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Assessment of Nurse's Performance Regarding Intravenous Medication Mistakes at Heevi Pediatric Teaching Hospital /Duhok City

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Abstract

Background: Errors in intravenous (IV) medication administration are particularly prevalent among pediatric patients in hospital settings.

Objectives: This study aims to assess IV medication administration errors among pediatric nurses at Heevi Pediatric Teaching Hospital in Duhok.

Methodology: An exploratory study was conducted at Heevi Pediatric Teaching Hospital in Duhok, located in the Kurdistan region of Iraq. A purposive sample of 30 nurses working across three different shifts was observed during five instances of IV medication administration to hospitalized children. The data collection tool consisted of a section for sociodemographic data and an observational checklist for evaluating nurses' IV medication administration practices. The data were analyzed using descriptive statistics and inferential statistical methods.

Results: The findings revealed that the phase of IV medication administration had the highest incidence of nursing errors. Common mistakes included incorrect medication calculation, failure to wash hands, and neglecting to monitor the patient before and after medication administration. A significant correlation was found between the nurse's gender and the frequency of IV medication errors.

Conclusion: Most nurses administer IV medications improperly, particularly regarding correct dosage and documentation. Additionally, many nurses did not consistently wash their hands before and after procedures.

What is already known about the topic? Intravenous (IV) medication errors are common in pediatric settings due to factors like complex dosing, nurse workload, and insufficient training. Common errors include incorrect dosage, wrong medication, and improper infusion rates. Effective training, hospital protocols, and a non-punitive error reporting culture help reduce these errors, especially in vulnerable pediatric patients.

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INTRODUCTION

Medication errors can occur at various stages of the drug administration process. Physicians commonly make errors during the prescribing phase, while nurses are more prone to errors during the administration phase (Liffe, 2008). These errors can involve improper instructions, transcription mistakes, neglecting guidelines, and executing tasks incorrectly (Howarth, 2015). Handwritten prescriptions often exacerbate the problem, especially when medications have similar names, leading to confusion. Studies have shown that a significant proportion of prescription errors result from medications with names that are either similar in appearance or sound (Anacleto et al., 2007).

Medication errors are a global issue with severe consequences in developing countries. In the Middle East, medication errors, including those occurring during IV administration, are not well-documented (Alsulami et al., 2013). Pediatric patients are especially vulnerable to such errors, which can lead to increased morbidity and mortality. Studies from the United States and the United Kingdom have reported that medication errors contribute significantly to adverse events in hospitals, with an estimated 6.5% of hospital admissions resulting in severe outcomes, including death (Lisby et al., 2017; Kaufman, 2009).

Objectives of the Study

1. To assess IV medication administration errors among pediatric nurses at Heevi Pediatric Teaching Hospital in Duhok City.
2. To examine the relationship between IV medication administration errors and nurses' demographic variables, including age, marital status, unit, gender, years of experience, and professional qualifications.

METHOD

Study Design: To assess IV medication administration errors among pediatric nurses, a descriptive study design was employed, encompassing various units at Heevi Teaching Hospital, including medical-surgical, neonatal, critical care, and emergency departments.

Setting: The study was conducted at Heevi Teaching Hospital in Duhok City, located in the Kurdistan region of Iraq.

Sampling Technique and Sample Size: A probability (random) sample of 30 nurses working in three shifts (morning, evening, and night) was selected for this study. These nurses administered IV medications to inpatients at Heevi Pediatric Teaching Hospital.

Instrument: The study tool, which included checklists, was developed based on a thorough literature review and was culturally and linguistically adapted. The instrument consisted of two parts:

- **Part I: Sociodemographic Data**: This section collected nurses' age, marital status, unit, gender, years of experience, and professional qualifications.
- **Part II: Skills Assessment Checklist**: A 20-item checklist was used to evaluate the nurses' IV medication administration techniques. This checklist was divided into five dimensions: storage, transcription, dispensing, observation, and general errors. Each item was rated on a 3-point scale ("Never," "Sometimes," "Always"). Content validity was confirmed by eight experts from various fields, who provided positive feedback on the instrument.

Calculation of Sufficiency: Nurses' sufficiency was determined based on the score cut-off points: 0–50% (deficit), 51–

74% (moderate deficit), and 75–100% (sufficient).

Ethical Consideration: Nurses were fully informed about the study's objectives, and verbal consent was obtained before participating. The study ensured anonymity, confidentiality, privacy, safety, and participant protection. Local ethical approval was granted by the Directorate General of Health's Ethical Committee of the Directorate of Planning and Scientific Research Division.

Statistical Analysis: Percentages and frequencies were used to describe the sample. Chi-square tests were conducted to explore the relationship between sufficiency levels and demographic variables, with significance set at $p < 0.05$.

RESULTS

Demographic Characteristics of the Sample

Table 1 summarizes the sociodemographic traits of the 30 nurses who participated in the study. Most nurses (60%) were aged between 20 and 30 years. Similarly, 60% of the sample were male, and 60% were married. Regarding their professional qualifications, 66.7% of the nurses held a diploma in nursing, and 73.4% of the nurses worked the morning shift, the most common shift among the participants.

