Original Article

Knowledge of Nurses in Hemodialysis Units

Evaluating the Efficiency of Potential Risk Program in Enhancing Nurses' Knowledge and Practices at Hemodialysis Units

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ABSTRACT

Objective: To assess the efficacy of a potential risks training program on the skills and knowledge of nurses in hemodialysis units.

Study Design: A quantitative quasi-experimental study

Place and Duration of Study: This study was conducted at the hemodialysis centers at Karbala City namely Imam Al-Hussein Medical City (Dr. Adel Al-Sabbah Hemodialysis Center and Habib Ibn Mazaher Al-Asadi center) and Imam Al-Hassan Al-Mujtaba Teaching Hospital Iraq from 1st January 2025 to 30th June 2025.

A quantitative quasi-experimental study design comprising of 100 purposively selected nurses in two hemodialysis units in Karbala randomly assigned to different groups; control and interventional. The knowledge questionnaire and the practices observational checklist were used to collect data, and their validity was based on expert advice and their reliability was ensured by statistics.

Results: The majority of the study population was between the ages of 22 and 26 and 27 and 31. Both groups were equally distributed in terms of sex (66% male, 34% female). The findings showed that both group members' pre-test knowledge and practice levels were inadequate. On both post-tests, however, the interventional group demonstrates a notable improvement in context of knowledge and practices.

Conclusion: The educational program demonstrated its efficiency in enhancing nurses' knowledge and practices regarding possible risks in hemodialysis units. Continuous in-service training, and conducting further studies with expanded sample sizes and governorates were recommended.

Key Words: Patient Injuries, Hemodialysis, Hand hygiene, Medication errors

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INTRODUCTION

Nurses are essential for the safe management of HD patients in healthcare environments. They play a crucial role in interrupting the transmission of infection by adhering to prevention and control of infections protocols.[1]

The most efficient method of preventing healthcare-associated infection, particularly in hemodialysis units, is hand hygiene, which necessitates the appropriate technique, appropriate use of sanitizers, and frequent checking of adherence.[2,3]

Hands that are visibly dirty need to be washed using soap and water, otherwise they should be sanitized using alcohol.

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The five-moment of Hand Hygiene guide by WHO assist in minimizing healthcare-associated infections.[4]

Proper hand hygiene and infection control policies are required to be maintained by having sufficient hand washing and sanitizing stations, continuous training, and monitoring of the healthcare personnel.[5]

Simple Hand Sanitization (SHS) is used to eliminate temporary microbes, sweat, oil, and dead cell of the hands. Liquid soap and 40-60 seconds of rubbing hands, followed by rinsing and using disposable tissue should be used by healthcare workers.[6]

Personal protective equipment including fluid-proof gown, face mask, gloves, and face shield or eyewear in hemodialysis should be used when the staff might be exposed to blood during a procedure, e.g., when starting or ending dialysis sessions, inserting catheters, and disinfecting the area. Selection and use of PPE must be based on risk assessment and adherence to CDC guidelines. Nurses must be trained in donning and doffing PPE correctly to minimize contamination.[7]

The polypharmacy in HD patients is sometimes viewed as a burden resulting in poor patient adherence. The consequence of poor adherence is the inability to get the desired outcome of the treatment, prescribing medications that are unnecessary and, therefore, wasting money and time.[8]

Polypharmacy can cause drug-related problems, including wrong drug choice, incorrect dose or route, side effects, interactions, missed doses, unaddressed indications, and unnecessary medications.[9]

As far as hemodialysis units' types of errors are concerned, slightly over 11% of medication errors were related to intravenous heparin (both omitted and dose). Other faults included such as vitamin D, erythropoietin, and antibiotics.[10]

Dialysis patients are more likely to experience falls because most of them are older than 65. Risk factors for falls include age, diabetes, motor strength, pharmaceutical use, prior fall incidents, and visual impairment.[11] The lack of education about fall prevention in nurses and nephrologists indicates the necessity to learn about the occurrence of falls, as well as about risk factors in this group of patients.[12]

A report was made for each fall, and episodes of orthostatic hypotension (drop in systolic > 20 mmHg) following dialysis were monitored. Fall risk can be decreased by monitoring blood pressure, educating staff, and assisting high-risk patients.[13]

METHODS

This quantitative quasi-experimental study was conducted at hemodialysis centers at Karbala City namely Imam Al-Hussein Medical City (Dr. Adel Al-Sabbah Hemodialysis Center and Habib Ibn Mazaher Al-Asadi center) and Imam Al-Hassan Al-Mujtaba Teaching Hospital Iraq from 1st January 2025 to 30th June 2025 vide letter No. 57 Dated 17th December 2024. A purposive non-probability sample of 100 nurses with at least one year of experience in hemodialysis units at Imam Al-Hussein and Imam Al-Hassan Al-Mujtaba hospitals in Karbala was recruited. Participants were allocated equally and randomly into control and interventional groups. The study used a questionnaire adapted from Wadi14 and an observational checklist, adopted from the CDC.15 was applied and observed three times during pre-test, post-test 1, and post-test 2 phases. The questionnaire used yes/no questions with a 2/1 scale to rate and score, with knowledge scales of unsatisfied (>1.5), fair (=1.5), and good (<1.5). Performance was also noted in three audits with a score of always (3), sometimes (2), never (1), and poor (1.0-1.6), fair (1.7-2.39), and good (2.4-3.0).

