

Nurses' Performance on Intravenous Fluid Therapy and Associated Factors for Adult Medical-Surgical Patients in Kisumu County, Kenya

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ABSTRACT

Context: Adult inpatients need intravenous fluid therapy to prevent or correct fluid and electrolyte status. Global surveys on nurses' performance in intravenous fluid therapy revealed considerable gaps in knowledge and skills, highlighting an urgent need for education and awareness regarding intravenous fluids.

Aim: The study aims to determine nurses' performance on intravenous fluid therapy and associated factors for adult patients in selected referral hospitals in Kisumu County, Kenya.

Methods: This study employed a cross-sectional analytical design. The study area was selected from hospitals in Kisumu County. The study population included nurses working in medical and surgical units. A total of 110 nurses were included in the study. The data were analyzed using SPSS version 28. The tools utilized were a structured interview questionnaire that collected data on respondents' demographics and knowledge of intravenous fluid, and an intravenous fluid administration checklist with 20 steps of intravenous fluid administration adopted from the Nursing Procedure Manual of the Nursing Council of Kenya.

Results: A total of 110 nurses participated in the study. Most respondents were aged between 31 and 40 years (55.4%); the majority, 62.7%, worked in surgical units. The majority of participants had a high level of knowledge, at 74 (67.0%). According to the checklist, 96.4% of nurses were able to review patients' records to verify intravenous fluid orders and medical histories, and 87.3% explained the procedure to patients. Preparation of the infusion bag which included verification of expiry date, placing bag on a flat surface, removing protective cap from the tubing, insertion of spike, hold port firmly with one hand then insert spike with other hand, priming tubing, calculation of drops and regulation of drops, inspect the IV site for complication, leaving patient comfortable and clears equipment was done by all the participant 110(100%), documentation of condition of IV site and any change of dressing (0.0%), and documentation of flow rate (0.0%) was poorly done 108(98.2%) did not label the infusion bag, 70.9% did not document patient's condition during and after infusion, 56.4% did not evaluate fluid intake and output charts, overall 59.1% had unsatisfactory performance. Only work experience ($p=0.05$) was significantly associated with the level of nurses' performance.

Conclusion: The study concludes that nurses possess a high level of knowledge but a low level of practice in intravenous fluid therapy, with documentation being a particular area of concern, as evidenced by the respondents' inadequate documentation. The study recommends that nurses should be encouraged to participate in continuing professional development to stay updated on the latest knowledge and guidelines in intravenous fluid therapy. Additionally, the units should have an intravenous fluid mentor to provide guidance, aiming to improve performance.

Keywords: Adult, factors, fluid therapy, intravenous, medical-surgical, nurses' performance, patients

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1. Introduction

Fluid therapy aims to prevent adverse effects by maintaining the body in an optimal state of tissue perfusion and hydration, thereby ensuring adequate electrolyte homeostasis and striking a balance between tissue oxygen supply and demand (Martin et al., 2020). An observational study by Colomina et al. (2021) found that, within the first 24 hours post-operatively, 67.5% of 4912 patients received balanced crystalloids, while 37.2% received saline. The

study concluded that crystalloids were the most frequently used fluids.

Adult inpatients need intravenous fluid therapy mainly to prevent or correct fluid and electrolyte status. To achieve this, must decide on the optimal amount and composition of the intravenous fluid for administration; they should also consider the best rate of administration. These decisions must be made based on a careful assessment of the patient's individual needs (National Institute for Health and Care Excellence. (2017).

Prescribing IV fluids requires knowledge of the appropriate fluid type, volume, and rate of administration. Studies have shown a challenge among junior prescribers,

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who consistently demonstrate poor knowledge associated with a wide variation of clinical practice in the management of intravenous fluids (Ramsay et al., 2018). Optimum perioperative intravenous fluid therapy improves perioperative morbidity and mortality. This improvement will be achieved through an interpersonal team approach, where all members understand fluid dynamics, assessment methods, and the rationale of intravenous fluid infusion, thereby preventing harm to patients (Wood, 2021).

