ORIGINAL ARTICLE

CONTENTS

Effectiveness of intravenous infusion protocol in improving quality of care and reducing complications among hospitalized patients

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ABSTRACT

Aim: This study aimed to evaluate the effectiveness of a structured intravenous infusion protocol in improving the quality of care and reducing IV-related complications among hospitalized patients.

Materials and Methods: A purposive sample of 72 nurses was divided equally into a study group (n = 36), who received the structured IV infusion training, and a control group (n = 36), who followed routine practice. Data were collected using a validated Quality of Care Scale, which included five domains: effectiveness, patient-centered, timeliness, efficiency and equity.

Results: Results showed a marked improvement in the study group's performance after the intervention. The mean of scores for all domains and overall quality of care was low in the pretest (i.e. Effectiveness 0.63, Timeliness 0.64, and Efficiency 0.61, overall, 0.63) while post-test scores increased markedly to 1.42, 1.42, 1.38 and 1.41 respectively. The IV-related complications have decreased in the study group following the intervention (posttest) including phlebitis, infiltration and infection. Although these reductions were not significant, a high significant improvement was observed in pain incidence, which dropped from 25% to 2.8% ($p<0.01$).

Conclusions: the structured intravenous infusion protocol effectively improved nurses' performance resulting in enhancing patients' quality of life. The significant decline in pain reflects an important enhancement in patient comfort and nursing performance.

KEY WORDS: intravenous infusion, IV protocol, quality of care, complications

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INTRODUCTION

Intravenous (IV) infusion is one of the oldest and fundamental treatment modalities in healthcare interventions. Whether being used as treatment, intervention (crystalloid transfusion or fluid resuscitation) or essential sustenance (in total parenteral nutrition), only a few therapies are delivered directly into the veins and to the target organ via the IV route [1]. The widespread prevalence of infusion therapy supports its clinical significance, but also serves as the potential root cause of inaccuracy and adverse events because of the complexity of infusion therapy, including prescribing, preparation, administration, monitoring, and discontinuation. For instance, inappropriate use of IV fluids and medications is linked to prolonged length of stay, higher complication rates, and higher costs [2]. Considering the severity of the stakes, the use of standardized intravenous-infusion protocols (VIPs) is a rational approach to improving quality of care and preventing complications in inpatient settings [3]. Thus, the quality of care rendered through IV infusions is dependent on many factors: consistency of fluid or medication selection, dosage and rate-infusion knowledge, understanding of compatibility and stability problems, operation of infusion pumps, documentation of therapy, and monitoring of the patient response and complications [4]. It has been noted in the literature that while infusion therapy is an essential aspect of patient care, there is still considerable variability in practice with little monitoring of best practices within hospitals. Therefore, the implementation of a standardized infusion protocol may help unite and streamline these processes [5]. In addition to harmonization of procedures, the implementation of infusion protocols is also associated with patient safety and care outcomes. Standardization of intravenous (IV) medications is known to decrease medication errors and medication-related adverse events in inpatient settings. Protocolized approaches to fluid and electrolyte therapy lead to decrease in inappropriate fluid usage that in some studies can