An expert panel of nine faculty members with at least 15 years of experience assessed the validity of the instruments and program, incorporating their feedback. Factor analysis results showed a KMO value of 0.780 and a significant Bartlett's Test, indicating acceptable validity. At Dr. Adel Al-Sabbah Hemodialysis Center, a pilot test was done among ten hemodialysis nurses. Two-week test-retest reliability of the questionnaire indicated a high correlation coefficient of 0.81, a coefficient of 0.827 was obtained by inter-rater reliability of the checklist, both are acceptable.

The needs assessment revealed unsatisfactory knowledge and practices. Both groups underwent a pretest. The control group was not subject to any intervention, and the post-tests were two weeks apart. The interventional group, which is subdivided into small groups of 4-6 nurses, had to attend 30–45 minutes educational sessions in the morning and evening shifts and do post-tests right after the sessions and in 2 weeks. The SPSS-26 was used to analyze the data. Baseline homogeneous was evaluated using T-tests as the two experimental and control groups. The level of significance was divided into highly significant ($P < 0.01$), significant ($0.01 > P < 0.05$), and non-significant ($P > 0.05$).

RESULTS

The subjects of both groups did not differ according to marriage status, age, or sex ($p = 0.05$), except in educational qualification ($p = 0.036$). A higher pe2rcentage of the participants were diploma holders in the interventional group (44%), in comparison to high proportion of bachelors (68%) and analytic completion of bachelor-level courses (2%) in the control group (Table 1).

The knowledge of hand hygiene of the interventional group improved greatly following the educational program. As an illustration, there was an increase in the level of understanding that improved adherence by 1.50 to 1.82 and knowledge about alcohol-based hand rub use by 1.58 to 1.98. The exposure to germs and handwashing technique also improved, whereas the control group experienced minor improvements, which also indicates the effectiveness of the intervention (Table 2).

The interventional group improved their knowledge about PPE steadily through all tests, with higher mean scores and lower variability. As an example, the knowledge about hand hygiene was increased, such as the comprehension of using gloves, disposing, reusing, and removing PPE improved to 1.88. However, control group did not change significantly, which is an indication of the effectiveness of the intervention (Table 3).

The interventional group was steadily increasing their learning about medication errors in the hemodialysis units, and such areas as prevention of drug errors, and prompt administration of enalapril increased. Despite the lack of statistical significance ($p>0.05$), the effect was positive, whereas the control group was not subject to substantial change (Table 4).

No statistically significant difference was found between interventional and control groups ($p>0.05$), but the knowledge regarding the prevention of injuries, such as the use of side rails (1.78) and the use of fall interventions (1.90) improved consistently in the former, whereas the latter experienced slight changes, which is a hint that the educational intervention made a positive impact (Table 5).

Table No.1: Demographical Characteristics (n=50)

Characteristics		Control group		Interventional group		P value
		No.	%	No.	%	
Age (years)	22-26	26	52.0	14	28.0	0.162
	27-31	8	16.0	21	42.0	
	32-36	7	14.0	7	14.0	
	37-41	5	10.0	6	12.0	
	42-46	4	8.0	3	6.0	
Gender	Female	17	34.0	17	34.0	0.134
	Male	33	66.0	33	66.0	
Marital status	Single	20	40.0	31	62.0	0.160
	Married	30	60.0	19	38.0	
Educational Qualifications	Secondary Nursing School	4	8.0	2	4.0	0.036
	Diploma	11	22.0	22	44.0	
	Bachelor	34	68.0	26	52.0	
	Postgraduate	1	2.0		100.0	
Residence	Rural	12	24.0	13	26.0	0.69
	Urban	38	76.0	37	74.0	

Table No. 2: Interventional and control group nurses' knowledge toward hand hygiene at hemodialysis units

Control Group				Interventional Group			
Pre-test	Post-test 1	Post-test 2	P value	Pre-test	Post-test 1	Post-test 2	P value
1.10±0.30	1.10±0.30	1.10±0.30	0.263	1.50±0.50	1.80±0.40	1.82±0.38	0.082
1.38±0.49	1.66±0.49	1.52±0.50		1.58±0.49	1.86±0.35	1.98±0.14	
1.44±0.50	1.30±0.46	1.32±.047		1.52±0.50	1.74±0.44	1.90±0.30	
1.38±0.49	1.48±0.50	1.46±.050		1.46±0.50	1.66±0.47	1.76±0.43	
1.42±0.49	1.52±0.50	1.38±.049		1.52±0.50	1.76±0.43	1.74±0.44	
1.44±0.50	1.60±0.49	1.34±.047		1.52±0.50	1.92±0.27	1.88±0.32	

Table No.3: Interventional and control group nurses' knowledge toward personal protective equipment at hemodialysis units

