



Original Article

Nurses' Knowledge and Practices Toward Parenteral Infusion (IV fluid administration and blood transfusion) in Intensive Care Units at Kirkuk city Teaching Hospitals

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Abstract

Parenteral infusion errors occur worldwide. A key component of critical care management in intensive care units (ICUs) is parenteral infusion therapy, which involves the delivery of intravenous (IV) fluids, IV drugs, blood transfusions, and parenteral nutrition. Because these interventions are complex and high-risk, nursing staff knowledge, competence, and adherence to best practices are critical to achieving the best possible patient outcomes. In order to ensure patient safety, avoid complications like infection, infiltration, or medication errors, and promote recovery, intensive care unit nurses are crucial in the initiation, monitoring, and management of infusion therapies. This study aims to evaluate nurses' knowledge and practices related to parenteral infusion therapy (IV fluid administration and blood transfusion).

Subjects and Methods: A quantitative design, descriptive study had been used through the present study with the application of test-retest approach for the studied sample during the period from 8th October, 2024 to 15th June, 2025. the sample include (95) nurses who were responsible for giving IV therapy and work in Intensive Care Units at Kirkuk city teaching hospitals.

Data collection: demographic information, nurses' knowledge about (IV fluid administration and blood transfusion) through structured questionnaire, and nurses' practice regarding parenteral infusion therapy through an observational checklist.

Result: The majority of nurses were female, majority of them in age group of (25-30) years. overall nurses' knowledge about IV fluid administration was in test and retest (64.84 (Moderate)) and (69.68 (High)) respectively. overall nurses' knowledge about blood transfusion was moderate in both test and retest (72.84 (High)) in the first test and (75.58 (High)) in the retest. Percentile Grand/or Global Mean of Score of nurses' practice was (53.45 (Moderate)) in the first test and (55.21 (Moderate)) in the retest.

Conclusion: The present study nurses' knowledge and practices as regards to parenteral infusion therapy were (high regarding blood transfusion, moderate regarding IV fluid administration and moderate regarding nurses' practices related to parenteral infusion therapy).

Recommendation: Ongoing supervision and evaluation of nurses regarding the follow up of protocols and guidelines could help improve their practical levels.

Key words: Parenteral Infusion, IV Fluid Infusion Blood Transfusion, Intensive Care Unit, Nurse, Knowledge, And Practice.

1 . Introduction:

The term "parenteral" is derived from the Greek phrase "para enteron," which translates as "bypassing the intestines"(Nema and Ludwig, 2019). Parenteral infusions deliver medications and fluids directly into a patient's bloodstream through the veins, enabling rapid effects to restore fluid balance and administer treatments. Once a substance is introduced into the vein, its action cannot be reversed, highlighting the importance of accurate IV preparation, dosage calculation, and safe administration. Since IV fluid therapy is considered a medical procedure, it requires a physician's order before initiation (Faizi F, et al ,2021). The advancement of site-specific, effective, safe, and reproducible administration strategies has resulted in the creation of sophisticated stand-alone drug delivery systems. Certain advancements have tackled substantial safety and efficacy issues; yet, research in drug delivery devices remains a dynamic area of investigation. (Nema and Ludwig, 2019).

Parenteral infusion lines or venipuncture are extensively utilized for the treatment of millions of patients globally (Amouei Foumani, et al. 2019). Primary IV fluids are prescribed by nurses to maintain or restore hydration and electrolyte levels. While administering these fluids, nurses must continuously monitor the patient's fluid and electrolyte balance to assess the infusion's effectiveness and prevent complications like fluid overload or electrolyte imbalances. (Doganay GE, et al ,2022). Colloids and crystalloids are classifications of fluids frequently administered intravenously. In instances of severe hypotension, a substantial volume of crystalloid solutions must be administered, which may result in peripheral edema, elevated central venous pressure, and pulmonary edema in individuals with cardiovascular conditions (Mahdi, F. A. et al. 2024). Phlebitis is a complication that may affect 50% of patients overall and up to 75% of those with infectious disorders; however, in patients without diabetes, burns, or emergency catheterization, the prevalence is roughly 20%. (Amouei Foumani, et al. 2019)

Blood transfusions are common therapeutic procedures for numerous medical illnesses, involving the administration of whole blood or isolated blood components, either individually or in various combinations, delivered by intravenous (IV) lines. The blood or its constituent components may originate from unidentified volunteer donors, patient attendees or their family members, or patients receiving the blood. Blood transfusions may be necessary in numerous circumstances, such as refilling blood loss during surgery or trauma, or compensating for the body's insufficient production of blood or its components, among others (Aggarwal, P., et al, 2023).