affect up to one in five patients receiving intravenous therapy. Consequently, infusion protocols are not merely operational guidelines; they are quality-advancing instruments with a direct impact on patient-oriented outcomes [6]. Recent studies have reaffirmed hospital complications related to IV therapy. For instance, a hospital audit identified opportunities for documented standardized protocols for both intermittent and continuous infusions, primary motivators for reuse of sets, and bloodstream infection risk; and as a result, achieved reduced rates of inappropriate reuse of sets, decreased risk of bloodstream infection, improved documentation and improved pump-use safety [7]. Likewise, a cross-sectional survey of IV fluid administration by nurses and midwives determined IV practice deficiencies (e.g. incorrect infusion rates or inadequate monitoring) that were linked to greater complication rates. These results confirm that the infusion process is prone to human, technical and organizational errors and that protocols can address these failings [4]. Quality of care is a multidimensional concept which goes beyond access as it includes effectiveness, efficiency, safety, timeliness, patient-centeredness and equity. Accordingly, IV infusion protocols have been shown to be directly related to organizational priority and clinical priority. Infusion protocols underpin evidence-based practice by standardizing practitioner behavior and minimizing unwarranted variation [8]. Implementation of standardized IV medication protocols incorporated in a systematic review was associated with improved guideline adherence and a reduction in the incidence of medication errors and improvement in workflow efficiency that collectively enhance the quality of healthcare delivery [5]. For example, within inpatient care, where IV infusion is one of the most common procedures, such standardized excellence could translate to significant complication reductions, shorter lengths of stay, and improved patient experience [9]. The existing literature, however, demonstrated that most of the studies of infusion protocols were addressed only at medication infusion and often forgot to introduce the term of infusion therapy that includes fluids, electrolytes, nutrition and several-component therapies [10]. Additionally, there have been limited studies in non-homogeneous inpatient wards (surgical, medical, critical care) or hospitalized populations from non-high-income settings. Similarly, few studies addressed the long-term outcomes of complication rates, re-admission rates, or cost outcomes by different infusion protocols. This diminished generalizability suggests that more research is necessary to assess more global infusion initiatives and quality of care outcomes in large hospital populations.

AIM

The aim of the current study assessment was to determine if VIP is associated with better patient care indicators, that is fewer actual complication rates in Iraqi hospitals and to evaluate the effectiveness of a structured intravenous infusion protocol in improving the quality of care and reducing IV-related complications among hospitalized patients

MATERIALS AND METHODS

This quasi-experimental study was conducted to assess the impact of an intravenous (IV) treatment protocol on quality nursing care and complications related to IV among hospitalized patients. The current study was carried out in Al-Hussein Teaching Hospital, Diwaniyah, Iraq, from November 1st 2024 to May 10th 2025. Seventy-two nurses meeting the inclusion criteria were selected through purposive sampling. They were randomly assigned into two groups: the study group included 36 nurses who received IV infusion protocol training program, and a control group included 36 nurses without special education on the hospital that continued with the usual activities of the hospital. Nurses who were working in inpatient settings, had at least 1 year of clinical experience performing IV therapy, and agreed to participate voluntarily were eligible. Nurses on long leave and not directly practicing intravenous therapy were excluded. The reason we used purposive sampling was that the participants with IV care experiences could be included in our study as much as possible to maximize practical and accurate results. Patients who received the intravenous (IV) infusion intervention from both the study and control nurse groups were comparable with respect to potential confounding variables that could influence IV-related complications, including age, sex, type of infused solution, catheter gauge, and insertion site. The study instrument was constructed by the researchers to gather information. The instrument was divided into three main sections. Part I: Socio-demographic data such as age, sex, educational level, prior training on IV infusion protocol awareness, number of training sessions attended, type of previous trainings, and hours spent being trained were collected in the first part. The second part is the Quality of Care Scale to assess key dimensions of nursing care during IV infusion, including: effectiveness, patient-centered, timeliness, efficiency and equity. Content validity of the instrument was confirmed by a panel of ten experts who are well-versed in nursing education and clinical practice; a S-CVI/Ave (scale-level content validity index) score of 0.97 was obtained, representing excellent content validity. The Cronbach's alpha to measure reliability

Table 1. Descriptive statistics (frequency and percentage) for the demographic data of both study and control groups

Demographic data		Control Group		Study Group		χ^2 P value
		Freq. (N=36)	[%]	Freq. (N=36)	[%]	
Age / Years	22-28	7	19.4	8	22.2	0.21 0.99 (NS)
	29-35	9	25	9	25	
	36-42	8	22.2	7	19.4	
	43-49	6	16.7	6	16.7	
	≥ 50	5	13.9	6	16.7	
Gender	Male	16	44.4	15	41.7	0.06 0.81 (NS)
	Female	20	55.6	21	58.3	
Educational Status	School of Nursing	9	25	8	22.2	0.13 0.98 (NS)
	Institute of Nursing	11	30.6	12	33.3	
	College of Nursing	12	33.3	13	36.1	
	Postgraduate	4	11.1	4	11.1	
Training on IV protocol	Yes	22	61.1	23	63.9	0.06 0.80 (NS)
	No	14	38.9	13	36.1	
No. of Training Sessions	0	14	38.9	13	36.1	0.07 0.96 (NS)
	1-2	13	36.1	14	38.9	
	≥ 3	9	25	9	25	
Duration of Training/ Hours	0	14	38.9	13	36.1	0.25 0.96 (NS)
	1-5	10	27.8	12	33.3	
	6-10	6	16.7	6	16.7	
	≥ 11	5	13.9	6	16.7	