Control Group				Interventional Group			
Pre-test	Post-test 1	Post-test 2	P value	Pre-test	Post-test 1	Post-test 2	P value
1.04±0.19	1.02±0.14	1.04±0.19	0.263	1.42±0.49	1.88±0.32	1.68±0.47	0.082
1.50±0.50	1.80±0.40	1.48±0.50		1.46±0.50	1.82±0.38	1.92±0.27	
1.12±0.32	1.10±0.630	1.02±0.14		1.52±0.50	1.70±0.46	1.80±0.40	
1.40±0.49	1.30±0.46	1.32±0.47		1.52±0.50	1.68±0.47	1.82±0.38	

Table 4: Interventional and control group nurses' knowledge toward medication errorsat hemodialysis units

Control Group				Interventional Group			
Pre-test	Post-test 1	Post-test 2	P value	Pre-test	Post-test 1	Post-test 2	P value
1.54±0.50	1.54±0.50	1.24±0.43	0.069	1.54±0.50	1.90±0.30	1.86±0.35	0.301
1.36±0.48	1.66±0.47	1.26±0.44		1.46±0.50	1.80±0.40	1.68±0.47	
1.30±0.46	1.28±0.45	1.20±0.40		1.54±0.50	1.76±0.43	1.70±0.46	
1.32±0.47	1.28±0.45	1.16±0.37		1.46±0.50	1.62±0.49	1.86±0.35	
1.30±0.46	1.28±0.45	1.20±0.40		1.52±0.50	1.68±0.47	1.86±0.35	

Table No. 5: Nurses' knowledge toward patient injuries at hemodialysis units

Control Group				Interventional Group			
Pre-test	Post-test 1	Post-test 2	P value	Pre-test	Post-test 1	Post-test 2	P value
1.52±0.50	1.78±0.41	1.46±0.50	0.213	1.56±0.50	1.86±0.35	1.78±0.41	0.218
1.08±0.27	1.46±2.83	1.06±0.24		1.54±0.50	1.50±0.50	1.90±0.30	
1.48±0.50	1.64±0.48	1.36±0.48		1.48±0.50	1.86±0.35	1.84±0.37	
1.44±0.50	1.44±0.50	1.24±0.43		1.50±0.50	1.76±0.43	1.84±0.37	

Practice scores differed in the interventional group as compared to the control group in all tests. The control group initially had a higher score (1.5024☺0.16) but following the intervention, interventional group scored higher at the post- test 1 (2.37±0.53) and retained the higher score at posttest 2 (1.75±0.13), which proves the intervention lasts impact on the nursing practice performance.

DISCUSSION

The demographic characteristics of both groups aligned with findings from previous studies. In the control group, most participants (52%) were aged 22-26 years, while in the interventional group, the largest proportion (42%) were aged 27-31 years. These results are consistent with Mahmood and Khudur.[16] Age is an important factor in evaluating the educational program, as younger nurses tend to be more receptive to newly introduced knowledge and methods.

A total of 66% males and 34% females participated in both of them, but research articles such as Osman et al[17] indicate that females constitute a larger fraction of the nursing population in some Arab countries.

The level of education was also significantly different (p= .036): 68% of bachelor's degree graduates belonged to the control group and 52% of interventional graduates, which is in line with regional and international studies.[17,18]

The interventional group had substantial knowledge of hand hygiene relative to the control group after the educational program. These results can be supported by the recent literature, including Abdelrahman et al[19] who have shown the effectiveness of structured training interventions in enhancing hand hygiene compliance.

The interventional group showed significant improvement in knowledge of personal protective equipment across all testing phases compared to the control group. These results are consistent with previous studies which reported that targeted training interventions and workshops improve nurses' compliance with PPE use, and hand hygiene[20], and overall infection prevention practices.[21]

Nurses in the interventional group showed steady improvement in their knowledge of medication errors in hemodialysis units across all pretest, posttest 1+2, demonstrating the positive effect of the educational program. These results are in line with previous research, such as Abu Hussein et al.[22]

The educational intervention enhanced the knowledge of nurses in prevention of patient injury in hemodialysis units, and there were consistent increases in the fall prevention and side rail in the interventional group. These outcomes are consistent with Ojo and Thiamwong[23] who discovered that patient outcomes and nurse behavior are improved with specialized fall prevention programs.

The educational intervention greatly benefited the interventional group with respect to the practices of hemodialysis nurses and evidence-based argument that specific training leads to better compliance with safety measures.[24] The sustained improvement at Post-test 2 further indicates the lasting effect of the educational program, corroborating similar findings by Heleno et al.[25]

CONCLUSION

The knowledge and practices of hand hygiene, PPE, medication safety, and preventing patient injury demonstrated progressive changes in the interventional group, which prove that a systematic educational program is an effective intervention in improving nurse competence in hemodialysis units.

Author's Contribution:

Concept & Design or acquisition of analysis or interpretation of data:	Shady Shafeek Anees Dowarah, Sahar Adham Ali
Drafting or Revising Critically:	Shady Shafeek Anees Dowarah, Sahar Adham Ali
Final Approval of version:	All the above authors
Agreement to accountable for all aspects of work:	All the above authors

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