An audit conducted by Marthur (2020) on the use of National Institute for Health and Care Excellence guidelines for intravenous fluid therapy in the United Kingdom has shown that educational approaches, awareness, and regular audits have improved practices and documentation. For nurses to improve their intravenous therapy skills, they must engage in regular, continuous educational training to enhance their knowledge and the quality of patient care (Njung'e & Kamolo, 2021).

2. Significance of the study

Intravenous fluid therapy is used to restore and maintain tissue perfusion, and it is also part of the routine management of almost all critically ill patients. Too much or too little can have a negative outcome for patients; therefore, it must be administered and regulated carefully. Fluid administration must be tailored to the patient's disease course (Vincent, 2019). It has been observed that intravenous fluid prescription and fluid balance documentation are poorly performed. Errors in prescribing intravenous fluids and electrolytes are particularly likely in emergency departments, acute admission units, and general medical-surgical wards. To improve patient outcomes, healthcare professionals should be skilled and competent in prescribing and administering intravenous fluids, as well as assessing and monitoring patients who receive these fluids (National Institute for Health and Care Excellence, 2017).

A study conducted in a teaching and referral hospital in Chitwan on nurses' knowledge and practice regarding intravenous fluid therapy found that the level of knowledge and practice was unsatisfactory (Lamsal & Shrestha, 2019). Therefore, the goal of this study is to evaluate the practices of intravenous fluid therapy for adult medical-surgical patients in hospitals in Kisumu County. No similar study has been conducted in this context at this study site.

The significance of this study lies in its potential to identify existing gaps in nurses' performance in administering intravenous fluids to adult medical-surgical patients. The study aims to contribute to the advancement of knowledge about intravenous fluids, ultimately leading to improved patient care.

3. Aim of the study

To determine nurses' performance on intravenous fluid therapy and associated factors for adult medical-surgical Kisumu County Hospitals, Kenya.

3.1. Research question

What is the performance level of nurses in intravenous fluid therapy and associated factors for adult medical-surgical patients in Kisumu County, Kenya?

4. Subjects & Methods

4.1. Research Design

The study adopted an analytical cross-sectional design. It is a type of observational study that is non-experimental, studying relationships between variables at a single point in time (Wang & Cheng, 2020).

4.2. Study setting

The study was conducted in the medical and surgical wards of Jaramogi Oginga Odinga Teaching and Referral Hospital (JOORTH) and Kisumu County Hospital (KCH). Jaramogi Oginga Odinga Teaching and Referral Hospital is situated in Kisumu County, specifically in Kisumu East constituency, within Kondele Ward. The hospitals, among other departments, have Medical and Surgical departments, which are of interest to the study.

The medical wards and surgical wards have an average of 200 and 243 admissions per month, respectively (KHIS 2023). JOOTRH serves more than 100 county and sub-county hospitals in the region, being the largest referral hospital in Western Kenya. The hospital offers a comprehensive range of services, including curative, preventive, promotive, diagnostic, and rehabilitative care, serving a vast catchment area of ten million people across 14 counties in the Lake Region (Ondari, 2025).

Kisumu County Hospital is the second-largest hospital in Kisumu County, situated in the heart of Kisumu city, within the Kisumu East constituency and Railways Ward. Its medical and surgical wards have a bed capacity of 51 and 50, respectively, with 100% bed occupancy in both wards. It serves the peripheral facilities and offers diagnostic, curative, preventive, promotive, and rehabilitative services. The hospital refers its complicated cases to JOOTRH for further management (Ondari, 2025).

4.3. Subjects

Two hospitals were included: Jaramogi Oginga Odinga Teaching and Referral Hospital (JOOTRH) and Kisumu County Health (KCH). The target population consisted of qualified nurses working in medical-surgical units, administering intravenous fluid therapy to adult patients in medical and surgical wards, totaling 150. Table 1 illustrates the distribution of the nurses in the two hospitals.

Table (1): Distribution of nurses in the health facilities.

Health care provider	KCH	JOOTRH	TOTAL
Nursing officers	49	101	150

Inclusion criteria

Nurses who have been working in the Medical and Surgical units for more than three months in JOOTRH and KCH and consented to participate in the study.

