2019) who reported that the majority of the nurses had competent practice level regarding measuring blood pressure before, during and after HD.

The results of the present study revealed that all nurses measured body weight before and after HD. These findings may be explained that HD nurses appreciate the importance of measuring body weight before HD to determine the ultrafiltration rate. Also, they measured it after HD to evaluate the efficiency of HD session. These results stand in opposition with the results of Hassona (2011) who reported that all nurses had unsatisfactory practice score regarding measuring body weight during HD.

The findings of the present study showed that all nurses assessed the catheters for infection before initiating HD, cleansed catheters exit with 70% alcohol or 10% povidone iodine, injected heparin into catheters after terminating HD. These findings could be related to nurses' awareness that keeping access site patent and infection free ensures that HD will go smoothly without complications. Similar findings were reported by Abdalmajed (2017).

The result of the present study reflected that all nurses used citric acid in the disinfection of the HD machine after HD. This result can be attributed to that nurse usually follow the policy of their HD unit. Similar result was reported by Ebrahim (2009) who found that all nurses rinsed fluid pathway after every HD session with citrosteril.

Hand decontamination should be performed before the initiation of HD procedure, during the HD procedure, after removal of gloves and after touching children's surroundings (Eltantawy, 2021). The current study findings revealed that all nurses decontaminated their hands before the HD procedure, after terminating HD procedure as well as after removal of the gloves. This might be due to the availability of hand wash facilities in HD. The findings of the present study are not supported by the findings of Ebrahim (2009) who found that the majority of nurses did not decontaminate their hands before HD. In addition, (Yanai et al. (2006) found that the minority of nurses washed their hands after removal of the gloves and after terminating HD procedure.

Personal protective equipment such as gloves, aprons and face shield is an important aspect of infection prevention (Brown, 2019). The current study showed that none of the nurses wore plastic apron during the HD or face shield before, during or after HD. This might be related to lack of such equipment. In this respect, Talaat et al. (2006) stated that the lack of infection control facilities was a major hindering

factor to the application of infection control precautions in HD unit.

The result documented that all nurses wore sterile gloves before both initiating and terminating HD. These findings could be related to nurses' awareness about its importance in prevention of infection. These findings are contradicted with the findings of Ebrahim (2009) who found that the minority of nurses wore sterile gloves before both initiating and terminating HD.

The finding of the current study revealed that all nurses had "Satisfactory" mean score about application of guidelines for management of children undergoing HD. The result of the current study could be attributed to continuous supervision from the head nurse of the HD unit. This finding was not congruent with Ibrahim et al. (2019) who reported that more than half of nurses had incompetent level of total practice score regarding care of children undergoing HD.

Conclusion

Based on the findings of the present study, it is concluded that all nurses had "Satisfactory" application score about guidelines for management of children undergoing HD procedure.

Recommendations

- The recent guidelines for management of children undergoing HD should be applied by pediatric nurses in HD unit.
- Continuous training programs on application of guidelines for management of children undergoing HD procedure in HD unit.
- Booklet about recent guidelines for management of children undergoing HD procedure should be available in HD unit.

Table (1): Nurses' application of guidelines according to their performance before HD

Items	Total (n=84)			
	Done		Not done	
	No	%	No	%
I. Preparation of the HD machine				
- Priming all lines and the dialyzer with the prescribed solution	84	100.0	0	0.0
- Checking the dialyzer and circuit for air bubbles	84	100.0	0	0.0
- Setting the dialysate flow	84	100.0	0	0.0
- Setting heparin time and infusion rate	84	100.0	0	0.0
- Setting session length	84	100.0	0	0.0
- Setting the blood pump at (150-200) m/ml	84	100.0	0	0.0
II. Preparation of the children				
- Measuring body weight	84	100.0	0	0.0
- Measuring temperature	84	100.0	0	0.0
- Measuring pulse	84	100.0	0	0.0
- Measuring respiration	0	0.0	84	100.0
- Measuring blood pressure	84	100.0	0	0.0
- Assessing access site for signs of infection	84	100.0	0	0.0
III. Initiation of the HD procedure				
- Cleansing each catheter exit with 70% alcohol or 10% povidone iodine	84	100.0	0	0.0
- Unclamping catheters and withdraw injected heparin from them	84	100.0	0	0.0
- Priming each catheter with 10 ml normal saline 0, 9%.	84	100.0	0	0.0
- Connecting the blood lines to each catheter	84	100.0	0	0.0

Table (2): Nurses' application of guidelines according to their performance during hemodialysis