Assessment of Intravenous Medication Administration Errors

Table 2 highlights the assessment of IV medication administration errors across various phases: transcription, dispensing, storage, observation during administration, and general procedures.

- **Transcriptional Errors**: A significant portion of the nurses (60%) failed to perform the six rights of medication administration consistently, with only 10% demonstrating sufficiency in this area. Similarly, 76.7% of the nurses were sufficient in charting the administered medication, while 13.3% failed to assess for any contraindications to the patient receiving the medication.
- **Dispensing Errors**: The results indicate that nurses struggled with medication dispensing procedures. Only 23.3% of the nurses followed established guidelines, and 53.3% checked the medication label against the medication administration record to ensure accuracy. However, only 16.7% of the nurses accurately calculated medication, and 20% reviewed the drug calculation before administration.
- **Storage Errors**: While 96.7% of the nurses had access to a dedicated refrigerator for storing medications, significant deficiencies were noted in checking the vial for alterations (36.7% sufficiency) and medication expiration dates (60% sufficiency). Additionally, 93.3% of the nurses failed to properly remove the patient's medication(s) from the storage area.
- **Observation During Administration**: The observation phase revealed considerable errors. Only 20% of the nurses analyzed whether the prescription was administered successfully, and 26.7% monitored vital signs during administration. On the other hand, 63.3% observed adverse reactions, and 80% checked the injection site for swelling or infiltration, demonstrating higher sufficiency in these areas.
- **General Procedural Errors**: The results show that many nurses did not consistently wash their hands before and after administering medication, with only 40% demonstrating sufficiency. Additionally, 43.3% informed relatives of potential side effects, and 36.7% observed the patient to identify any issues that needed to be reported to the

guardian or doctor before medication administration.

Relationship Between Demographic Characteristics and Medication Administration Errors

Table 3 presents the relationships between the nurses' sociodemographic characteristics and the frequency of IV medication administration errors. A significant relationship was found between the gender of the nurses and the frequency of errors ($p = 0.04$), with male nurses showing higher sufficiency levels than their female counterparts. However, no significant correlations were observed between age, marital status, shift type, or professional qualification and the frequency of medication administration errors.

Table 1: Social and Demographic Traits of Nurses (n = 30)

Variables	Categories	(F)	(%)
Age	20-30 Y	18	60
	31-40Y	8	26.7
	40Y and above	4	13.3
Gender	Male	18	60
	Female	12	40
Marital status	Married	18	60
	Single	12	40
Type of Shift	Morning	22	73.4
	Afternoon	4	13.3
	Night	4	13.3
Professional qualification	Diploma in Nursing	20	66.67
	Bachelor's in Nursing	7	23.3
	Diploma in Midwifery	3	10

Table 2: Assessment of Intravenous Medication Mistakes Made by Nurses

Mistakes	Always	Sometimes	Never	(Mean	SD	(Sufficient %)	(Evaluation)
I-Transcriptional mistakes							
1. Perform the 6 rights of medication administration	3	9	18	0.5	0.7	10%	Def
2. Chart the medication administered on the medication administration	23	2	5	1.6	0.8	76.7%	Suf
3. Assess for any contraindications to client receiving medications	4	7	19	0.5	0.7	13.3%	Def
II- Dispensing mistakes							
1. Establish procedures with guidelines	7	8	15	0.7	0.8	23.3%	Def
2. Check the label on the bottle or card and select the medication	16	9	5	1.4	0.8	53.3%	Mod
3. Compare the medication administration record with the label	9	7	14	0.8	0.9	30%	Def
4. Accurate medication calculation	5	8	17	0.6	0.8	16.7%	Def
5. Reviewing the drug calculation	6	7	17	0.6	0.8	20%	Def
6. Follow the specific instructions listed for each type of medication	10	6	14	0.9	0.9	33.3%	Def
III- Storage mistakes							
1. Check the vial for any alterations (discoloration, debris, etc.)	11	7	12	1.0	0.9	36.7%	Def

2. Check the medication expiration date	18	7	5	1.4	0.8	60%	Mod
3. Have a dedicated refrigerator for storing medications	29	1	0	2.0	0.2	96.7%	Suf
4. Remove the individual's medication(s) from the storage area	2	10	18	0.5	0.6	6.7%	Def
IV- Observation during administration mistakes							
1. Analyze whether the prescription was administered successfully	6	8	16	0.7	0.8	20%	Def
2. Monitoring vital signs	8	10	12	0.9	0.8	26.7%	Def
3. Observe for allergy or any adverse reaction	19	7	4	1.5	0.7	63.3%	Mod
4. Observe the site of injection for swelling, infiltration	24	5	1	1.8	0.5	80%	Suf
V- General mistakes							
1. Wash hands before and after each medicine administration procedure	12	8	10	1.1	0.9	40%	Def
2. Informing the relative of any potential side effects	13	8	9	1.1	0.9	43.3%	Def
3. Observe the individual to see if anything needs to be reported	11	10	9	1.1	0.8	36.7%	Def