Exclusion criteria

- Nurses who have requested leave.
- Nurses who were transferred out of the units during the study period.

Sample size calculation

According to Kothari (2004), a sample size refers to a subset of the total population used to provide a general

view of the target population. Yamane's (1967) formula was used to determine the sample size. This sampling formula was suitable because the sample population was less than 10,000.

$$n = \frac{N}{1 + N(e)^2}$$

Where:

n= sample size

N= population size

e= level of precision or sampling of error, which is 5%

Sample size calculated in each facility among the different carders as follows:

$$n = \frac{150}{1 + 150(0.05)^2} = 150$$

Therefore, the total number of participants in both study sites is 150 nurses

Sampling procedure

The hospitals JOOTRH and KCH were selected purposively due to their larger bed capacities in medical and surgical wards, and the number of nurses involved in intravenous fluid therapy would provide a larger sample size for the study. Within the hospitals, nurses were selected from the duty roster, which served as the sampling frame for this study. The first HCP was selected randomly from the list; subsequently, the remaining ones were systematically selected, with every k th HCP included. Where K is the sample interval. The formula below illustrates the sampling interval, which was 1.

4.4. Tools of Data Collection

4.4.1. Structured Interview Questionnaire

The questionnaire included multiple-choice questions to assess the following variables: Demographic characteristics, which included age group, gender, educational level, and years of practice. Nine questions assessed knowledge of intravenous fluid therapy. The questionnaire included the assessment of the patient before, during, and after intravenous fluid administration.

Scoring system

The responses were further classified into high knowledge (knowledgeable) and low knowledge (not knowledgeable) based on the Nursing Council's pass grade for theory, which is 50%. Nurses who scored correctly ($\geq 50\%$) or greater than five on the knowledge item were considered to have a high level of knowledge or be knowledgeable, and those who scored ($< 50\%$) less than five were considered not knowledgeable.

4.4.2. Intravenous Fluid Administration Checklist

The checklist was adopted from the *Nursing Council of Kenya (2021) Manual*, 4th edition. Performance on IV fluid therapy was assessed by observing the nurse performing the procedure as instructed in the nursing procedure manual, which includes 20 steps, such as reviewing the patient's record to verify the IV fluid order and medical history, explaining the procedure to the patient and obtaining consent, and assessing vital signs.

Scoring system

Steps that were carried out correctly according to the manual were scored as performed; those that were not done correctly were scored as not performed. Further analysis classified performance into satisfactory and unsatisfactory. According to the Nursing Council of Kenya, clinical assessment pass grade of above 60%, those who correctly performed $\geq 60\%$ were considered to have satisfactory performance on intravenous fluid therapy, and those who performed $\leq 60\%$ or less than 12 items had unsatisfactory performance.

4.5. Procedures

To ensure ethical conduct of the study, clearance was sought from the Institutional Ethical Review Committee of Masinde Muliro University of Science and Technology, MMU/COR:509099. The researcher obtained a research permit from the National Commission for Science, Technology, and Innovation (NACOSTI), Ref. No. 153173. This process is required by law in Kenya before conducting research. Permission to conduct the study was sought from JOOTRH Ref: IERC/JOOTRH/416/21 and KCH Ref: GN 133 VOL.VII/(222).

Consent from the participants was obtained after they were informed of the study's purpose, the tool used, and the information required. Participation was voluntary, and no one was coerced into taking part. The study participants were informed of their freedom to withdraw from the participation at any stage.

The principal investigator and the research assistant administered the questionnaire to the participants and collected it after obtaining their consent. Data was collected over a period of two months (June 2022 - July 2022). Data obtained from the observation checklist provided information on nurses' standards of practice regarding intravenous fluid therapy. The steps were adopted from the nursing procedure manual issued by the Nursing Council of Kenya, with modifications from the researcher. Data was obtained from observing the HCP administering the fluid. Documentation of intravenous fluid therapy management was collected from the Kardex and fluid charts.