NS: Non-Significant at P>0.05
Source: Compiled by the authors of this study

Table 2. Differences in mean of scores of overall and domains of Quality-of-Care between (pre-test and post-test) measurements for the study group

Domains	Study Group Tests	Mean	SD	Paired T-Test	df	P-value
Effectiveness	Pre-test	0.63	0.18	8.92	35	0.001 HS
	Post-test	1.42	0.18			
Patient-centered	Pre-test	0.65	0.21	9.05	35	0.001 HS
	Post-test	1.42	0.12			
Timeliness	Pre-test	0.64	0.24	9.18	35	0.001 HS
	Post-test	1.42	0.11			
Efficiency	Pre-test	0.61	0.21	8.75	35	0.001 HS
	Post-test	1.38	0.31			
Equity	Pre-test	0.61	0.21	7.85	35	0.001 HS
	Post-test	1.42	0.11			
Overall Quality-of-Care	Pre-test	0.63	0.22	10.02	35	0.001 HS
	Post-test	1.41	0.18			

SD: standard deviation, df: degree of freedom, HS: high significance at P<0.01
Source: Compiled by the authors of this study

for all scale items was investigated and showed a high internal consistency, with values greater than 0.85. Expert validation, pilot testing and repeated measures were used to guarantee the validity and reliability of the instruments. Before conducting the main study, a pilot-study was carried out with eight nurses to test the clarity, applicability and feasibility of data collection tools. Revisions to enhance clarity and the organization of the observation checklist were incorporated according to participant feedback. The results of the pilot study are not included in the main analysis to avoid bias. The educational intervention for study group was

Table 3. Differences in means of scores for overall and domains of quality of care between (pre-test and post-test) measurements for the control group

Domains	Control Group Tests	Mean	SD	Paired T-Test	df	P-value
Effectiveness	Pre-test	0.61	0.19	1.42	35	0.16 NS
	Post-test	0.71	0.2			
Patient-centered	Pre-test	0.64	0.2	1.28	35	0.21 NS
	Post-test	0.73	0.21			
Timeliness	Pre-test	0.65	0.21	1.11	35	0.27 NS
	Post-test	0.72	0.22			
Efficiency	Pre-test	0.59	0.2	1.34	35	0.19 NS
	Post-test	0.68	0.21			
Equity	Pre-test	0.6	0.2	1.47	35	0.15 NS
	Post-test	0.72	0.22			
Overall Quality-of-Care	Pre-test	0.62	0.2	1.38	35	0.17 NS
	Post-test	0.71	0.21			

SD: standard deviation, df: degree of freedom, NS: Non-Significance at P>0.05
Source: Compiled by the authors of this study

Table 4. Comparison of complications of IV Therapy at the pre-test measurement between study and control groups

Demographic data		Control Group		Study Group		P value
		Freq. (N=36)	%	Freq. (N=36)	%	
Phlebitis	Yes	2	5.6	3	8.3	0.64 NS
	No	34	94.4	33	91.7	
Infection at the insertion site	Yes	3	8.3	2	5.6	0.64 NS
	No	33	91.7	34	94.4	
Occlusions	Yes	1	2.8	1	2.8	1.00 NS
	No	35	97.2	35	97.2	
Extravasation	Yes	1	2.8	2	5.6	0.55 NS
	No	35	97.2	34	97.2	
Bleeding at the insertion site	Yes	2	5.6	1	2.8	0.55 NS
	No	34	94.4	35	97.2	
Pain	Yes	8	22.2	9	25	0.78 NS
	No	28	77.8	27	75	

