



Effect of Education Program on Infection Control Practices of Nurses at Hemodialysis Unit in Sohag University Hospital

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ABSTRACT

Background: While potentially preventable, hospital acquired Infection is still the second cause of mortality in hemodialysis patients. Education about infection prevention measures and infection control guidelines could improve healthcare workers compliance with standard precautions. **Objectives:** To determine the effect of education program about infection prevention on nurses' practices at the hemodialysis unit in Sohag University Hospital. **Methods:** This is a quasi-experimental hospital study that was conducted during a six-months period between 1st January 2022 to 30th June 2022. We observed infection prevention practices of hemodialysis nurses during initiation and terminations of the hemodialysis sessions for patients with arterio-venous shunt and central catheters. Data before and after the education program were compared. **Results:** A total of 23 nurses were included, with an average age of 26.7 years and average experience of 7.2 years. The majority were females (73.9%) and only 43.5% received previous training in infection control. There was a statistically significant improvement of infection control practices after education program (p-value <0.001). The improvement included arterio-venous shunt initiation, arterio-venous shunt termination, catheter initiation, and catheter termination (Mean scores of practices after education program became 81%, 86%, 81.3%, 81.3% respectively. P-value <0.0001). The main areas of improvement were hand hygiene practices and scrub the hub protocol. **Conclusions:** The implemented education program improved overall nurses' infection control practices during initiation and termination of dialysis procedure among patients with arterio-venous shunt and central catheter, especially hand hygiene and scrub the hub protocol. The findings underscore the importance of continuous infection control training of dialysis nurses.

INTRODUCTION

Infection prevention is an applied, evidence-based practice that protects patients and healthcare workers from the danger of infections that could be easily prevented. By avoiding health care-associated infections, we prevent the danger that could reach to mortality, reduce the cost, decrease the risk of antimicrobial resistance and ensures high quality health services.¹ Hemodialysis is the essential and main treatment for end-stage renal disease, infection control is a must in hemodialysis technique.² The nature of hemodialysis unit differs from other hospital wards, because of the lay-out and associated conditions in most hemodialysis

units, in which a lot of patients encounter extracorporeal treatment with extended periods of blood exposures in the same area and most of the time with one nurse takes care of multiple patients at the same time, are probable factors that makes transmission of infections high.³ Hospital acquired infections are the second cause of mortality in hemodialysis patients although it could be avoided by strict infection control measures.⁴ To prevent transmission of nosocomial infections especially hepatitis B and C in dialysis units, The Centers for Disease Control and Prevention CDC has put list of guidelines that help against infection transmission.⁵

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Education about infection prevention measures and infection control guidelines improves healthcare workers compliance to standard precautions. It is also crucial for preventing hospital acquired infection and decreasing the rate of infection.⁶ Thus, infection control education is critical in laying the foundation for nursing staff to improve their infection control practical skills, which is required in the clinical field.

This study aimed to assess the effect of education program about infection prevention on nurses' practices at hemodialysis unit in Sohag University Hospital

METHODS

This is a quasi-experimental study that included three phases; pre-interventional phase, educational program, and post-interventional phase. The study was carried out in a hemodialysis unit at Sohag university hospital. Observations of infection control practices were done for all 23 nurses at hemodialysis unit in Sohag University Hospital

Data collection: Data was collected during six-months period between 1st January 2022 to 30th June 2022 through direct observations of all hemodialysis nurses (23 nurse) while doing initiation and termination of the hemodialysis sessions during the three shifts of dialysis.

Study phases: *pre-interventional phase:* This was before the education program, we did direct observation of nurses' infection control practice for 3 months while doing initiation and termination of the hemodialysis sessions, we collected 178 observations while doing arterio-venous shunt initiation, 189 observations while doing arterio-venous shunt termination, 54 observations during initiation of patients with central catheter and 78 observations during termination of dialysis of patients with catheter. Observations were done according to *CDC hemodialysis audit tool checklists*. **Education program:** Education about Infection prevention was done for one month. Education session is done one to one to the 23 nurses in every shift during their spare time. The Education is done for all hemodialysis unit nurses that are involved in direct patient care using CDC dialysis guidelines from CDC website. We also displayed the CDC Video: *Preventing BSIs in Outpatient Hemodialysis Patients: Best Practices for Dialysis Staff*. The education program covered aspects regarding Gloving and proper hand hygiene technique, scrub the hub protocol, all the steps regarding infection control needed for connection and disconnection process of dialysis.

