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Nurses' Practices of Input and Output Monitoring of Patients on Intravenous Fluid Therapy within Fako Division

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Abstract

***Background**: Alternative routes of fluid administration such as intravenous access can deliver fluids directly to the vascular system for hospitalised patients who might have a reason for not tolerating oral intake. Too much or too little fluid can have a negative impact on patient outcomes; hence, careful titration of fluid administered is required. Previous studies have shown that majority of fluid balance records were incorrectly calculated or poorly documented.*

***Aim**: To investigate nurses' practices of input/output monitoring of patients on intravenous fluid (IVF) therapy in the medical and surgical wards in hospitals within Fako Division, Cameroon.*

***Methods**: This study employed a retrospective and cross sectional design, data was collected using a structured questionnaire to assess nurses' knowledge of fluid input/output monitoring from May to June 2021. In addition, a checklist was used to conduct an audit of 671 patients' files and 76 nurses took part in the study. Data was analysed with the aid of SPSS 25. A multi-linear regression analysis was done for knowledge and practices using demographic variables and factors affecting monitoring of patients to test relationships between categorical variables. All statistics were set at 95% confidence interval with a 5% margin of error. Results were presented using frequency distribution, mean and standard deviation to describe different characteristics.*

***Results:** 77.63% nurses' could identify methods of assessing patients on IVF therapy. However, they lacked knowledge on laboratory indications of fluid overload (5.26%), fluid loss (1.32), symptoms of fluid gain (3.9%) and fluid depletion (2.26). Their overall practice was 128(19.08%). Factors affecting monitoring of patients on intravenous fluid therapy were mainly workload 55(72.4%) and lack of measuring equipment 46(60.5%).*

***Conclusion:** Nurses' in the medical and surgical wards in Fako Division lacked knowledge in certain areas of patients' assessment about input/output monitoring of patients on IVF therapy and their practices were generally unsatisfactory. Qualification had a significant impact on nurses' practices (P<0.05)*

Keywords: *Nurses' Knowledge, Nurses' Practices, Fluid Input/Output Monitoring, IV Fluids Monitoring, Intake/Output Chart.*

INTRODUCTION

A balance between the volume of fluid taken in by the human body and the volume of fluid excreted is essential for life. Many patients who are sick, needing admission to the hospital might have a reason for tolerating oral intake [1]. Alternative routes of administration such as intravenous (IV) access can deliver fluids directly to the vascular system [2]. Hospitalised patients need IV fluids and electrolytes for one or more of the following reasons; fluid resuscitation, routine maintenance, replacement and fluid redistribution [3,4]. Monitoring is an important clinical care process that provides the means to determine the progress of the disease, and the beneficial as well as detrimental effects of treatment. Monitoring of intake/output helps care givers ensure that the patient has proper intake of fluid and other nutrients. Therefore, documenting and sharing information regarding whatever is taken in by the patient especially fluids (either via the gastrointestinal tract or through the IV route) as well as adequate output (whatever is excreted or removed from the patient) is mandatory [5]. Fluid therapy, which is provided to restore and maintain tissue perfusion is part of routine management for almost all patients. However, because either too much or too little fluid can have a negative impact on patient outcomes, fluid administration must be titrated carefully for each patient [6].

Studies have been conducted regarding nurses' knowledge of input/output monitoring of patients on IV therapy. A study conducted by Aslam et al. [7] on monitoring of patients' fluid and electrolyte balance found that nurses' knowledge and practices were poor. Similarly, a study conducted by Aliya

et al. [8] and Habasa [9] showed that the majority of input/output charts were inadequately completed and most of them were not balanced at the end of the shift. Monitoring a patient's intake and output is a relatively simple task; however, it is notoriously inadequate or not done. A study conducted by Susanna et al. [4] identified workload during a shift, condition of the patient, design of the intake and output chart as factors affecting monitoring of patients on IVF therapy.

Twenty percent (20%) of patients on Intravenous Fluid (IVF) therapy may experience a complication as a result of too much, too little or the wrong type of fluid, decrease in lung mechanics and gas exchange, severe or permanent neurological dysfunction. Up-to 50% of patients especially the elderly develop at least one fluid-related complication due to post-operative over hydration [10]. Also, IVF administration is reported to contribute to about 9000 deaths in the USA annually [10].The most obvious complication is the administration of too much fluid; when this occurs, the heart can fail to pump the expanded circulatory volume effectively. By the time peripheral oedema or lung oedema are apparent, these patients have already been harmed by excessive volume or wrong choice of IVF [11]. According to a study, more than 30% of patients who did not have Acute Kidney Injury (AKI) on admission to the Intensive Care Unit (ICU) developed AKI during the first 24 to 72 hours. In addition, more severe AKI with diuretic use and cumulative fluid balance were strongly associated with non-recovery [11]. Besides, numerous studies indicated an increase in mortality rate associated with issues of Fluid Balance (FB) [12]. A study by Clodagh [13] reported ongoing issues with IVF prescribing in inpatient settings; over prescribing of fluids is reported in 17-54% of hospital inpatients leading to harm in about 50% of these cases.