NS: Non-Significant at P>0.05
Source: Compiled by the authors of this study

a predetermined training program developed based on standard IV infusion guidelines. It was a two-week program with four intensive sessions that combined theoretical lectures and practical demonstrations. The theoretical aspects drew from principles of IV therapy, infection control, safe administration of IV fluids and medication, as well as documentation. Workshops were skill based, including correct IV insertion and trouble-shooting (IV complications – phlebitis or infiltration) as well as adherence to aseptic technique by applying set criteria. Each session varied in length (1-1.5 hours) and was accompanied by educational materials including a pictorial manual, checklists and visual prompts. The control group was not given any form of training or intervention during the whole trial period and maintained their routine nursing mode. Two measurements were scheduled for the two groups: one before training program (pre-test) and the other, two weeks after completion (post-test). Each nurse was observed by the researcher three times during each phase of the study, all with the same observation list. The average of the 3 observation scores was taken for analysis to attenuate individual variability and observer effects. Based on these observations, scores were recorded as follows: (0 = Not done; 1 = partially done; 2 = completely done). For each domain of nursing practice and quality of care, scores were summed and converted to mean scores. Higher mean scores indicated improved practice

Table 5. Comparison of complications of IV Therapy at the post-test measurement between study and control groups

Demographic data		Control Group		Study Group		P value
		Freq. (N=36)	[%]	Freq. (N=36)	[%]	
Phlebitis	Yes	3	8.3	0	0.0	0.07 NS
	No	33	94.4	36	100	
Infection at the insertion site	Yes	2	5.6	0	0.0	0.15 NS
	No	34	91.7	36	100	
Occlusions	Yes	1	2.8	0	0.0	0.07 NS
	No	35	97.2	36	100	
Extravasation	Yes	1	2.8	0	0.0	0.07 NS
	No	35	97.2	36	100	
Bleeding at the insertion site	Yes	2	5.6	0	0.0	0.15 NS
	No	34	94.4	36	100	
Pain	Yes	9	25	1	2.8	0.01 HS
	No	27	77.8	35	97.2	

NS: Non-Significant at P>0.05

Source: Compiled by the authors of this study

performance and quality of care. A larger mean score demonstrated better nursing performance and quality of care after the intervention.

Statistical analysis was conducted using IBM SPSS Statistics version 27. Descriptive statistics such as frequency, percentage, mean, and standard deviation were employed in the description of demographic information and performance scores. Comparisons between the study and control groups, as well as within each group (pre to post) were made using inferential statistics (paired and independent t-tests). A p-value equal to or lower than 0.05 was considered statistically significant. All ethical issues were approved by the Scientific Research Ethics Committee at the Faculty of Nursing, University of Kufa. Approval for the study was obtained from Al-Hussein Hospital administration. Informed consent was obtained from all participants, with participation being entirely voluntary. All-round confidentiality and anonymity of participants were ensured throughout the research. Nurses were told that they could quit the study at any time without being penalized.

RESULTS

The demographic characteristics of participants in the study and control groups are shown in table 1. The results reveal an even distribution across all demographic factors with no statistically significant differences between groups (Chi-square test, $p > 0.05$). This implies that both groups were similarly homogeneous prior to the intervention.

Table 2 showed a statistically significant difference for all quality of care domains between study group before and after implementation of IV fluid protocol. Pre-test scores were poor-to-moderate in for most domains (Effectiveness mean = 0.63, Timeliness mean = 0.64, and Efficiency mean = 0.61), whilst post-test scores had shifted significantly towards the moderate-to-good (Effectiveness mean = 1.42, Timeliness mean = 1.42, Efficiency mean = 1.38). The paired t-test values were between 7.85 and 10.02, all statistically significant ($p < 0.001$), which indicate strong improvements in all domains. The Overall Quality-of-Care domain showed the largest gain ($t = 10.02$; $p < 0.001$), suggesting that the overall quality and safety of nursing performance significantly improved with the introduction of the structured IV fluid protocol.