Table 1: Sociodemographic characteristics of the studied nurses at hemodialysis unit in Sohag university hospital

Sociodemographic Characteristics	N (%)
Gender	
• Male	6 (26.1)
• Female	17 (73.9)
Nursing education degree	
• 2ry school of nursing	7 (30.4)
• Technical institute of nursing	16 (69.6)
Previous training in infection control	
• Yes	10 (43.5)
• No	13 (56.5)
Age	
• <28 years	18 (78.3)
• >28 years	5 (21.7)
Years of experience	
• <7 years	15 (65.2)
• >7 years	8 (34.8)
Mean age \pm SD: 26.7 \pm 3.3	
Median age (Range): 26 (22-34 years)	
Mean years of experience \pm SD: 7.2 \pm 4.6	
Median years of experience (Range): 5(1-6)	

Post-interventional phase: Reassessment of the infection control practices is done for 2 months period after the education program. We collected 102 observations of arterio-venous shunt initiation, 109 observations of arterio-venous shunt termination, 44 observations regarding initiation of patients with central catheter and 54 observations regarding termination of dialysis with central catheter. Observations were done according to *CDC hemodialysis audit tool checklists*.

Tools of the study: we used *CDC hemodialysis audit tool checklists* (available at CDC website regarding dialysis safety)⁷ that observes items of infection prevention practices while doing arterio-venous fistula initiation, arterio-venous fistula termination, catheter initiation and catheter termination. The observations were done before and after education program about infection control.

Data Analysis: Data was subjected to analysis and tabulation using SPSS version 21 was used for data entry and analysis. Quantitative variables were expressed as mean, standard deviation or median and interquartile range (IQR). Qualitative data were presented as number and percentage. Wilcoxon signed-rank test was used to compare practice scores before and after education program (P-value was significant if < 0.05).

Table 2: Comparison between infection control practices regarding Arteriovenous shunt initiation before and after education program in hemodialysis unit at Sohag University Hospital

Items of checklist	Before N*=178		After N*=102	
	Number (%)		Number (%)	
Site cleaned with soap & water	69	38.8	61	59.8
Hand hygiene Performed	41	23	71	69.6
Clean gloves	148	83.1	87	85.3
Apply skin aseptic	178	100	102	100
Aseptic connection technique	166	93.3	102	100
Remove gloves & perform hand hygiene	43	24.2	73	71.6
Overall score**				
Mean score (\pm SD)	60.3% \pm 16.7		81% \pm 11.4	
Median	50%		83.3%	
Interquartile range IQR	(50-66.6%)		(66.6-83.3%)	

*N= number of observations, ** Wilcoxon signed rank test p-value <0.001

Table 3: Comparison between infection control practices regarding Arterio-venous shunt termination before and after education program in hemodialysis unit at Sohag University Hospital

Items of checklists	Before N*=189		After N*=109	
	Number	(%)	Number	(%)
Hand hygiene Performed	42	22.2	77	70.6
Wearing clean gloves	161	85.2	96	86.2
Aseptic disconnection technique	169	89.4	109	100
Clean bandage applied to the site	189	100	109	100
Remove gloves & perform hand hygiene	42	22.2	80	73.4
Overall score**				
Mean score (\pm SD)	63.8% \pm 8.4		86% \pm 14.5	
Median	60%		80%	
Interquartile range IQR	(60-80%)		(80-100%)	

*N= number of observations, ** Wilcoxon signed rank test p-value <0.001

RESULTS

Table 1 shows the characteristics of nurses at the hemodialysis unit. A total of 23 nurses were included, with an average age of 26.7 years and average experience of 7.2 years. The majority were females (73.9%), holding high diploma of technical institute of nursing (69.6%), and only 43.5% received previous training in infection control.

Table 2 shows highly statistically significant improvement of nurses' practices during initiation of dialysis session in patients with arterio-venous shunt AVI (p-value <0.0001) after the education program. The percentage of performing hand hygiene before the procedure increased from 23% before education program to 69.6% after. Also, the percentage of performing hand hygiene after the procedure was increased from 24.2% to become 71.6% after the implemented education.

Table 3 shows highly statistically significant improvement of nurses' practices during termination of dialysis session in patients with arterio-venous shunt (p-value <0.0001) after the education program. The percentage of performing hand hygiene before termination the dialysis procedure in arterio-venous shunt patients was 22.2% that increased to 70.6% after the education program. Also, rates of performing hand hygiene after the procedure increased to 73.4% after the education program.

Table 4 shows a highly statistically significant improvement of nurses' total practices during initiation of dialysis procedures in patients with central venous catheter (p-value <0.0001) after the education program.

