Descriptive Cross-sectional Study

Intravenous Infiltration and Extravasation: Performance of Nurses at Pediatric Hospitals in Khartoum State in 2019

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How to cite this article: Alshiekh I, Ali AM, Gassmalla HM, Hussein MK. Intravenous Infiltration and Extravasation: Performance of Nurses at Pediatric Hospitals in Khartoum State in 2019. 2023;15(2): 24-28.

ABSTRACT

Aim: Prevention is the best method for decreasing morbidity from peripheral intravenous infiltration and extravasation.The study aimed to study nurses' performance regardingi ntravenous infiltration and extravasation.

Method: This descriptive cross-sectional hospital-based studywas conducted at four pediatric hospitals in Khartoum state. In total, 165 nurses were included using a simple random sampling of different working experiences.Data were collected using an observational checklist and analysed using the statistical packages forthe social sciences (SPSS) version 20.

Results: Most of the nurses(72.8%) did not flush 0.9% saline to assess cannula function; all nurses in the present study covered the insertion site with non-transparent plaster, and more than half (57.6%) diluted vesicant medication with a lesser amount than required. There was a statistically significant association between qualifications and practice scores (P=0.001).

Conclusion: This study showed that nurses had a poor level of practice regarding intravenous infiltration and extravasation.

Recommendation: We recommend education, guidelines, and standards for infusion therapy. Additionally, a supervisory system should be created to ensure best practices.

Keywords: prevention, intravenous infiltration, extravasation, performance .

INTRODUCTION

Nurses are expected to maintain competence in peripheral intravenous site care to enhance patient outcomes and prevent potentially life-threatening complications, and this is a technically difficult and complicated procedure that needs to be performed successfully [(1)]. Intravenous infusion therapy is associated with many complications, including infiltration and extravasation [(2)]. Intravenous infiltration is the leakage of a non-vesicant solution into the surrounding tissues, while extravasation is the inadvertent leakage of a vesicant solution into the surrounding tissues. A vesicant refers to any medication or fluid with the potential to cause blisters, severe tissue injury, or necrosis.The concentration of vesicant, amount extravasated, and type of vesicant are all factors that influence the severity of extravasation. Prevention of infiltration and extravasation begins with choosing an appropriate IV-gauge, careful site selection, frequent visual assessment, vein patency, comparison of the two extremities, and recognition of the signs and symptoms of infiltration and extravasation. During site

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selection, areas of flexion and pain on palpation should be avoided. Peripheral or central venous access devicesare flushed before each infusion as a step for assessingthe catheter and preventing contact between incompatible medications[3]. The intravenous cannula site should be covered with a transparent dressing, which helpssecure the site and makes it visible at all times [4]. The tape or plaster should not be wrapped aroundthe extremity, as this could result in a tourniquet effect [5]. Many practitioners' peripheral intravenous catheter knowledge and insertion skill deficits have been identified, including patient assessment, insertion site selection, catheter selection, and insertion, catheter securement, dwell time, complication identification and treatment, compliance with best practice guidelines, and the need for effective educational strategies [6]. In 2012, the Infusion Nurses Society(INS) released a position paper on the frequency of peripheral catheter site assessment. Observation of the insertion site is recommended every 1–2 hbased on the type of fluids and medications being administered [7]. The Centre for Disease Control and Prevention Guidelines for the Prevention of Intravascular Catheter-Related Infections recommend replacing peripheral catheters in children only when clinically indicated[8]. Accurate documentation of infiltration and extravasation is vital for facilitating patient care and litigation. Documentation is the key to effective legal defence in the event of a medicolegal claim [9]. The outcome of infiltration and extravasation can range from oedema in an extremity to full-thickness skin loss, muscle or tendon necrosis, and, in some cases, amputation [10], leading to prolonged hospitalisation and increased medical costs [11].Nurses need to improve their practice and knowledge through specific education and training, to provide high-quality and effective health care for patients [12]. It is also important to assess nurses' abilities to create positive changes in their knowledge and practice. The number of studies on intravenous infiltration and extravasation among children in Sudan is limited.Therefore, this study aimed to examine nurses` performance regarding the prevention of infiltration and extravasation in paediatric hospitals.

METHODOLOGY

This descriptive cross-sectional hospital-based study was conducted at pediatric governmental hospitals in Khartoum state: Ahmed Gasim Pediatric Hospital, Mohammed Elamin Hamid Pediatric Hospital,GafaarIbnuof Pediatric Hospital, and Albluck Pediatric Hospital.Using a simple random sampling technique, 165 nurses were included in this study,regardless of their qualifications and years of experience, and the sample size was calculated based on the total population. The variables studied were cannula size, site selection, flushing, security of the insertion site,documentation of cannula insertion, and the touch, look, compare (TLC) method. Data were collected using an observational checklist to assesss kills related to preventive measures for infiltration and extravasation based on the Infusion Therapy Standards of Practice and analysed using the statistical packages forthe social sciences (SPSS) version 20. The practical skills were scored from 1–3, with3indicatinggood if the skill was performed correctly, 2 indicating fair if the skill was not performed correctly, and 1 indicating poor if the skill was not performed. Data are presented in the form of a simple frequency table and a cross table to explore the relationships between variables. Statistical significance was set at $P \leq 0.05$. Ethical approval was obtained from the ethics committees and administrative authorities of the hospitals.