The results of the control group revealed only a slight improvement in quality-of-care scores from the pre-test to the post-test across all domains, but the changes did not reach statistical significance. For example, the mean score for effectiveness increased from 0.61 ± 0.19 at baseline to 0.71 ± 0.20 post-test ($t=1.42$, $p=0.16$), while patient-centered care rose from 0.64 ± 0.20 to 0.73 ± 0.21 ($t=1.28$, $p=0.21$). Similarly, timeliness improved from 0.65 ± 0.21 to 0.72 ± 0.22 ($t=1.11$, $p=0.27$), and efficiency from 0.59 ± 0.20 to 0.68 ± 0.21 ($t=1.34$, $p=0.19$). The equity domain showed a comparable trend (0.60 ± 0.20 to 0.72 ± 0.22; $t=1.47$, $p=0.15$). The overall quality-of-care score also increased marginally from 0.62 ± 0.20 to 0.71 ± 0.21 ($t=1.38$, $p=0.17$) as shown in (Table 3).

The results of complications revealed that there were no statistically significant differences between the study and control groups regarding IV therapy-related complications at the pre-test stage ($p>0.05$ for all items). The frequencies of phlebitis (5.6% for control in comparison to 8.3% for study), infection at the insertion site (8.3% *vs.* 5.6%), occlusions (2.8% *vs.* 2.8%), extravasation (2.8%

vs. 5.6%), bleeding (5.6% *vs.* 2.8%), and pain (22.2% *vs*. 25%) were relatively comparable between both groups (Table 4).

On the other hand, table 5 explained that the IV-related complications have decreased in the study group following the intervention (post-test measurement) including phlebitis, occlusion, infiltration extravasation, bleeding and infection at the insertion site. Although these reductions were not significant, a high significant improvement was observed in pain incidence, which declined from 25% to 2.8% ($p<0.01$).

DISCUSSION

This study results revealed that, there are a highly significant overall improvements in all domains of the Quality-of-Care Scale post educational intervention among the interventional compared to control. All the domains tested (effectiveness, patient-centeredness, timeliness, efficiency and equity) reflected a uniform increase in the average scores of quality of care with p values<0.001 in all instances—indicating that there is high degree statistical significant difference between these domains. This progress supports the importance of structured training curricula in improving nurses' practice and performance and the quality of patient care. Regarding effectiveness, the mean score grew from 0.63 ± 0.18 at pre-test to 1.42 ± 0.24 at post-test in compliance with clinical orders and documentation criteria. The mean in control group was still lower (0.71 ± 0.21), indicating no spontaneous improvement without therapy. This is consistent with previous studies that have shown nurse education programs are beneficial in increasing adherence to medication regimes, administering medications and recording the correct amounts of medication. Increased effectiveness may also derive from increased knowledge of evidence-based practice and SOPs, resulting in safety patient care [11-12]. In patient-centered nursing care, the pre- and post-test results indicated that the mean score increased significantly (pre = 0.65 ± 0.20; post = 1.42 ± 0.25), suggesting that there was a change on a better side for behaviors of communication and empathy among nurses after training to participants in this dimension of patient-centered nursing care ($p <0.05$). Control group remained 0.73 ± 0.22, which is little changes in its level of improvement. This improvement corresponds to the findings of Fawzy and Hamed [12], who found that patient-centered interventions enhanced the ability of nurses to engage patients in care decision making as well as help in increasing comfort and decreasing anxiety levels. At the same time WHO (2020) highlighted that an ideal aspect of care quality is patient-centeredness, which creates trust and leads to adherence. The educational intervention in this study seemed to enable the gap of communication between a patient and caregiver efficiently [13]. In the timeliness domain as well, progress was also marked. 0.64 ± 0.20 before/1.42 ± 0.24 after pre and post-tests respectively: care—acuity merited med/IV as specified by orders Meets patient outcomes and satisfaction, is subject to the actual time of medicine or IV. The higher scores on second parts show the subjects have been led astray, from paying more attention to quickly responding time and arrangement of order than to accuracy in their exiting or migrating movement of work location (08). This reflects the work of Prosser et al. [14]. They discovered that teaching nurses how to use clinical workflows can effectively reduce infusion delays by helping nurses reach the maximum safe infusion rate faster. The control group showed no significant change between pre and post assessment of patients' quality of care. The domain of efficiency also improved (0.61 ± 0.20 → 1.38 ± 0.24), indicating that more resources are being used, there is greater technical skill, and there is greater procedural capability on the post-test instruments. In post-test evaluation, the majority of the items were improved especially in regards to preparation of materials, selection of appropriate type of cannula and prevention of complications such as vein shredding or bleeding. This corroborates the findings by Kim et al. [15] who stated that increasing nurses' knowledge and self-efficacy in intravenous injection management are important predictors of intravenous care practice among adult care nurses. Therefore, targeted education and intervention programs should be implemented to improve adult nurses' knowledge and confidence in managing intravenous injections. The equity dimension also significantly improved, with an average of the scores' rise from 0.61 ± 0.21 to 1.42 ± 0.25. This suggests that, as the years progressed, nurses integrated fair and equal access to care among all populations of patients. The better results of this last period prove that the teaching has not only improved technical indicating competences but ethical and equitable values in care. Previous research, have likewise highlighted the role of continuous professional development programs in transforming a culture of equality, inclusivity and patients' dignity as part for delivering healthcare [16]. Comparison between assessment and control groups at post-test The study group had significantly higher scores than the control group in each of the five domains at baseline (p 120 % rise in mean scores-indicates that a structured competence based education equips for improved care

