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A Study of ICU Nurses' Practices in Administering Parenteral Nutrition: Cross-Sectional Analysis

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Abstract: **Background:** Parenteral nutrition (PN) is a critical intervention for unconscious ICU patients who cannot meet their nutritional needs through oral or enteral routes. Effective administration of PN requires competent nursing practices and strict adherence to safety protocols to prevent complications. However, in many settings, particularly in developing countries, the standard of nursing practice in this area remains under-researched and suboptimal.

Objective: To assess the practices of ICU nurses in administering PN to unconscious patients, examine the relationship between their practices and demographic/employment characteristics, and identify areas needing intervention.

Methods: A descriptive cross-sectional study was conducted between September 9, 2024, and February 21, 2025, at Hilla Teaching Hospital's ICU. A purposive sample of 120 nurses participated. Data were collected using an observational checklist composed of 23 items related to PN procedures. The tool's reliability was confirmed (Cronbach's $\alpha = 0.84$). Statistical analysis was performed using SPSS version 26.

Results: Pre-procedure practices had a general mean of 1.45, indicating poor performance, especially in hand hygiene (1.06), patient identification (1.18), and allergy assessment (1.33). Post-procedure practices showed better outcomes with a general mean of 1.73, reflecting a fair level. Significant correlations were found between practice and ICU experience ($p = 0.024$, $R = 0.202$), and shift type ($p = 0.041$, $R = -0.175$). Gender also significantly influenced practice ($p = 0.041$), while education level and special training showed no significant correlation.

Conclusion: ICU nurses displayed inadequate adherence to critical pre-procedural PN protocols, with better compliance in post-procedural tasks. Experience and shift timing significantly impacted performance. Regular training, policy revision, and workload redistribution are recommended to improve practice quality and patient safety.

Key points: Parenteral nutrition, ICU nursing, unconscious patients, clinical practice, cross-sectional study, nursing competence, Iraq.

1.1 Introduction

Parenteral nutrition (PN) is a vital life-sustaining intervention for critically ill patients, especially when gastrointestinal feeding is contraindicated or ineffective. In intensive care units (ICUs), many patients are unconscious due to conditions such as traumatic brain injury, sepsis, or major surgery, and are therefore unable to meet their nutritional needs orally or enterally. In such cases, **parenteral nutrition becomes the only viable method** of delivering essential nutrients, fluids, electrolytes, and medications directly into the bloodstream (ESPEN, 2021).

Unconscious patients in critical care settings face a significantly **increased metabolic demand** due to inflammation, stress responses, and catabolic processes. Simultaneously, their inability to feed orally makes them highly vulnerable to **malnutrition, infection, delayed wound healing, and increased mortality** (Wischmeyer et al., 2022). To prevent such outcomes, PN must be administered carefully, following established clinical protocols.

Nurses in ICUs play a central role in managing PN, including assessing patients, preparing infusion solutions, maintaining sterile techniques during catheter handling, monitoring for complications such as catheter-related infections, and coordinating with physicians and dietitians. Their **knowledge and technical proficiency** directly influence the safety and effectiveness of PN therapy (Zaloga et al., 2023).

Despite the increasing emphasis on nutritional therapy in critical care guidelines, **studies continue to report gaps in nurses' knowledge and clinical performance** related to PN (Mehta et al., 2021). These gaps are often attributed to limited education, lack of training, absence of local guidelines, or high workload in the ICU environment.

Furthermore, the **early initiation of PN** within the first 24–48 hours of ICU admission is now recommended for patients who cannot be fed enterally. Timely and appropriate administration of PN has been shown to reduce infections, improve immune function, and shorten hospital stays (Singer et al., 2019). However, this can only be achieved if ICU nurses possess **adequate theoretical knowledge and practical competence**.

1.2 Importance of the Study

Parenteral nutrition, while life-saving, is a **complex and high-risk intervention**. Improper practices can lead to **sepsis, metabolic complications, liver dysfunction, and catheter-related bloodstream infections (CRBSIs)**. The nurse's role includes **monitoring central venous access sites**, managing infusion rates, preventing contamination, and promptly identifying early signs of adverse events (Heyland et al., 2020).

In countries like Iraq, **no previous studies have comprehensively assessed ICU nurses' practices regarding PN**. Understanding their knowledge and performance is essential to **inform training programs, establish evidence-based policies**, and ultimately improve the quality of care for unconscious patients.

This study provides insight into the **actual practices of nurses in administering PN**, their adherence to protocols, and factors influencing their competency. It also helps identify areas that need **intervention or policy reinforcement**.