Also, previous studies have shown that majority of intake/output records were incorrectly calculated or had errors in documentation, particularly when large numbers of calculations are involved [14, 15]. Again, studies discussed the incidence of errors stating that inaccuracies had occurred during the charting of FB, which can harm patients [13]. The incorrect calculation of fluid intake/output means that every patient management decision was influenced by inaccurate FB information. Therefore, fluid intake/output monitoring requires close attention to provide comprehensive data, upon which patient management decisions can be based [16]. The inaccuracy of FB measurements directly impacts patient safety, patient flow, clinical reasoning and nursing job satisfaction [17].

Even though studies have been conducted on input/output monitoring of patients on IVF therapy, little has been done in sub-Saharan Africa particularly Cameroon. The quality of fluid input/output monitoring in Cameroon is not known. Therefore, this study sought to investigate nurses' knowledge and practices of input/output monitoring of patients on IVF therapy. Specifically, we sought to assess nurses' knowledge and practices, and identify the factors that are associated with nurses' practices of input/output monitoring of patients on IVF therapy in hospitals in Fako. This is in order to provide information which could be used to establish a framework that can serve as a guide for nurses to make sure IV fluid monitoring is done in a confident, reasoned and evidence based manner.

MATERIALS AND METHODS

A hospital-based cross-sectional and retrospective study was conducted from May 2021 to June 2021 to investigate nurses' knowledge and practices of input/output monitoring of patients on IVF therapy in three hospitals in Fako Division. Also, a retrospective audit was conducted to assess nurses' practices of intake/output monitoring of patients on IVF therapy. Both qualitative and quantitative approaches were employed to collect and process data. A structured questionnaire made-up of both open and close ended questions, an extraction and observation checklists were used to collect data. The target population of this study comprised all nurses in the Regional Hospital Limbe (RHL), District Hospital Limbe (DHL) and the Cottage Hospital in Tiko (CHT). Also, all medical records of patients on IVF therapy for 48 hours and more in the Medical, Surgical and Solidarity wards of the three hospitals from 2019 to 2020 were studied.

These hospitals were purposively selected due to the large number of nurses providing care to the high patient inflow, which was appropriate for the study. Registered nurses who met the inclusion criteria and gave their consent to participate in the study were selected; eligible participants were recruited from the three selected hospitals. The sample size was calculated using the Cochran's formula $n_0 = Z^2pq/e^{2,}$ which then adjusted using: n= to a reasonable size. A sample of 83 registered nurses selected from all three hospitals using probability proportionate to size sampling and then consecutive convenient sampling participated in the study.

Data was collected on nurses' knowledge, practices and factors associated with nurses' practices of input/output monitoring of patients on IVF therapy. Patients' files were sampled thrice weekly for the audit by the ward charges, persons in charge of the archives and the researcher. Files of patients who had received IVF therapy for 48 hours or more within 2 years (2019-2020) were selected. We conducted a retrospective audit of intake and output charts for six weeks using the designed checklist, which contained the basic items that nurses should perform regarding input and output monitoring of patients on IVF therapy.

The audit assessed nurses' fluid monitoring practices in patients admitted from 2019 to 2020 in order to identify the actual practices. Therefore, the extraction form comprised the assessment (clinical, laboratory and weight measurements) of patients' fluid status, presence of a fluid monitoring plan

and fluid type, amount, rate of flow, start and finish time as well as the reasons for administering IV fluids. It also included documentation of fluid output to estimate balance between input and output. The appointment for starting the audit sessions was scheduled according to the work schedule, targeting the less busy periods where patients' records were available and the nurses less busy and relaxed. Three sessions were held in a week with durations of three to four hours per session for three weeks; one week for each hospital.

The overall practice score was 41; scores 0-20 (less than 50%) were considered unsatisfactory practice while scores of 21- 41(50%-100%) were satisfactory. Satisfactory nursing practice was for the variables with the highest number of right responses unsatisfactory nursing practice for variables with the highest number of wrong responses. Before collecting data, a pretest was carried out on 10% of study sample (8 nurses) and 8 patient records were audited in April 2021 at the District Hospital in Tiko and modifications were made accordingly.