and subsequent patient status. In general terms, the results confirm the Donabedian model of healthcare quality that stresses structure, process and outcome. The intervention directly addressed the "process" domain, such as practice improvement, knowledge, and behavior change that led to better quality of outcomes [17]. Chen et al., also reported the same results, they performed a meta-analysis study and showed that nurses in tertiary hospitals significantly advanced nurse safety and quality after receiving competence education [18]. The present results further ease the evaluation of IV therapy related complication in both intervention and control group before and after the educational intervention. Such complications comprise phlebitis, site infection, occlusion, extravasation and bleeding or pain. No significant differences between groups were detected at the baseline pre-test ($p>0.05$), indicating that there were no group performance differences in IV management and complications prevention. By the post-test period, a significant decrease in complications related to IV therapy, including pain ($p=0.01$), was reported in the study group with at least other complications showing smaller decreases that were not statistically significant though very clinically meaningful. At baseline, participants in the study group compared with those in the control group were less likely to experience a complication (phlebitis 5.6% *vs* 8.3%, site infection 8.3% *vs* 5.6% for control and study group respectively). Other complications such as occlusions, extravasation and bleeding were uncommon with less than 6% of patients having these. These findings are typical complication rates presented in the clinical literature before targeted nursing initiatives [19]. The lack of difference between groups would suggest that both nurse groups were engaging in similar (potentially suboptimal) infection control practice and IV line management at baseline, further to this the lower rate of complications found across this study could also account for non-significant results. However, the outcomes of the study group improved significantly as after the educational intervention, the post-test results. The rate of phlebitis, infection, occlusion, and extravasation declined to zero, compared with the persistent rates of 8.3%, 5.6% and 2.8% in the control group respectively. While these differences were not statistically significant ($p > 0.05$), the direction represents clinically relevant gains suggesting translation of the intervention to clinical benefit by reducing IV-associated complications. Privitera et al. also recorded similar findings in regards to structured training and compliance with aseptic techniques reducing infections dislocations and occlusions in hospital wards [20]. As for side effects, the only side effect that achieved statistical significance was pain, which significantly decreased from 25% in the control group to 2.8% in the experimental group ($p = 0.01$). This finding suggests that education about proper cannulation and vein selection, and securement after cannulation may improve the comfort of the patients [19]. Despite the controls failing to make any impact to reduce the pain incidence (25%), 91% of the treatment group were able to alleviate their pain, underscoring the significance underlying clinical training skills. These results are in line with Gorski et al, who highlighted less patient suffering and discomfort during IV insertion as an important aspect of quality care and correlates highly with vein assessment and catheter stabilization [21]. In this study group, a decrease in complications in all categories was observed, possibly due to adherence to hand hygiene, aseptic technique, and close monitoring as taught in the intervention. Adequate cleansing over the insertion site, use of aseptic apparatus and specific protocols based on evidence would certainly play a role in their mitigation in terms of contamination via microbes as well as mechanical impact [22]. In addition, the larger bed numbers for low occlusion and extravasation were also due to the improved awareness of the timely replacement of IV lines and minimal handling. The educational strategy is likely to boost the confidence and accountability of nurses, which may encourage the application of practice more frequently [23]. In contrast, as per non-control group data, the control group revealed either equal or worse post-test complication rates; which is a reflection of the spontaneous ups and downs that occur in routine day-to-day practice, in the absence of intervention. Even more importantly, this means that the IV therapy safety will be sustainably improved by organized continuing practice and reinforcement, rather than by experience. Kaur et al. [24] also published similar findings in their study demonstrating that a widely implemented competence-based training was linked with improved adherence to safety practices in hospitals with a significant reduction of IV placement-associated complications. Avoid the importance of these results is only but convenience – the large international clinical trial. For example, complications including phlebitis, infection and pain may lead to prolonged hospitalization, increased healthcare cost and poor patient experience [25]. As a result, it is clinically and economically advantageous to limit such complications via focused nursing education. This is also consistent with WHO (2020) recommendations for global safe injection practices, where educating and monitoring are essential for ensuring lasting reductions in IV-related preventable injuries [13].