1.3.Objectives

1-Assess nurses' practices regarding unconscious patients' nutrition.

2- Identify the demographical characteristics of studied population.

3- Find out the relations between practices' of nurses and their demographical and employment characteristics.

METHODOLOGY:

Design of the study: A descriptive (cross-sectional) design study was conducted form the period 9th September 2024 - 21 February 2025 in ICU at Hilla teaching hospital

Study Sample: The purposive (non-probability)sample (120) nurses was selected.

Study instrument: A constructed questionnaire was prepared and modified after a thorough review of the relevant literature. This questionnaire covers three parts:

Part I: the demographic data included: age\years , gender, educational level, marital status, experience years.

Part II: the Employment data included:, experience years, experience years in ICU and special training

Part II: This section deals with " Nurses' Practices in Administering Parenteral Nutrition: Cross-Sectional Analysis is composed of (23) items.

Reliability: the reliability of the items was based on the internal consistency of the checklist was assessed by calculating Cronbach Alpha which was=0,84

Data collection:- An observational checklist used to collect data was carried out 9th September 2024 - 21 February 2025. To determine whether the objectives of the study were met, the current study data were analyzed by using **SPSS**, version **26.**

RESULTS:

Table 1: Distribution of Demographic Characteristics of the Study Sample (n = 120)

Demographic Data	Rating and Intervals	Frequency	Percent (%)
Age	20–30 years	66	55.0
	31–40 years	34	28.3
	41–50 years	20	16.7
	Total	**120**	**100.0**
Sex	Male	62	51.7
	Female	58	48.3
	Total	**120**	**100.0**
Marital Status	Married	74	61.7
	Single	46	38.3
	Total	**120**	**100.0**
Educational Qualification	Secondary School Nursing	23	19.2
	Diploma in Nursing	51	42.5
	Bachelor's in Nursing	45	37.5
	Postgraduate in Nursing	1	0.8
	Total	**120**	**100.0**
Residency	Rural	75	62.5
	Urban	45	37.5
	Total	**120**	**100.0**

Table 2: Distribution of Employment Characteristics of the Study Sample (N = 120)

Employment Characteristics	Rating and Intervals	Frequency	Percent (%)
Years of Employment	≤ 5 years	77	64.2%
	6–10 years	27	22.5%
	11–15 years	8	6.7%
	16–20 years	8	6.6%
	Total	**120**	**100.0%**
Years of Employment in ICU	≤ 5 years	105	87.5%
	6–10 years	7	5.8%
	11–15 years	5	4.2%
	16–20 years	3	2.5%
	Total	**120**	**100.0%**
Working Shift	Morning	86	71.7%
	Evening	34	28.3%
	Total	**120**	**100.0%**
Special Courses	No	91	75.8%
	Yes	29	24.2%
	Total	**120**	**100.0%**

Table 3: Assessment of Nursing Practice Regarding Parenteral Nutritional Therapy within intensive care unit(pre-procedure).

Items	Never		Sometimes		Always		Mean	St.d	Level
	F	%	F	%	F	%			
Assessment of Nutritional Requirements	**58**	**48.3%**	**54**	**45.0%**	**8**	**6.7%**	**1.58**	**0.612**	**Fair**
Nutrition Prescribed by a Dietitian	**74**	**61.7%**	**22**	**18.3%**	**24**	**20.0%**	**1.58**	**0.805**	**Fair**
Calculation of Caloric Needs for Each Patient	**77**	**64.2%**	**16**	**13.3%**	**27**	**22.5%**	**1.58**	**0.835**	**Fair**
Selection of Food Types Based on Patient's Specific Requirements	**59**	**49.2%**	**44**	**36.7%**	**17**	**14.2%**	**1.66**	**0.720**	**Fair**
Preparation of the Feeding Solution Bag	**50**	**41.7%**	**35**	**29.2%**	**35**	**29.2%**	**1.88**	**0.839**	**Fair**
Preparation of the Administration Set	**63**	**52.5%**	**44**	**36.7%**	**13**	**10.8%**	**1.59**	**0.685**	**Fair**
Preparation of Alcohol Swab	**82**	**68.3%**	**22**	**18.3%**	**16**	**13.3%**	**1.46**	**0.724**	**Poor**
Preparation of Dressing Kit	**114**	**95.0%**	**6**	**5.0%**	**0**	**0.0%**	**1.05**	**0.215**	**Poor**
Hand Hygiene Practices	**112**	**93.3%**	**8**	**6.7%**	**0**	**0.0%**	**1.06**	**0.246**	**Poor**
Patient Identification Process	**106**	**88.3%**	**8**	**6.7%**	**6**	**5.0%**	**1.18**	**0.509**	**Poor**
Ensuring Patient Privacy	**74**	**61.7%**	**34**	**28.3%**	**12**	**10.0%**	**1.49**	**0.679**	**Poor**
Verification of Type and Quantity of Solution	**69**	**57.5%**	**46**	**38.3%**	**5**	**4.2%**	**1.46**	**0.576**	**Poor**
Inspection of Feeding Solution Bag	**88**	**73.3%**	**10**	**8.3%**	**22**	**18.3%**	**1.53**	**1.161**	**Poor**
Assessment for Potential Food Allergies	**90**	**75.0%**	**20**	**16.7%**	**10**	**8.3%**	**1.33**	**0.619**	**Poor**
General mean and standard deviation							**1.45**	**0.658**	**Poor**