RESULTS

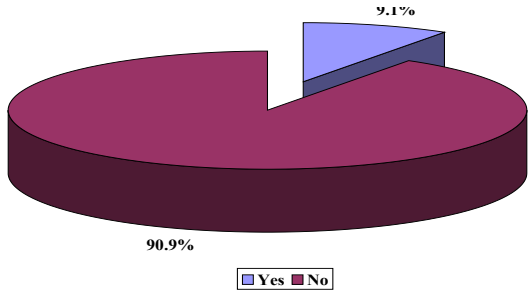

Fig. 1. In-service training on intravenous therapy (N =165).

DISCUSSION

This study illustrated that only 9% of nurses received a training course on intravenous complications, which is in disagreement with the study conducted by Ajani, who mentioned the importance of educational programmes and training [11].The findings revealed that most of the nurses (61.2%) used the smallest-sized cannula (24gauge) more frequently. Similar to a study by Alexander, a small-gauge catheter results in fewer traumas to the vein [3], and small cannulasare preferable and available in pediatric hospitals. In total,30.9% of nurses inserted cannulas from distal to proximal, as starting from distal saves more proximal veins for future use. Moreover, the study revealed that 20% of the nurses had committedmalpractice in that they flushed peripheral cannula with sterile water. Sterile Water for Injection, a unique selling proposition (USP), is a haemolytic agent and is contraindicated for intravenous administrationdue to the nurses' lack of education concerning intravenous therapy. All nurses in the present study covered the insertion site with non-transparent plaster, and this practice is not in line with the INS practice criteria, as the site of peripheral catheter insertion should be covered with a transparent plaster to allow visibility of the site.However, transparent plasters,which help in the prevention and early detection of infiltration and extravasation,are not

Table 1. Characteristics of the study participants(N=165)

Demographic	Frequency	Percentage
Age		
20–30 years	11	6.70%
31–40 years	92	55.80%
41–50 years	39	23.60%
>50 years	23	13.90%
Nurses' qualifications		
Certified nurse	57	34.50%
Diploma	71	43.00%
Bachelor	31	18.80%
Master	6	3.60%
Gender		
Male	30	18.20%
Female	135	81.80%
Years of experience		
1–5 years	11	6.70%
6–10 years	31	18.80%
11–15 years	86	52.10%
>15 years	37	22.40%
Total	**165**	**100%**

Table 2: Association between nurses' qualification and assessment of cannula function (N =165)

Qualification		Assessment of cannula function			
		Not done	Done not correctly	Done correctly	Total
Certified nurse	count	57	0	0	57
	%	0%	0%	0%	100%
Diploma	count	36	29	6	71
	%	50.7%	40.8%	8.5%	100%
B.Sc.	count	24	3	4	31
	%	77.4%	9.7%	12.9%	100%
M.Sc.	count	3	1	2	6
	%	50%	16.7%	33.3%	100%
Total	count	120	33	12	165
	%	72.7	20	7.3%	100%

P-value=0.001

Table 3. Distribution of the nurses according to preventive measuresfor IV infiltration and extravasation (N =165)

Items	Not done		Not done correctly		Done correctly	
	N	%	N	%	N	%
Select the smallest-gauge	27	16.4	00	0.0	138	83.6
Avoid area of flexion	130	78.8	00	0.0	35	21.2
Start from distal to proximal	89	53.9	00	0.0	76	46.1
Insert cannula on first attempt	86	52.1	00	0.0	79	47.9
Assess catheter function by flushing 0.9% saline	120	72.7	33	20	12	7.3
Insertion site visible with transparent plaster	165	100.0	0.0	0.0	0	0.0
Plaster tape not circumferential	165	100.0	0.0	0.0	0	0.0
Monitoring site hourly for oedema and discoloration	112	67.9	49	29.7	4	2.4
Documentation of cannula insertion	165	100.0	0	0.0	0	0.0
Dilute vesicant medications appropriately before administration	0	0.0	95	57.6	70	42.4
Flush cannula after each infusion to clear the infused medication	162	98.2	0.0	0.0	3	1.8
Perform TLC hourly: touch insertion site for coolness and pain; look for signs of swelling, blanching, and blister at the insertion site; and compare both extremities every hour	165	100.0	0.0	0.0	0.0	0.0

available in governmental pediatric hospitals in Khartoum state.All nurses in this study applied plaster tape circumferentially, and a study conducted by Amjad reported that circumferential taping had a tourniquet effect and that tight taping could worsen the effects of infiltration[5]. Nurses in this study monitored the insertion site hourly for signs of oedema and discoloration, contrary to Gorski's recommended frequency ofevery 1–2 h based on the type of fluids and medications administered[7].None of the nurses in this study documented cannula insertion. A study conducted by Raveesh suggested that documentation is the key to an effective legal defence in the event of a medicolegal claim [9]. More than half(57.6%) of the nurses diluted medications with a lesser amount than required, and the concentration of vesicants is an influencing factor for extravasation severity.[9]However, in the study conducted by Amjad, the medical staff were asked to notify the pharmacy when using a short peripheral cannula so that dilutions could be adjusted for administration [5].Inpaediatric hospitalsin Khartoum state, the use of short peripheral cannulas was common, and nurseswerein charge of mixing and diluting medications, not pharmacists. The current study showed significant differences in practice scores with regard to nursing qualification (P=0.001).

CONCLUSION

This study showed that the performance of nurses in the prevention of infiltration and extravasation was poor.

RECOMMENDATION

We recommend adherence tostandards and guidelines for infusion therapy.In addition, a supervisory system should be created to ensure best practice.

Ethical clearance- Ethical approval was obtained from ethical committees and administrative authorities of hospitals.

Source of funding- Self

Conflict of Interest: Nil

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