The research assistant returned the filled-out questionnaires and observation checklists to the researcher for editing and to verify completeness and consistency before processing them. The data was coded to facilitate easy data entry. All raw data were reviewed by the principal investigator and cross-checked to ensure completeness; any necessary clarifications were sought out immediately. The completed questionnaires were stored in a secure and confidential location, accessible only to the principal investigator, and were ready for data entry.

4.6. Limitations of the study

Study limitations include the small sample size, which limits the generalizability of the findings to the population. The study design was a limitation, as it was conducted over a short period. The study, despite its limitations, has provided valuable insights into nurses' knowledge of intravenous fluid therapy.

4.7. Data analysis

After cross-checking the information in the instruments for any missing entries, a database was designed in SPSS. Data were coded and entered into the Statistical Package for the Social Sciences (SPSS) version 28. Descriptive statistics were used to obtain frequencies, means, percent, ages, and standard deviations. Chi-square analysis was also used to test the association between the socio-demographic characteristics of the respondents and their performance in intravenous fluid therapy, with a p-value considered significant at 0.05.

5. Results

One hundred and ten (110) respondents participated in the study out of 150, resulting in a response rate of 73.3%.

Table 2 presents the demographic characteristics of the study subjects, including gender, age, education, current work unit, and work experience. 60(54.5%) were females and 50(45.5%) were males. The ages ranged from 25 years to 50 years, with a mean of 35.4 ± 2.88 . Most of the participants (55.4%) were in the 31-40 age group, followed by 28 (25%) who were in the 25-30 age group. The majority held a diploma 72(65.5%), while 28.2% held a bachelor's degree, and 6.4% held a master's degree in nursing. Additionally, 64.5% of the nurses had between 11 and 20 years of work experience.

Table 3 shows nurses' knowledge in intravenous fluid therapy management; all the respondents were able to cite examples of crystalloids. On the contrary, a relatively smaller proportion (43.6%) knew examples of colloids. More than a third (56.4%) mistakenly mentioned crystalloids as colloids. Most of them incorrectly use clinical assessment to assess patients' hydration (56.4%). Additionally, 77.3% use clinical assessment methods to guide discontinuation of IV fluid, while 22.7% use other methods, such as serum electrolyte levels. Furthermore, 65.5% do not weigh patients during IV fluid therapy.

Figure 1 demonstrates the total level of nurses' knowledge in intravenous fluid therapy. The majority of nurses had high knowledge, 74(67.0%). A low level of knowledge about intravenous therapy was observed in less than a third (33.0%).

Table 4 illustrates the performance of nurses in administering intravenous fluids in the medical-surgical units. The proportion of nurses who demonstrated the ability to review patients' records to verify IV fluid orders and medical history was 106(96.4%), while 97.3% adequately observed infection control through hand washing and gloving. Ninety-six (87.3%) were able to explain the procedure to patients and get consent.

All the nurses were able to adequately verify the type and volume of intravenous fluid and expiry date, place the bag on a flat surface or hang it on an IV pole, remove protective cap from tubing insertion port and hold the port with one hand and insert spike with one hand, prime tubing, calculate drop rate, inspect IV site for complication and leave patient comfortable.

However, 108(98.2%) did not label the IV bag with the patient's identification, date, time, and duration of fluid administration. Nearly three-quarters (82, 74.5%) adequately documented the time and date, while close to half (54, 49.1%) were able to evaluate the patient's condition during and after the procedure. On the other hand, not all participants were able to document the condition of the IV site and any changes to dressings and flow rate.

Figure 2 illustrates the level of performance of nurses in intravenous therapy. Further analysis classified performance into satisfactory and unsatisfactory. The overall mean was 11.8 ± 2.17 . Nearly 65(59%) had unsatisfactory performance in intravenous therapy, while nurses with satisfactory performance were 41%.

Table 5 shows association of demographic characteristics on nurses' performance in intravenous fluid therapy, the results show the following categories having satisfactory performance the male gender (60%), those of the age group 36-40 (68.9%), participants with a master's degree (71.4%), nurses working in the surgical unit (61.0%) and participants who worked between the 21-30 (88.9%). Work experience shows a significant influence on nurses' performance in intravenous fluid therapy, with a p-value of 0.05.