1.1 Importance of the study:

This study focuses on evaluate of nurses' knowledge as well as their practices related to parenteral infusion therapy at Kirkuk city teaching hospitals. These knowledge and practice deficiencies are often attributed to inadequate training, high workloads, and lack of regular competency assessments. Addressing these challenges is essential to enhance patient safety and improve outcomes in critical care settings. researching nurses' knowledge and practices toward parenteral infusion in ICUs is, therefore, crucial to identify gaps and implement targeted interventions.

1.2 Objectives of the study:

1. To assess nurses' knowledge toward Parenteral Infusion in intensive care units.
2. To assess nurses' practice toward parenteral Infusion in intensive care units.
3. To evaluate nurses' knowledge and practice toward parenteral Infusion in intensive care units.

1.3 Hypotheses of the Study:

- Null: There will not be significant differences between nurses' knowledge and Practice score of study sample toward parenteral Infusion.
- alternative: There will be significant differences between nurses' knowledge and Practice score of study sample toward parenteral Infusion.

1. Subjects and methods:

2.1 Study design:

This study employed a quantitative design, descriptive study.

2.2 Study setting:

This study was conducted in intensive care units at Kirkuk city teaching hospitals.

2.3 Period of the study:

A non - probability purposive sample was selected from nurses working in ICU at Kirkuk City Teaching Hospitals from the period between 8th October, 2024 to 15th June, 2025 at Kirkuk city teaching Hospitals.

2.4 Instrument:

To evaluate nurses' knowledge and practices toward parenteral infusion in Kirkuk city teaching hospitals, the researcher constructs a comprehensive questionnaire interview form for the purpose of data collection, it consists of 3 parts:

- I. Self-administered questionnaire sheet related to (demographic characteristics and professional background of nurses participate in the study).
- II. Self-administered questionnaire sheet related to (nurses' knowledge toward parenteral infusion).
- III. An observational check list for nurses' practices regarding nursing intervention related to parenteral infusion.

2.5 Validity and reliability of the tools:

The validity of the study instruments knowledge test and practice are determined by the panel of 10 experts, who have more than 5 years' experience in their field to investigate the content of the questionnaire related to parenteral infusion.

Those experts were asked to review instruments, clarity, relevancy and adequacy, some items are added and some others are excluded after discussion with each expert. 100% of experts approved the final edition.

2.6 Pilot study:

A convenient sample of (10) individuals were selected among nurses concerning with nurses' knowledge and practices toward parenteral infusion in ICU's, this preliminary study was conducted for the period of 14th December, 2024 to 24th January 2025.

The purposes of the pilot study were:

- To confirm the clarity & content adequacy of the instrument structure throughout the subjects understanding and to determine the required modifications.
- To estimate the average time needed for data collection for each nurse.
- To identify the best approach needed to find out nature of difficulties which they might be faced.

2.7 Ethical consecrations:

After obtaining the approval of the College of Nursing Council for the study, the researcher submitted a detailed description including the study objectives and project to the Ministry of Health in Iraq (Planning Department, Health Research Division) in order to obtain official permission to conduct the study (Appendices A). Subsequently, permission was submitted to the Director of Kirkuk Health Office, which includes Azadi and Kirkuk Teaching Hospitals in Kirkuk, to ensure their approval and cooperation. The approval facilitated entering the hospitals and interviewing nurses to obtain the necessary data

after obtaining their permission to participate in the study.

2.8 Data analysis:

Data are analyzed through the use of SPSS (Statistical package for Social Sciences) version

22.0 application Statistical analysis system and Excel application.