Copies of the questionnaire were then administered to the study participants who completed the various sections of the questionnaire. This study was authorised by the Department of Nursing, Faculty of Health Sciences, University of Buea, Cameroon. We received ethical approval from the Institutional Review Board of the Faculty of Health Sciences of the University of Buea. Also, administrative authorisation was obtained from the Regional Delegation of Public Health, and then from the heads of the various health facilities. Before responding to the questionnaire each respondent gave a written consent after the aim and objectives were clearly explained. The raw data was checked and responses were coded and the data entered into SPSS version 25.0 using an electronic data set. The score of the items was summed up and the total divided by the number of items, giving a mean score for that section and means to compute the standard deviations.

A multi linear regression analysis was done on the factors affecting the monitoring of patients on IVF therapy. Also, it was done on the impact of socio- demographic variables of nurses on the monitoring of patients on IVF therapy to determine how it is affected. The dependent variable was nurses' practices on monitoring of patients on IVF therapy and the confidence Interval (CI) of 95% was used to test the significance of results and to test relationships between categorical variables. The following statistical measures were used; frequency distribution, mean and standard deviation to describe different characteristics.

RESULTS

A total of 79 copies of questionnaire were administered and 76 completed copies were returned giving a response rate of 96.2%. More than half 42(55.26%) of the participants were below 30 years old, majority 64(84.21%) were females, 46(60.53%) were SRN holders while only 12(15.79%) were graduate nurses (BNS). With regards to working experience 37(48.68%) of the participants had worked for 1-4 years and majority 51(67.11%) of the participants reported that they had not participated in any audit programme. Majority 32(42.11%) of the participants came from Regional Hospital Limbe (Table 1). Most 59(77.63%) of the participants reported that patients' history clinical examination, clinical monitoring and laboratory investigation were methods of assessment. However, only 5(6.579%) knew that current medication was a method of assessment.

Table 1. Social and Demographic Characteristics of Participants

Parameter		**n (%)**
Gender	Male	12 (15.79)
	Female	64(84.21)
Age (years)	< 30	42(55.26)
	≥ 30	34 (44.74)
Qualification	SRN	46(60.53)
	BNS	12(15.79)
	Others	18 (23.68)
Working experience (years)	1-4	37(48.68)
	5-10	19 (25)
	>10	20 (26.32)
Had participated in audit programme	Yes	25 (32.89)
	No	51(67.11)

Just 4(5.26%) of the participants gave the correct response on laboratory indications for fluid gain, which were reduced plasma urea and reduced hematocrit (Figure 1). Only 1(1.32%) of the participants knew the laboratory indication of fluid loss, which were raised serum osmolarity, high urine osmolarity and raised hematocrit (Figure 2). Only 2 (2.6%)

of participants could completely identify the symptoms of fluid overload, which were hypertension, noisy/effort breathing and increased respiration (Table 2). Few 3(3.9) could accurately identify the symptoms associated with fluid depletion, which were rapid shallow breathing, lowered pulse and rapid thread pulse (Table 3). Majority 56(73.68%) of the participants agreed that input/output chart is a way of monitoring patients on IVF therapy (Figure 3). Majority 59 (77.63%) of the nurses knew that the input/output chart is a tool used to document fluids administered to patients and whatever is excreted. Concerning nurses' practices with regards to the use of input/output chart, only a few 22 (28.95%) said they monitor patients on IVF therapy using the chart.