6. Discussion

Intravenous fluid therapy is vital in the management of medical and surgical conditions, which involves assessing patients to determine the need for intravenous fluids, prescribing and administering the appropriate fluid, evaluating patients, and documenting the process. Nurses are tasked with initiating and maintaining patients on intravenous fluids; they are required to have adequate knowledge and appropriate practices to effectively accomplish this task. The study aimed to determine nurses' performance on intravenous fluid therapy and associated factors for adult patients in selected referral hospitals in Kisumu County, Kenya.

The study reveals that nurses possess a high level of knowledge regarding intravenous fluid therapy. According to the study's results, the finding could be attributed to the fact that increased years of practice would increase the likelihood of gaining more knowledge. A study by *Tesgera et al. (2023)* yielded similar findings, where participants had adequate knowledge regarding intravenous fluid and electrolyte management. Study findings by *Meenaa et al. (2023)* found that nurses' knowledge of intravenous fluids was average.

The findings are contradicted by a study whose findings revealed that nurses had inadequate knowledge in fluid therapy (*Tolera et al., 2024*), similar to another study, which found that two-thirds of the study participants perceived that they needed additional support or guidance on intravenous fluid, and their overall performance on knowledge was unsatisfactory (*Nasa et al., 2022*).

Table (2): Frequency and percentage distribution of demographic Profile of nurses in the Medical Surgical Unit (n=110).

Variables	Frequency	Percentage
Gender		
Male	50	45.5
Female	60	54.5
Age		
25-30	28	25
31-35	32	29.1
36-40	29	26.3
41-45	12	10.9
Above 45	9	8.2
Range	25-50	
Mean ± SD	35.4 ±2.88	
Qualification		
Diploma in nursing	72	65.5
Bachelor's degree in nursing	31	28.2
Master's in nursing	7	6.4
Current unit		
Medical ward	41	37.3
Surgical ward	69	62.7
Work experience (years)		
1-10	27	24.5
11-20	71	64.5
21-30	9	8.2
31-40	3	2.7

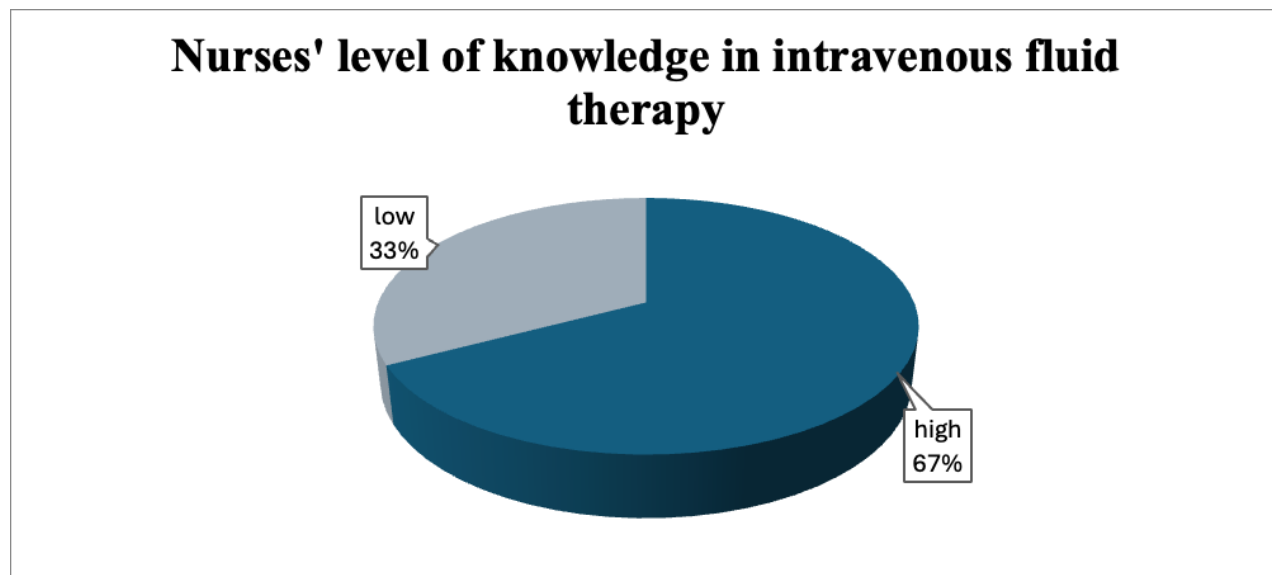


Figure (1): Percentage distribution of nurses' total level of knowledge in intravenous fluid therapy (n=110).