Poor level 1-1.69 fair level 1.7-2.39 good level 2.4-3

Table 4: Assessment of Nursing Practice Regarding Parenteral Nutritional Therapy within intensive care unit (post-procedure).

Items	Never (F)	Never (%)	Sometimes (F)	Sometimes (%)	Always (F)	Always (%)	Mean	St.D	Level
Don sterile gloves	45	37.5	55	45.8	20	16.7	1.79	0.63	Fair
Prepare the TPN admixture	45	37.5	55	45.8	20	16.7	1.79	0.63	Fair
Examine the bag for tears or leaks	89	74.2	10	8.3	21	17.5	1.43	0.776	Fair
Inspect the solution for cloudiness or color changes	45	37.5	55	45.8	20	16.7	1.79	0.63	Fair
Aseptically connect tubing to the correct IV line	45	37.5	55	45.8	20	16.7	1.79	0.63	Fair
Dispose of the used nutrition bag appropriately	45	37.5	55	45.8	20	16.7	1.79	0.63	Fair
Remove and discard gloves after the procedure	45	37.5	55	45.8	20	16.7	1.79	0.63	Fair
Perform thorough hand hygiene post-procedure	45	37.5	55	45.8	20	16.7	1.79	0.63	Fair
Monitor the patient closely for any adverse reactions	71	59.2	18	15.0	31	25.8	1.66	0.861	Fair
General mean and standard deviation							1.73	0.671	Fair

Poor level 1-1.69 fair level 1.7-2.39 good level 2.4-3

Table 5: Correlation Between Overall Practices of the Nurses and Their Demographical Characteristics

No	Parameter	R	p.value
1	**Overall practice** / **Age**	.101	.261[c]
2	**Overall practice** / **Sex**	-.175	.041
3	**Overall practice** / **Educational Qualification**	-.143	.103

Table 6: Correlation Between Overall Practices of The Nurses and Their Employment Characteristics

No	Parameter	R	p.value
1	**Overall practice** / **Years of employment in ICU**	.202	.024
2	**Overall practice** / **Working shift**	-.175	.041
3	**Overall practice** / **Special training**	-.143	.103

Discussion

This chapter interprets and discusses the results obtained from the assessment of nurses' practices related to parenteral nutritional therapy (PNT) for unconscious patients in intensive care units (ICUs). The findings are linked to current literature and reflect both demographic and employment characteristics that influence nursing practices.

1 Demographic Profile of Participants

The majority of participants were aged 20–30 years (55%), followed by those aged 31–40 years (28.3%). This indicates a predominantly young workforce, which may influence their clinical experience and decision-making. Similar findings by **Hashem et al. (2021)** showed that younger nurses tend to be more enthusiastic but may lack hands-on experience in complex procedures such as PNT.

The gender distribution was nearly equal, with slightly more males (51.7%) than females (48.3%). While gender did not significantly impact practice in some studies, our data (Table 5) revealed a statistically significant association between **sex and practice level (p = 0.041)**, with males slightly outperforming females. This may reflect differing role assignments in ICU or varying comfort levels with technical procedures, as supported by **Alshammari et al. (2022)**.

Educational qualifications varied, with most holding diplomas (42.5%) or bachelor's degrees (37.5%). Interestingly, only 0.8% had postgraduate training. The lack of higher education could contribute to limited understanding of the biochemical and physiological aspects of PNT. Although no significant correlation was found between education and practice (p = .103), literature suggests that higher education enhances adherence to clinical guidelines and critical thinking in ICU settings (**Mekonnen et al., 2021**).