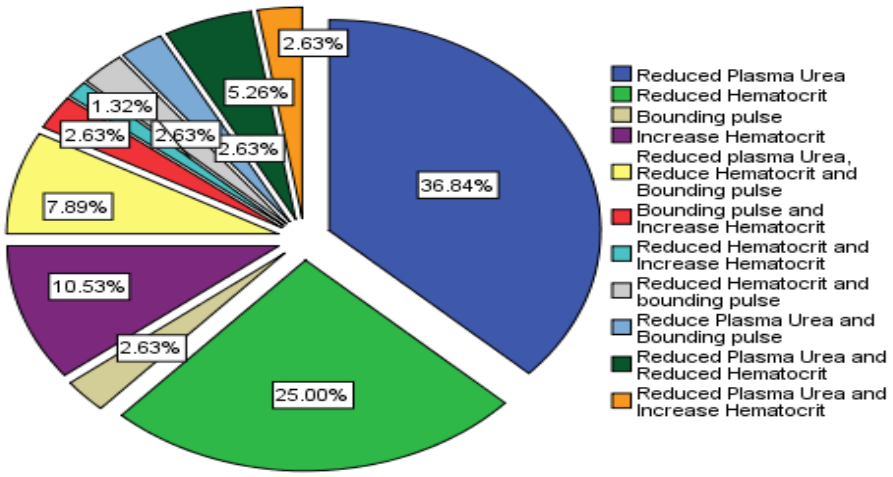

Figure 1. Nurse's Knowledge on Laboratory Indicators of Fluid Gain

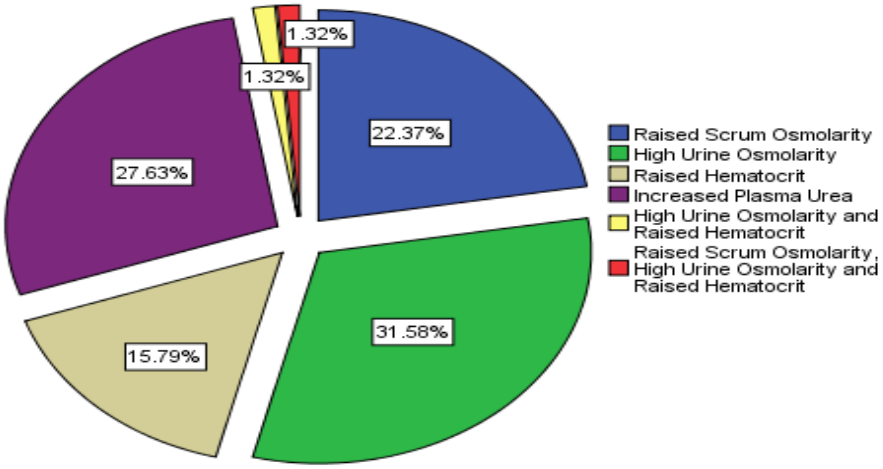

Figure 2. Nurse's Knowledge on Laboratory Indicators for Fluid Loss

Table 2. Nurse's Knowledge on the Symptoms of Fluid Overload

Symptoms	**N(%)**
Hypertension	11(14.5)
Noisy/effort breathing	17(22.4)
Bradycardia	19(25.0)
Increased Respiration	12(15.8)
Noisy/effort breathing and increased respiration	4(5.3)
Noisy/effort breathing and Bradycardia	1(1.3)
Hypertension and Noisy/effort breathing	6(7.9)
Hypertension and Increased Respiration	1(1.3)
Hypertension and Bradycardia	1(1.3)
Hypertension, Noisy/effort breathing and increase respiration	2(2.6)
Hypertension, Noisy/effort breathing and Bradycardia	2(2.6)
Total	**76(100)**

Table 3. Nurse's Knowledge on the Symptoms of Fluid Depletion

Symptoms	N(%)
Rapid Shallow breathing	9(11.8)
Lowered Pulse	25(32.9)
Rapid thread pulse	5(6.6)
Tachycardia	15(19.7)
Rapid shallow breathing, lowered pulse and rapid thread pulse	3(3.9)
Rapid shallow breathing and Tachycardia	4(5.3)
Lowered Pulse and Tachycardia	3(3.9)
Rapid shallow breathing and lowered pulse	10(13.2)
Rapid shallow breathing, lowered pulse and Tachycardia	2(2.6)
Total	**76(100)**