Table 3: Relationships Between Nurses' Sociodemographic Traits and the Frequency of Intravenous Medication Administration Mistakes

Variables	Sufficient	Moderate	Deficit	X2	P. Value
Age					
20-30 Y	4	6	8	1.25	0.87
31-40 Y	3	3	2		
40Y and above	1	1	2		
Gender					
Male	12	4	2	6.6	0.04
Female	3	3	6		
Marital status					
Married	2	5	11	4.2	0.12
Single	4	5	3		
Type of Shift					
Morning shift	6	7	9	1.04	0.9
Afternoon shift	1	1	2		
Night shift	2	1	1		
Professional qualification					
Diploma in Nursing	4	7	9	6.12	0.18
Bachelors in Nursing	5	1	1		
Diploma in midwifery	1	1	1		

DISCUSSION

The findings of this study provide critical insights into the prevalence of intravenous (IV) medication administration errors among pediatric nurses at Heevi Pediatric Teaching Hospital in Duhok City. The discussion is structured around the key areas where errors were most frequent, comparing these results with existing literature and considering potential reasons for the observed outcomes.

1. **Sociodemographic Characteristics of Nurses**

The demographic data revealed that most nurses were young, predominantly in the 20–30 age range, male, and married. These characteristics align with the broader trends observed in nursing demographics within the region. The significant portion of male nurses (60%) contrasts with global trends where nursing is often female-dominated, suggesting potential cultural or regional differences in gender roles within the healthcare workforce.

2. **Transcriptional Errors**

The study found that transcriptional errors, particularly the failure to adhere to the "six rights" of medication administration, were prevalent among the nurses. Only 10% of the nurses consistently performed this essential safety check. This finding is consistent with previous studies highlighting nurses' challenges in maintaining accuracy during transcription, especially under time pressure (Kareem & Zaki, 2018). The inadequate performance in this area could be attributed to insufficient training, high workload, or lack of awareness regarding the critical importance of these checks.

3. **Dispensing Errors**

Errors in the dispensing phase were also prominent, with many nurses failing to accurately calculate medication dosages and follow established procedures. This

finding corroborates the work of Fahimi et al. (2008), who reported similar challenges in medication calculation accuracy among nurses. The moderate sufficiency (53.3%) in checking labels and selecting the correct medication highlights a partial adherence to best practices. However, the overall performance indicates a need for targeted interventions to improve these skills.

4. **Storage and Observation Errors**
Storage-related errors were common, particularly in checking medication vials for alterations and verifying expiration dates. This aligns with the findings of Giorgi et al. (2010), who identified similar issues in pediatric settings. The high sufficiency in having dedicated storage facilities (96.7%) contrasts with the low sufficiency in actively monitoring the stored medications, suggesting a disconnect between infrastructure availability and its effective utilization.
Observation errors during administration, such as monitoring vital signs and checking for allergic reactions, were also significant. The deficiency in these areas is concerning, as they are critical for patient safety during IV medication administration. Previous research by Silva and Camerini (2012) supports these findings, indicating that poor monitoring is a widespread issue that can lead to adverse outcomes.
5. **General Procedural Errors**
The general procedural errors, particularly the failure to consistently wash hands before and after medication administration, underscore a significant lapse in infection control practices. This finding is consistent with the work of Vazin and Delfani (2012), who highlighted the importance of hand hygiene in preventing hospital-acquired infections. The insufficient practice of informing relatives about potential side effects further emphasizes the need for improved communication between healthcare providers and patient's families.
6. **Relationship Between Sociodemographic Traits and Medication Errors**
The study revealed a significant relationship between the gender of nurses and the frequency of medication errors, with male nurses demonstrating higher sufficiency levels. This finding contrasts with some studies that suggest female nurses may be more diligent in following protocols due to traditionally perceived gender roles. However, it is essential to consider the cultural context in Duhok City, where gender dynamics might differ from those in other regions. Additionally, the lack of significant correlations between other demographic factors (age, marital status, shift type, and professional qualifications) and medication errors suggests that these errors are likely influenced more by situational factors, such as workload and environmental pressures, rather than by inherent demographic characteristics.

CONCLUSIONS

Overall, the study underscores the need for ongoing training and education to enhance the accuracy and safety of IV medication administration among pediatric nurses. The identified gaps in practice, particularly in transcription, dispensing, storage, and observation, indicate that targeted interventions are necessary to mitigate the risk of medication errors. Future research could explore the underlying causes of these errors in more detail and evaluate the effectiveness of training programs designed to address these issues. Moreover, healthcare institutions should

consider regular audits and feedback mechanisms to ensure continuous improvement in nursing practices.

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Study the concept and write and review the final edition by all authors.

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