Table (3): Frequency and percentage distribution of nurses' knowledge on intravenous fluid therapy (n=110).

Variables	Responses	Frequency	Percentage
Identifies complications of intravenous fluid on patient assessment	Correct	96	87.3
	Incorrect	14	12.7
Identifies the rationale against performing irrigation of an occluded cannula	Correct	83	75.5
	Incorrect	27	25.5
Can establish the goal of IV therapy for a patient with continuous intravenous fluid	Correct	108	98.2
	Incorrect	2	1.8
Able to calculate the time an intravenous fluid infusion should end	Correct	55	50.0
	Incorrect	55	50.0
Identifies examples of crystalloids	Correct	110	100
	Correct	48	43.6
Identifies examples of colloids	Incorrect	62	56.4
	Correct	45	40.9
Can establish a method used to assess a patient's hydration status	Incorrect	65	56.4
	Correct	25	22.7
Can identify when to discontinue the patient from IV fluid	Incorrect	85	77.3
	Correct	38	35.5
Establishes whether they weigh patients on intravenous fluid therapy	Incorrect	72	65.5

Table (4): Frequency and Percentage distribution of nurse performance in intravenous fluid administration(n=110).

Skill	Performed		Not performed	
	No.	%	No.	%
Reviews the patient's record to verify the IV fluid order and medical history	106	96.4	4	3.6
Explain the procedure to the patient and get consent	96	87.3	14	12.7
Vital signs assessment	17	15.5	93	84.5
Observes infection control by hand washing and gloving	107	97.3	3	2.7
Verify the type of fluid volume and expiration	110	0	0	0.0
Place the bag on a flat surface or hang it on an IV pole drip	110	100	0	0.0
Remove the protective cap from the tubing insertion port and set the spike	110	100	0	0.0
Hold the port firmly with one hand, insert the spike with the other hand	110	100	0	0.0
Label bag with patient name, ID No., date, time, rate, duration, and admin initials	2	1.8	108	98.2
Priming tubing	110	100	0	0.0
Calculate drops per minute, regulate the drops, and verify with a watch	110	100	0	0.0
Inspect the IV site for complications	110	100	0	0.0
Leaves the patient comfortable and clears the equipment	110	100	0	0.0
Evaluates the patient's condition during and after the procedure	54	49.1	56	50.9
Evaluates fluid intake and output	48	43.6	62	56.4
Document date and time	82	74.5	28	25.5
Document the patient's condition before, during, and after the infusion	32	29.1	78	70.9
Document the type of IV solution	78	70.9	32	29.1
Document the condition of the IV site and any changes to dressings	0	0	110	100
Document flow rate	0	0	110	100