2. Result:

Table 1: Distribution of studied sample according to (SDCv.) Observed Frequencies, Percents and comparison's significant (N=95)

Socio-Demographical Characteristics variables	Groups	No.	%	C.S. (*) P-value
Gender	Male	28	29.5	P=0.000 (HS)
	Female	67	70.5	
	Total	95	100	
Age Groups yrs.	20 _	19	20.0	$\chi^2 = 43.979$ P=0.000 (HS) Mean \pm SD 26.49 \pm 2.79
	25 _	62	65.3	
	30 _ 35	14	14.7	
	Total	95	100	
Level of education	Diploma	34	35.8	$\chi^2 = 44.611$ P=0.000 (HS)
	Bachelor	57	60.0	
	Master's Degree	4	4.20	
	Total	95	100	
Marital status	Single	67	70.5	$\chi^2 = 69.811$ P=0.000 (HS)
	Married	27	28.4	
	Widowed	1	1.10	
	Total	95	100	

(*) HS: Highly Sig. at P<0.01, S: Sig. at P<0.05; NS: Non Sig. at P>0.05; Testing based on One-Sample Chi-Square test, and Binomial test.

Table 1, shows distribution of the studied "Socio-Demographical Characteristics variables-(SDCv.)" of nurses staff sampled regarding of studied subject: "Evaluation of nurses' knowledge and practices toward parenteral infusion in intensive care units at Kirkuk city teaching hospitals", which including distribution of the

observed frequencies, and a percentages for estimating the proportional relating to studied sampling population's SDCv., in addition to a significant comparisons for the purpose of showing whether the observed frequencies of SDCv. are randomly or has restrictedly distribution.

Table 2: Distribution of studied sample according to (Rv.) Observed Frequencies, Percent's and comparison's significant (N=95)

Related variables	Groups	No.	%	C.S. (*)
				P-value
Years of work in clinical units	1 _ 3	44	46.3	$\chi^2 = 7.979$ P=0.019 (S) Mean ± SD 3.44 ± 2.66
	4 _ 6	29	30.5	
	> 6	22	23.2	
	Total	95	100	
Years of work in Intensive Care Unit	1 _ 3	84	88.4	$\chi^2 = 130.126$ P=0.000 (HS) Mean ± SD 2.12 ± 1.60
	4 _ 6	8	8.4	
	> 6	3	3.2	
	Total	95	100	
Training in intravenous (IV) therapy or infusion management	Yes, formal certification	41	43.2	$\chi^2 = 6.400$ P=0.041 (S)
	Yes, on-the-job training	33	34.7	
	No training	21	22.1	
	Total	95	100	

(*) HS: Highly Sig. at P<0.01, S: Sig. at P<0.05; NS: Non Sig. at P>0.05; Testing based on One-Sample Chi-Square test, and Binomial test.

Table 2, shows distribution of the studied "Related variables -(Rv.)" of nurses staff sampled regarding of studied subject, such as: "Years of work in clinical units, Years of work in Intensive Care Unit, and Training in intravenous (IV) therapy or infusion management", which including distribution of the observed frequencies,

and a percentages for estimating the proportional relating to studied sampling population's SDCv., in addition to a significant comparisons for the purpose of showing whether the observed frequencies of Rv. are randomly or has restrictedly distribution.

Table (3): Summary Statistics of "Nurses' Knowledge About IV Fluid Infusion" Sub domain's items for test retest with comparison's significant

Test retest	Tests	Test Period					Retest Period					C.S. (*)
		Response	No.	%	M S	SD	RS %	No.	%	M S	SD	
1. Isotonic solutions (e.g., 0.9% saline, lactated Ringer's) are primarily used to expand intravascular volume in hypovolemia patients.	False	16	16.8	0.8	0.4	80.0	18	18.9	0.81	0.39	81.1	P=1.000 NS
	Don't know	3	3.2				0	0.00				
	True	76	80				77	81				