Items	Total (n=84)			
	Done		Not done	
	No.	%	No.	%
I. Intradialytic patient's assessment and HD machine monitoring				
- Measuring temperature hourly	84	100.0	0	0.0
- Measuring pulse hourly	84	100.0	0	0.0
- Measuring respiration hourly	0	0.0	84	0.0
- Measuring blood pressure hourly	84	100.0	0	0.0
- Checking clotting time hourly	0	0.0	84	0.0
- Monitoring of vascular access and lines connection	78	92.9	6	7.1
- Giving prescribed medication as heparin and iron	84	100.0	0	0.0
- Observing for occurrence of complications as: muscle cramps	84	100.0	0	0.0

n=84 (number of observations)

HD: Hemodialysis

Table (3): Nurses' application of guidelines according to their performance after hemodialysis

Items	Total (n=84)			
	Done		Not done	
	No.	%	No.	%
I. Termination of procedure as regards children				
- Connecting prescribed solution to the blood lines	84	100.0	0	0.0
- Turning on solution to return blood to children through arterial line	84	100.0	0	0.0
- Turning on blood pump to return blood to children through venous line	84	100.0	0	0.0
- Disinfecting the catheter moving from the hub toward the body	84	100.0	0	0.0
- Disconnecting the blood line from the catheter	84	100.0	0	0.0
- Flushing the lumens of the catheters with 10ml of normal saline 0.9%	84	100.0	0	0.0
- Instilling heparin into each catheter	84	100.0	0	0.0
- Measuring temperature	84	100.0	0	0.0
- Measuring pulse	84	100.0	0	0.0
- Measuring respiration	0	0.0	84	100.0
- Measuring blood pressure	84	100.0	0	0.0
- Measuring body weight	84	100.0	0	0.0
II. Termination of procedure as regards machine				
- Disconnecting the used blood tubing and dialyzer from dialysis machine	84	100.0	0	0.0
- Cleansing outer surface of machine with a bleach solution	84	100.0	0	0.0
- Performing chemical disinfection using citric acid after each session	84	100.0	0	0.0

Table (4): Nurses' application of guidelines according to infection control precautions before, during and after hemodialysis procedure

Items	Total (n=84)			
	Done		Not done	
	No.	%	No.	%
Before the initiation of HD procedure				
- Washing hands	84	100.0	0	0.0
- Wearing sterile gloves	84	100.0	0	0.0
- Wearing plastic apron	80	95.2	4	4.8
- Wearing face shield	0	0.0	84	100.0
During the HD procedure				
- Washing hands before any contact with children	3	3.6	81	96.4
- Changing sterile gloves between children	84	100.0	0	0.0
- Wearing plastic apron before any contact with children	0	0.0	84	100.0
- Wearing face shield before any contact with children	0	0.0	84	100.0
After the HD procedure				
- Washing hands after terminating procedure	84	100.0	0	0.0
- Washing hands after removal of gloves	84	100.0	0	0.0
- Wearing sterile gloves before terminating procedure	84	100.0	0	0.0
- Wearing plastic apron before terminating procedure	80	95.2	4	4.8
- Wearing face shield before terminating procedure	0	0.0	84	100.0

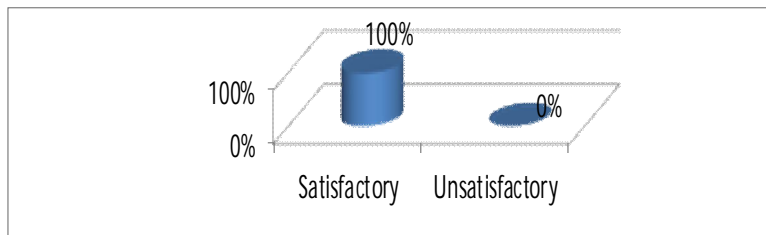


Figure (1): Total percent score of nurses' application of guidelines for management of children undergoing hemodialysis procedure

Table (5): Relation between nurses' application total percent score of guidelines for management of children undergoing hemodialysis procedure and their characteristics

Items	Total (n=21)	Test of Significance
	Mean ± SD	
Age (years)		
- <25	132.00 ± 0.000	F = 0.526 P = 0.670
- 25-	130.84 ± 1.952	
- 35-	131.21 ± 1.503	
- ≥45	132.17 ± 1.267	
Level of education		
- Secondary school of nursing diploma	132.75 ± 0.500	F = 0.601 P = 0.559
- Technical institute of nursing diploma	130.96 ± 1.513	
- Bachelor degree of nursing	131.46 ± 2.206	
Years of experience		
- <1	131.56 ± 1.780	F = 3.356 P = 0.044*
- 1-	128.13 ± 1.959	
- 5-	131.13 ± 0.991	
- ≥10	131.56 ± 0.878	

F ANOVA test * Statistically significant at $p \leq 0.05$

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