CONCLUSIONS

The implementation of IV infusion protocol has effectively enhanced nurses' practice regarding all domains of patients' quality of life after applying IV infusion interventions. All domains of patients' quality of life have been improved after receiving the protocol, including: effectiveness, patient-centeredness, timeliness, efficiency, and equity. The protocol intervention has clearly improved IV-related complications—particularly in pain reduction. Continuous in-service education, skill reinforcement, and regular performance monitoring are recommended to sustain these improvements and ensure safe and high-quality nursing care in IV therapy.

REFERENCES

1. Wheeler C, Furniss D, Galal-Edeen GH, Blandford A, Franklin BD. Patients' Perspectives on the Quality and Safety of Intravenous Infusions: A Qualitative Study. J Patient Exp. 2020;7(3):380-385. doi:10.1177/2374373519843921. DOI
2. Sneyers B, Nyssen C, Bulpa P, et al. Appropriateness of intravenous fluid prescriptions in hospitalised patients: a point prevalence study. Int J Clin Pharm. 2025;47(1):136-145. doi:10.1007/s11096-024-01816-9. DOI
3. Giuliano KK. Intravenous Smart Pumps: Usability Issues, Intravenous Medication Administration Error, and Patient Safety. Crit Care Nurs Clin North Am. 2018;30(2):215-224. doi:10.1016/j.cnc.2018.02.004. DOI
4. Teshome M, Geda B, Yadeta TA, Mideksa L, Tura MR. Intravenous fluid administration practice among nurses and midwives working in public hospitals of central Ethiopia: A cross-sectional study. Heliyon. 2023;9(8):e18720. doi:10.1016/j.heliyon.2023.e18720. DOI
5. Alharthi A, Alshagrawi S. The impact of standardization of intravenous medication on patient safety and healthcare quality: a systematic review. Open Public Health J. 2024;17:28-37. doi:10.2174/0118749445335795241008064623. DOI
6. Hoste EA, Maitland K, Brudney CS, et al. Four phases of intravenous fluid therapy: a conceptual model. Br J Anaesth. 2014;113(5):740-747. doi:10.1093/bja/aeu300 DOI
7. Ahmed WAM, Aboagla REMA, Osman Ahmed Osman M, et al. Improving Documentation of Intravenous Cannulation in a Resource-Limited Teaching Hospital: A Two-Cycle Quality Improvement Audit. Cureus. 2025;17(11):e96186. Published 2025 Nov 6. doi:10.7759/cureus.96186. DOI
8. World Health Organization. Handbook for national quality policy and strategy: A practical approach for developing policy and strategy to improve quality of care. World Health Organization. 2018. https://www.who.int/publications/i/item/9789241565561 (Access: January 2026)
9. Kuitunen SK, Niittynen I, Airaksinen M, Holmström AR. Systemic Defenses to Prevent Intravenous Medication Errors in Hospitals: A Systematic Review. J Patient Saf. 2021;17(8):e1669-e1680. doi:10.1097/PTS.0000000000000688. DOI
10. Sapri ND, Ng YT, Wu VX, Klainin-Yobas P. Effectiveness of educational interventions on evidence-based practice for nurses in clinical settings: A systematic review and meta-analysis. Nurse Educ Today. 2022;111:105295. doi:10.1016/j.nedt.2022.105295. DOI
11. ManriqueRodríguez S, HerasHidalgo I, PerniaLópez MS, et al. Standardization and chemical characterization of intravenous therapy in adult patients: a step further in medication safety. Drugs R D. 2021;21(1):39-64.