								.1				
2. Administering hypotonic solutions (e.g., 0.45% saline) to a patient with increased intracranial pressure is contraindicated.	False	32	33 .7	0.6 3	0.4 8	63. 2 M	32	33 .7	0. 64	0.4 8	64. 2 M	P=1. 000 NS
	Don't know	3	3. 2				2	2. 1				
	True	60	63 .2				61	64 .2				
3. Pain, redness, and local swelling are signs and symptoms of vein inflammation in the cannulation site.	False	26	27 .4	0.7 3	0.4 5	72. 6 H	19	20	0. 78	0.4 2	77. 9 H	P=0. 405 NS
	Don't know	0	0. 00				2	2. 1				
	True	69	72 .6				74	77 .9				
4. Crystalloid solutions like saline are preferred over colloids for rapid resuscitation in hemorrhagic shock.	False	43	45 .3	0.5 1	0.5	50. 5 M	35	36 .8	0. 62	0.4 9	62. 1 M	P=0. 118 NS
	Don't know	4	4. 2				1	1. 1				
	True	48	50 .5				59	62 .1				
5. The administration of large volumes of IV fluids can cause hemodilution and electrolyte imbalances.	False	26	27 .4	0.7 2	0.4 5	71. 6 H	28	29 .5	0. 68	0.4 7	68. 4 H	P=0. 710 NS
	Don't know	1	1. 1				2	2. 1				
	True	68	71 .6				65	68 .4				
6. Fluid administration can be affected by patient position (hand or leg).	False	42	44 .2	0.5 4	0.5	53. 7 M	23	24 .2	0. 75	0.4 4	74. 7 H	P=0. 007 HS
	Don't know	2	2. 1				1	1. 1				
	True	51	53 .7				71	74 .7				
7. Lactated Ringer's solution contains potassium and is contraindicated in patients with hyperkalemia.	False	25	26 .3	0.7 3	0.4 5	72. 6 H	20	21 .1	0. 77	0.4 2	76. 8 H	P=0. 584 NS
	Don't know	1	1. 1				2	2. 1				
	True	69	72 .6				73	76 .8				
8. After 3 days of cannulation the fluid stopped from running through the I.V. set because of inflammation.	False	41	43 .2	0.4 3	0.5 0	43. 2 M	41	43 .2	0. 43	0.5 0	43. 2 M	P=1. 000 NS
	Don't know	1	1. 1				0	0. 00				
	True	53	55 .8				54	56 .8				
	False	19	20	0.7	0.4	77.	17	17	0.	0.3	82.1	P=

9. A sterile technique is mandatory when preparing and administering all IV solutions to reduce infection risk.			.0	8	2	9		.9	82	9	H	0.5 41 NS
	Don't know	2	2.1			H	0	0.00				
	True	74	77.9				78	82.1				
10. Rapid infusion of hypertonic solutions can lead to circulatory overload and pulmonary edema.	False	33	34.7	0.62	0.49	62.1	29	30.5	0.66	0.48	66.3	P=0.66 5 NS
	Don't know	3	3.2			M	3	3.2				
	True	59	62.1				63	66.3				

(*): HS: High Sig. at P<0.01; NS: Non Sig. at P>0.05; Testing are based on a McNemar Test. Evaluated Intervals: (00.00 – 33.33) Low (L); (33.34 – 66.66) Moderate (M); (66.67– 100) High (H). Red color items reversed measuring scale, and that reverse an evaluated scored by false responses.

Table (3) represents a summary statistics of nurses' knowledge items about "IV Fluid Infusion" regarding of test – retest periods, with comparison's significant.

Results showed that about two third of studied items has accounted at a high level of assessed

6(60%), with reference of the retest period, and of them 4(40.0%) items have a moderate assessed, while 5(50%) items were at a high assessed at the first test period, and the leftover was assessed at a moderate level 5(50.0%).

Table (4): Summary Statistics of "Nurses' Knowledge About Blood Transfusion" Sub domain's items regarding of test retest periods with comparison's significant

Test retest	Tests	Test Period					Retest Period					C.S. (*)
		No.	%	M S	SD	RS %	No.	%	M S	SD	RS %	
1. Blood transfusions must be initiated only after confirming ABO compatibility and Rh factor matching.	False	13	13.7				11	11.6				P=1.000 NS
	Don't know	0	0.00	0.86	0.35	86.3	1	1.1	0.87	0.34	87.4	
	True	82	86.3				83	87.4				
2. Blood transfusion should be initiated with small-gauge cannula related to high viscosity of the blood.	False	63	66.3				72	75.8				P=0.109 NS
	Don't know	0	0.00	0.66	0.48	66.3	2	2.1	0.76	0.42	75.8	
	True	32	33.7				21	22.1				
3. Febrile non-hemolytic reactions are the most common adverse reaction associated with blood transfusions.	False	43	45.3				22	23.2				P=0.018 S
	Don't know	1	1.1	0.54	0.5	53.7	6	6.3	0.71	0.46	70.5	
	True	51	53.7				67	70.5				
4. Blood products can't be	False	25	26.	0.7	0.4	72.	27	28.4	0.7	0.4	70.	P=0.