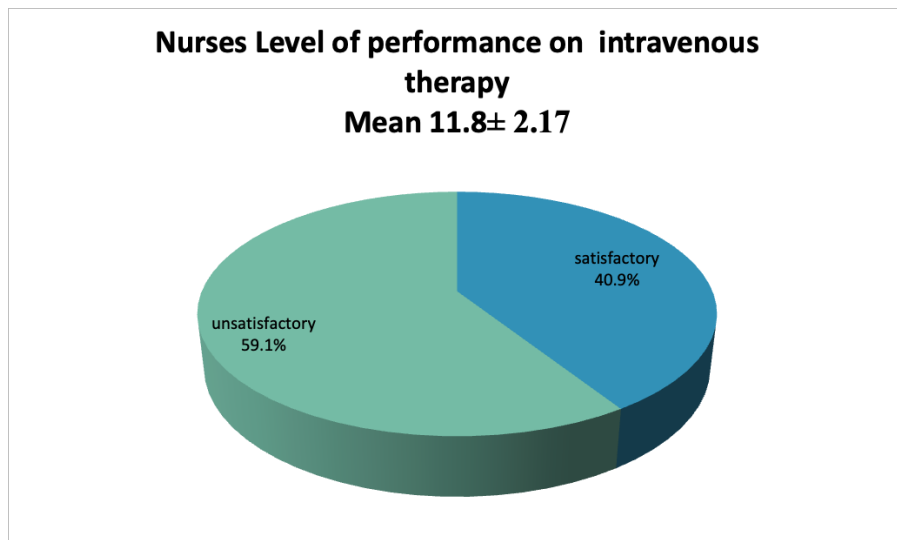


Figure (2): Percentage distribution of the total level of nurses' performance in intravenous fluid therapy (n=110).

Table (5): Association of socio-demographic characteristics with nurses' performance in intravenous fluid therapy (n=110).

Variables	Performance				χ^2	p-value
	Satisfactory performance		Unsatisfactory performance			
	No.	%	No.	%		
Gender						
Male	30	60.0	20	40.0	0.31	0.86
Female	35	58.3	25	41.7		
Age						
25-30	17	60.7	11	39.2	1.35	0.72
31-35	18	56.2	14	43.7		
36-40	20	68.9	9	31		
41-45	7	58.3	5	41.7		
Above 45	5	55.5	3	33.3		
Qualifications						
Diploma in nursing	41	56.9	31	43.1	0.64	0.73
Bachelor's degree in nursing	19	61.3	12	38.7		
Master's in nursing	5	71.4	2	28.6		
Current unit						
Medical	40	58.0	29	42.0	0.1	0.76
Surgical ward	25	61.0	16	39.0		
Work experience						
1-10	15	55.6	12	44.4	3.74	0.05
11-20	40	56.3	31	43.7		
21-30	8	88.9	1	11.1		
31-40	2	66.7	1	33.3		

The study has shown that the nurses had a low level of performance in intravenous fluid therapy. Upon further analysis, work experience of more than 10 years was significantly associated with their performance in intravenous fluid therapy. Findings show that the nurses had unsatisfactory performance in intravenous fluid therapy areas of concern included patient assessment of vital signs where most of them did not assess patients, documentation areas included patients' condition during infusion was not documented by near three fourths of them including IV site condition (100%), infusion rate (100%), more than half did not complete fluid input output charts.

An audit of the appropriateness and accuracy of fluid intake and output monitoring in hospitalized patients yielded similar findings, revealing inaccurate documentation of monitoring with 21% accuracy in output documentation (Lim et al., 2021). These findings are supported by a study in which only 43% of patients receiving intravenous fluids had input-output charts documented (Njung'e et al., 2017).

Accurate fluid monitoring is essential in fluid therapy, as a systematic review suggests that fluid overload and positive cumulative fluid balance are associated with increased mortality in the general population, including critically ill patients (Messmer et al., 2020). This finding shows the importance of intravenous fluid monitoring as part of the recommended practice for early detection of fluid overload.

A study conducted in Ethiopia by Tolera et al. (2024) contradicts the findings, which suggested that the practice of nurses in fluid therapy was satisfactory. The satisfactory performance in intravenous fluid administration during over

10 years of work experience is attributed to the fact that the skill has improved through years of practice. However, no variable was independently associated with superior performance in Nasa's study (Nasa et al., 2022).

7. Conclusion

The study found that the majority of the nurses had a high level of knowledge. The majority performed unsatisfactorily in intravenous fluid therapy. Work experience was also significantly associated with the performance.

8. Recommendations

- Nurses should be encouraged to maintain their knowledge in intravenous fluid therapy and participate in continuing professional development training to stay updated on the latest advancements in this field.
- Hospitals should provide quick access to guiding protocols in each unit for intravenous fluid administration, for reference in cases of doubt by healthcare providers. This access will improve their practice in fluid therapy.
- The study recommends that hospitals have intravenous fluid mentors in every unit to guide nurses in improving their practice and facilitating skill transfer.

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