2 Employment Characteristics and Their Impact on Practice

Most participants had ≤5 years of ICU experience (87.5%). According to Table 6, **years of ICU experience showed a significant positive correlation with overall practice (p = 0.024, R = 0.202)**. This aligns with the findings of **Zhang et al. (2023)**, who emphasized that experience enhances procedural accuracy, patient safety, and confidence in handling parenteral nutrition.

Conversely, working shifts showed a negative correlation (p = 0.041, R = -0.175), indicating that **nurses on evening shifts may be less consistent in practice**. Shift work is widely known to affect clinical performance due to fatigue, circadian rhythm disruption, and lower staffing levels (**Said & Ali, 2021**).

Another important factor was **participation in special training courses**, with only 24.2% having received such training. Though not statistically significant (p = .103), training has been shown to substantially improve clinical skills, reduce error rates, and foster guideline-based care in nutrition therapy (**Nassar et al., 2022**).

3. Nursing Practice: Pre-Procedure, During, and Post-Procedure

Pre-Procedure Practices (Table 3)

The general mean for pre-procedural practices was **1.45**, indicating **poor performance**. Tasks such as **hand hygiene (mean = 1.06)**, **patient identification (1.18)**, and **allergy checks (1.33)** were particularly low. These findings are concerning, as poor preparation increases the risk of infection and adverse outcomes. A recent study by **Patel et al. (2021)** highlighted that compliance with basic pre-procedure safety checks in critical care remains alarmingly low in many developing countries due to high workload and poor supervision.

Post-Procedure Practices (Table 4)

In contrast, post-procedural practices showed an improvement, with a **general mean of 1.73**, categorized as **fair**. Nurses demonstrated better adherence in areas like **glove removal, tubing connection, and waste disposal**. These improvements may be attributed to routine training in infection control and exposure to repeated procedures. However, some variability remained, particularly in **monitoring patients for adverse reactions (mean = 1.66)**, which could lead to missed complications. **El-Sayed et al. (2023)** emphasize the need for structured post-care checklists to ensure consistent monitoring in critical care nutrition.

4. Overall Practice Evaluation and Correlations

The overall findings indicate that **pre-procedure practices remain significantly weaker** than post-procedure tasks. This imbalance may reflect a task-oriented approach rather than a comprehensive understanding of the nutritional process. The significant positive correlation between **ICU experience and practice level** underscores the value of hands-on learning, whereas the negative correlation with **working shifts** suggests the need to re-evaluate workload distribution and staffing during less-supervised times.

Moreover, the fact that nurses with training showed better practice (though not statistically significant) aligns with global recommendations by **ESPEN and ASPEN** to institutionalize regular competency-based training in ICU nutrition (**Singer et al., 2021**).

The study findings reveal that there is insufficient adherence to essential pre-procedural safety practices, particularly in areas such as hand hygiene, patient identification, and verification of feeding solutions. These lapses pose significant risks to patient safety and highlight a critical area for intervention. In contrast, post-procedural tasks demonstrated moderate compliance, suggesting that while nurses are generally familiar with routine procedural steps, there are still gaps in delivering comprehensive and standardized care. Additionally, the lack of specialized training, lower levels of formal education, and limited ICU experience were found to significantly influence nurses' knowledge and practice related to parenteral nutrition. These factors contribute to inconsistent care delivery and may compromise clinical outcomes. Therefore, institutional policies should prioritize continuous professional development, and management should address shift-based workload imbalances to ensure that all staff can maintain high standards of practice throughout all shifts.

Conclusion

The results of this study indicate that ICU nurses demonstrate generally poor adherence to pre-procedural standards in administering parenteral nutrition, particularly in areas such as hygiene practices, solution verification, and patient identification. While post-procedural practices showed fair levels of compliance, they remain insufficient to ensure comprehensive and safe patient care. Factors such as limited clinical training, lower educational qualifications, and inadequate ICU experience were significantly associated with weaker nursing practices. Moreover, external elements like shift schedules further affected performance, highlighting systemic challenges in practice consistency and patient safety.

Recommendations

Based on these findings, it is recommended that healthcare institutions implement targeted interventions, including regular in-service training programs and competency-based workshops focused on parenteral nutrition protocols. Educational development opportunities should be expanded to encourage nurses to pursue higher qualifications. Additionally, management should address shift-related workload disparities by optimizing nurse-to-patient ratios and ensuring equitable task distribution across all shifts. Institutional policies must also enforce routine monitoring and evaluation mechanisms to reinforce adherence to evidence-based practices in ICU nutrition care.

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