stored in standard refrigerators if immediately required for use in Intensive Care Unit.			3	3	5	6			1	6	5	871
	Don't know	1	1.1			H	1	1.1			H	NS
	True	69	72.6				67	70.5				
5. Monitoring for transfusion reactions such as checking for fever during and after transfusion.	False	25	26.3				14	14.7				
	Don't know	2	2.1	0.7	0.4	71.6	0	0.00	0.8	0.3	85.3	P=0.043
	True	68	71.6	2	5	H	81	85.3	5	6	H	S

(*): S: Sig. at P<0.05; NS: Non Sig. at P>0.05; Testing are based on a McNemar Test. Evaluated (00.00 – 33.33) Low (L); (33.34 – 66.66) Moderate (M); (66.67– 100) High (H). Red color items reversed measuring scale, and that reverse an evaluated scored by false responses.

Table (4) represents a summary statistics of nurses' knowledge items about "blood transfusion" regarding of test – retest periods, with comparison's significant.

Results showed that all of studied items has accounted at a high level of assessment 5(100%), concerning of the retest period, while 2(40%) of items was at moderate assessed at the initial test

period, and the leftover was assessed at a high level 4(60.0%), and according to that it was confirmed by achieving significant differences between the results of test-retest for each of: "Febrile non-hemolytic reactions are the most common adverse reaction associated with blood transfusions, and Monitoring for transfusion reactions such as checking for fever during and after transfusion" items.

Table 5: Summary Statistics for Percentile readings of studied Main and Sub domains with an Overall Global assessment at test - retest periods with comparison's significant (N=95)

Main Domain	Nurses Knowledge and Practices	N o.	Test Period				Retest Period				C.S. (*) P-value
			Min i.	Ma x.	PGMS	PPS D	Min i.	Ma x.	PGMS	PPS D	
Knowledge	About Blood transfusion	95	20.0	100	72.84 (H)	19.77	20.0	100	75.58 (H)	22.06	P=0.353 (NS)
	About Drug Infusions	95	0.0	100	70.53 (H)	23.49	0.0	100	73.47 (H)	21.92	P=0.541 (NS)
	About IV Fluid Infusion	95	10.0	90.0	64.84 (M)	17.74	30.0	100	69.68 (H)	17.59	P=0.041 (S)
	About Parenteral Nutrition	95	20.0	100	59.79 (M)	15.44	30.0	100	64.53 (M)	17.24	P=0.026 (S)
	Global Overall Knowledge	95	23.3	90.0	65.44 (M)	12.51	40.0	96.7	69.58 (H)	14.31	P=0.0098 (HS)
Practices	Equipment	95	50.0	91.7	59.74 (M)	10.78	50.0	91.7	59.91 (M)	10.41	P=0.011 (S)
	Preparations	95	50.0	91.7	59.74 (M)	10.78	50.0	91.7	59.91 (M)	10.41	P=0.904 (NS)
	Performance	95	23.7	73.7	47.56 (M)	10.52	21.1	73.7	48.89 (M)	10.26	P=0.000 (HS)
	Evaluation	95	33.3	100	67.02 (H)	19.14	33.3	100	68.77 (H)	18.71	P=0.000 (HS)

Global Practices	Overall	95	34.39	73.64	53.45 (M)	8.91	36.36	75.09	55.21 (M)	8.39	P=0.000 (HS)
Global Practices	Overall Knowledge & Practices	95	30.17	80.15	59.22 (M)	7.93	46.48	83.40	62.62 (M)	8.46	P=0.000 (HS)

(*): **HS: High Sig. at P<0.01; NS: Non Sig. at P>0.05; Testing are based on a Wilcoxon Signed Ranks Test.**

PGMS: Percentile Grand/or Global Mean of Score; PPSD: Percentile Pooled Standard Deviation.

Table 5, shows a summary statistics of an overall assessments in light of studied sub and main domains along all their items in which transformed by an admixed form, and includes the following estimates, such as: "Minimum, and Maximum of percentile readings for the studied sampled, Percentile Grand/Global Mean of Score-PGMS, Percentile Pooled Standard Deviation-PPSD", as well as different responding levels for assessing the studied sub and main domains through using the three differentiate categories' levels, such as: (Low, Moderate, and High) assessments, in light of PGMS outcomes, such as: [(0.00 – 33.33), (33.34 – 66.66), (66.67 – 100)] intervals respectively.

4. Discussion:

The study was conducted with the aim of determining the level of knowledge and practice of nurses regarding parenteral infusion (IV drug administration and parenteral nutrition).