Table 4: Comparison between infection control practices regarding catheter access initiation care before and after education program in hemodialysis unit at Sohag University Hospital

Items of the checklist	Before N*=54		After N*=44	
	Number	%	Number	%
Hand hygiene performed	13	24.1	32	72.7
Wearing clean gloves	47	87	39	88.6
Scrub the hub	0	0	32	72.7
Aseptic connection	51	94.4	44	100
Hand hygiene after	15	27.8	32	72.7
Overall score**				
Mean score (\pm SD)	46.6% \pm 14		81.3% \pm 15.7	
Median	40%		80%	
Interquartile range IQR	(40-60%)		(60-100%)	

*Number of observations, ** Wilcoxon signed rank test p -value <0.001

Table 5. Comparison between nurses' infection control practices regarding catheter access termination care before and after education program at hemodialysis unit in Sohag University Hospital

Items of the checklist	Before N*=78		After N*=54	
	Number	%	Number	%
Hand hygiene before	20	27.4	39	72.2
Wearing clean gloves	61	83.6	46	85.2
Scrub the hub	0	0	38	70.4
Aseptic disconnection	67	91.8	54	100
Hand hygiene after	20	27.4	39	72.2
Overall score**				
Mean score (\pm SD)	46% \pm 14		81.3 % \pm 15.8	
Median	40%		80%	
Interquartile range IQR	(40-60%)		(60-100%)	

*Number of observations, ** Wilcoxon signed rank test p -value <0.001

Scrub the hub protocol wasn't done at all before education program, and soon after the education program it was done by a rate of 72.7%. The percentage of hand hygiene performed before and after the procedure was increased after the education program.(%72.7)

Table 5 shows a highly statistically significant improvement of nurses' total practices during termination of dialysis procedures in patients with central venous catheter (p -value <0.0001). Scrub the hub protocol wasn't done at all before education program, and after education program it was done by a rate 70.4%. Also, the percentage of performing hand hygiene before and after the catheter termination procedure was increased to 72.2% after the education program.

DISCUSSION

Several studies have studied infection control practices and hand hygiene at hemodialysis units

and the importance of education programs on improving those practices. In line with our study, the study done in Vietnam at a district level hemodialysis unit that included observations of infection preventions practices of all 12 nurses worked at the hemodialysis unit.

Hand hygiene compliance was low at 27%, Glove use was high 76%.⁸ Our results are consistent with a cross-sectional descriptive study carried out among nurses at El-Hawwary Renal Center in Benghazi, Libya. When caring for patients, taking blood samples, and changing gloves between patients, more than 90% of the nurses in this study consistently used gloves. Nonetheless, it has been noted that a percentage of nurses (24%, 29%, and 18%) did not always follow hand washing protocols.⁹ Our research aligns with a descriptive study carried out at Abo Homos Hospital and Kafr El Dwar General Hospital, two hospitals under the Ministry of Health.

The study shows that, in terms of hand hygiene, the majority of nurses at both institutions had low compliance levels with infection control standard precautions (33.3%–58.05).¹⁰ Our findings align with a quasi-experimental study that involved 32 nurses working in the pediatric renal dialysis unit at Assiut Children University Hospital. The study found that the nurses' practice scores for hand-washing, wearing gloves, mask-wearing, catheter insertion, and skin preparation technique significantly improved after the education program, with the mean total practice score going from 66.17 ± 8.67 to 78.00 ± 6.82 .¹¹ Also we are in line with the study conducted in hemodialysis unit at Assiut University Hospital that revealed improvement of nurse's total practice about infection after an educational nursing program.¹² Our results are also consistent to the study conducted in a tertiary care facility hemodialysis unit at Tanta city, Egypt. The results showed improvement in percentage of the nurses who were adherent to best practices after the education program.¹³ Our findings are also in line with an educational interventional, hospital-based study was conducted in a dialysis unit in India. There was statistically significant difference in Compliance with all the parameters of infection prevention pre- and post-intervention.¹⁴

Limitations of the study: The limited number of nurses in the dialysis unit limited our ability to increase the sample size. Future studies may consider multicenter studies to increase the sample size.

CONCLUSIONS

The implemented education program improved overall nurses' infection control practices during initiation and termination of dialysis procedure among patients with arterio-venous shunt and central catheter, especially hand hygiene and scrub the hub protocol. The findings underscore the importance of continuous infection control training of dialysis nurses.

Ethical consideration

Approval of the concerned administrative authority was obtained. Written informed consent after explaining the aim of the study was obtained from nurses who participated in the study.

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