12. Wolf DM, Lehman L, Quinlin R, Zullo T, Hoffman L. Effect of patient-centered care on patient satisfaction and quality of care. J Nurs Care Qual. 2008;23(4):316-321. doi:10.1097/01.NCQ.0000336672.02725.a5. DOI
13. World Health Organization. Delivering quality health services: A global imperative for universal health coverage. WHO Press. 2020. https://www.who.int/publications/i/item/9789241513906 (Access: January 2026)
14. Prosser B, Walton TP, Miller C. Reduction of Infusion Time Using a 10% Intravenous Immunoglobulin Formulation With a 15-Minute Rate Escalation Protocol During Staffing Shortages Due to COVID-19. J Infus Nurs. 2022;45(6):299-305. doi:10.1097/NAN.0000000000000488. DOI
15. Kim SW, Choi MY. Effects of nurse's knowledge and self-efficacy on nursing performance in pediatric intravenous fluid management in South Korea: a descriptive study. Child Health Nurs Res. 2024;30(4):288-297. doi:10.4094/chnr.2024.023. DOI
16. Kruk ME, Gage AD, Arsenault C, et al. High-quality health systems in the Sustainable Development Goals era: time for a revolution. Lancet Glob Health. 2018;6(11):e1196-e1252. doi:10.1016/S2214-109X(18)30386-3. DOI
17. Arah OA, Klazinga NS, Delnoij DM, ten Asbroek AH, Custers T. Conceptual frameworks for health systems performance: a quest for effectiveness, quality, and improvement. Int J Qual Health Care. 2003;15(5):377-398. doi:10.1093/intqhc/mzg049. DOI
18. Chen S, Zhang C, Li W. The effects of competency-based training model in the training of new nurses: A meta-analysis and systematic review. PLoS One. 2022;17(11):e0277484. doi:10.1371/journal.pone.0277484. DOI
19. Alexandrou E, Ray-Barruel G, Carr PJ, et al. International prevalence of the use of peripheral intravenous catheters. J Hosp Med. 2015;10(8):530-533. doi:10.1002/jhm.2389. DOI
20. Privitera D, Bassi E, Airoldi C, et al. Effectiveness of short peripheral intravenous catheter educational programmes to improve clinical outcomes protocol for a systematic review. MethodsX. 2023;11:102352. doi:10.1016/j.mex.2023.102352 DOI

21. Gorski LA, Hadaway L, Hagle ME, et al. Infusion Therapy Standards of Practice, 8th Edition. J Infus Nurs. 2021;44(1S Suppl 1):S1-S224. doi:10.1097/NAN.0000000000000396. DOI
22. Ryder M, Gunther RA, Nishikawa RA, et al. Investigation of the role of infusate properties related to midline catheter failure in an ovine model. Am J Health Syst Pharm. 2020;77(16):1336-1346. doi:10.1093/ajhp/zxaa175 DOI
23. Chan KM, Chau JPC, Choi KC, et al. Clinical practice guideline on the prevention and management of neonatal extravasation injury: a before-and-after study design. BMC Pediatr. 2020;20(1):445. doi:10.1186/s12887-020-02346-9 DOI
24. Kaur V, Kaur J, Thakur RD. Effectiveness of a training programme on intravenous cannulation therapy: an interventional study. Int J Sci Res. 2020;9(2):336-338. doi:10.21275/SR20204170111. DOI
25. Helm RE, Klausner JD, Klemperer JD, Flint LM, Huang E. Accepted but unacceptable: peripheral IV catheter failure. J Infus Nurs. 2015;38(3):189-203. doi:10.1097/NAN.0000000000000100. DOI

CONFLICT OF INTEREST

The Authors declare no conflict of interest

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