In the current study, most of the studied nurses were female (table 1). This finding is in agreement with that of [(Al-Faouri et al. 2021); (Ahmed et al. 2021); (Amin et al. (2021), and (Weheida et al. 2023) who revealed the dominance of females among most of their studied samples. Another study by Mohammed, A., & Baez, Y. K. (2023) showed that two-thirds of the studied nursing staff were female (63.6%).

Our study revealed that the majority of the nurses 62 (65.3%) are aged between (25-30) years old. This finding is supported by study conducted by Kumait Al-Jumaily and Khudur, 2019 at

Kirkuk city teaching hospitals which revealed that most studied nurses were in the age group (20-29) years. A study by Raof, A. A., & Baez, Y. K. (2024) also support our result which showed that over half of the participants are in the age group 25 to 29 years, with a mean and SD of (25.48 ± 2.76).

Relative to their educational status, most of the nurses 57 (60%) have a bachelor degree in nursing. On the same way (Alwan, A. H., & Kumait, A. S. 2023) reported that most of nurses (n=45; 83.3%) were graduates from nursing college.

Our study reveals that only one third (33 (34.7%)) of nurses have a job training in parenteral infusion therapy and 41 (43.2%) of nurses have a formal certificate in IV therapy (table 2). This result is in agreement with that of Abo Aita, et al. 2022) which revealed that more than half of the nurses have taken a course on how to care for patients receiving complete parenteral feeding. More than two-thirds of the nurses in the study had attended training courses on parenteral infusion, which is consistent with the findings of a Khalefa et al, 2018).

The analysis of the data of the nurses' knowledge toward blood transfusion had indicated that there are no significant differences between test-retests (Table 5). This result agrees with the study by Malhotra, et al, (2022) showed that baseline scores were low in the nursing officers. post intervention, a significant improvement in scores was observed in the study group whereas the control group remained at the same score with no differences between pre-posttests.

The analysis of the data of the nurses' knowledge toward IV Fluid Infusion had indicated that there are significant differences between the two test periods and the mean of score in the test-retest was (64.84 (Moderate)), (69.68 (High)) respectively. This result is in agreement with a study in Kenya by Njung'e, et al, (2021) which find that the mean knowledge score on intravenous fluid therapy among nurses was 57.4% (SD =±28.55), depicting moderately adequate knowledge. Another study by Teshome, et al, (2023) reported that Among 396 respondent's majority 224 of them had adequate knowledge 56.6% (95% CI: 51.8%–61.4%) about IV fluid administration while 172 had inadequate knowledge 43.4% (95% CI: 38.6%–48.2%). This result is contrary to a study conducted in Namibia by Tomas, et al, (2024) which indicated that the majority of nurses (84%) in the study exhibited an insufficient level of knowledge regarding intravenous therapy, with only a minority (16%) demonstrating a moderately adequate understanding of intravenous fluid therapy.

The result of this study revealed that the Percentile Grand/or Global Mean of Score of nurses practice was (53.45 (Moderate)) in the first test and (55.21 (Moderate)) in the retest which mean that the practices of nurses are at moderate level. The results are supported by a study by Haileyesus and Muluken, (2022), that reveals that nurses practice was (54.3%), other study by Sharadha Ramesh, (2020), revealed that 54% of respondents practices correctly, and a study by Qamar et al, (2017) showed that only 49.3% of nurses practice was good.

5. Conclusion:

The findings revealed that the nurses' knowledge and practices of parenteral infusion was at moderate level (insufficient) which could be harmful to patient safety in Kirkuk city teaching hospitals. Nurses had a moderate level of knowledge in the field of parenteral infusion therapy. Institutional protocols and guidelines for parenteral infusion therapy were not consistently adhered to.

6. Recommendations:

1. Ongoing supervision and evaluation of nurses regarding the follow up of protocols and guidelines could help improve their practical levels.
2. The Training and Development Unit should intensify its efforts to increase training courses and educational programs on parenteral infusion and apply them in intensive care units to improve the competence of nurses working in these units.
3. Future education and practical training are essential to enhance patient safety and improve quality of care.

7. Limitations:

1. Calling nurses for reason or another.
2. The findings of the study are limited and can be generalized only to two hospitals.
3. Non-probability sampling technique.

Conflicts of Interest

The authors declare that they have no conflicts of interest with regard to the publication of this work.

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