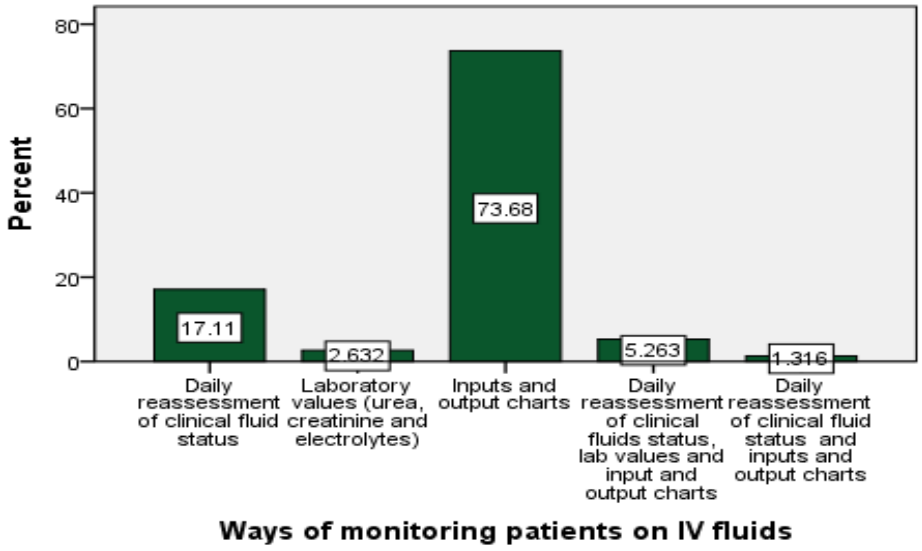

Figure 3. Patients Knowledge on Ways of Monitoring Patients on IV Fluids

Also, in this study a total of 671 files were reviewed; majority 244 (36.4%) of the files were from the Regional Hospital Limbe followed by 227(33.8%) from the Limbe District Hospital. About half 338 (50.4%) were files of patients from the Medical Ward. The reasons for commencement of IV fluids was recorded for only 96 (14.3%) patients (Table 4). With respect to assessment of patients' fluid status, fluid type 665(99.1%) and amount 663 (98.1%) were the highest recoded assessment findings on the nursing prescription chart while the finish time 53(7.9%) was the least recorded. For patient's weight, only 5(0.7%) was recorded, blood pressure 653(99.5%) and pulse 652(97.2%) were the most recorded parameters. The lowest recorded were the presence of pulmonary edema 79(11.8%) and jugular venous pressure (Table 5).

Table 4. Recording of Patients' Information on Hospital Files

		N(%)
Demographic information: **Patients details completed**	Name Age Gender Hospital ward Date	668(99.6 671(100) 667(99.4) 657(97.9) 668 (99.6)
Daily fluid target was recorded	YES NO	456(68) 151(22.5)
The reason for commencement was recorded	YES NO	96(14.3) 575(85.7)
The condition of the patient warrants continuation	YES NO NA	206(30.7) 453(67.5) 12(1.8)

Table 5. Nurse's Practices on Assessment of Patients' Fluid Status

Variables		Frequency (N=671)	Percentage (%)
Nursing-prescription chart		YES	
	Fluid type	665	99.1
If the patient has prescribed fluid, has the following been recorded accurately?	Amount	663	98.1
	Rate of flow	222	33.1
	Start	190	28.3
	Finish	53	7.9
	Batch number	-	-
Has the patient's weight been recorded?	**NO**	**666**	**99.3**
	YES	**5**	**.7**
Laboratory investigations	Full Blood Count	582	86.7
	Hematocrit (Raised in fluid loss, reduced in fluid gain)	298	44.9
	Specific gravity of urine	171	25.5
	Creatinine	139	20.7
	Urea	98	14.6
	Electrolytes	83	12.4
Was the patient's clinical fluid status assessed accurately?	Pulse	652	97.2
	Blood	653	99.5
	Capillary	22	3.3
	Jugular venous pressure	1	.1
	Presence of pulmonary edema	9	1.3
	peripheral edema	79	11.8
	Presence of postural hypotension	104	15.5

On the nursing intake-output chart, presence of fluid monitoring plan was available for 236 (35.2%) patient records and only 55 (8.2%) of the patient records had documented other additives which were added to the fluids. The initials of nursing staff was absent in majority 540(80.5%) of the patients' records. Only 3(.4%) of the patients records had their intake-output correctly recorded. The association of nurses' practices of input/output monitoring of patients on IVF therapy and socio-demographic variables was determined. The practices of all participants from the District Hospital of Limbe 222(100%) was unsatisfactory with a P value of .11 followed by the CDC Cottage Hospital 197(98.5%) with a P value of .21. Generally, the practices of most 543(80.92%) of the participants was unsatisfactory while a few 128(19.08%) demonstrated satisfactory practices.

The factors associated with input/output monitoring of patients on IVF therapy were mostly lack of knowledge and skills in monitoring (78.95%), the belief that monitoring of patients on IV fluids does not affect the quality of care was (75.68%), and difficulties using inputs/output charts to monitor patients (72.37%) (Table 6). A multi linear regression analysis was carried out to assess the extent to which nurses monitoring of patients on IVF therapy is affected by the lack of assessment and monitoring plan for nurses, difficulties using input/output charts and nurses' lack of knowledge and skills. The dependent variables (nurses' practices in monitoring of patients on IVF therapy) was regressed on the predicting variables. That is, the lack of assessment and monitoring plan to guide nurses, difficulties using inputs/output charts and nurses' lack of knowledge and skills, which had P values of 0.348, 0.396 and 0.089 respectively. These factors had no significant effect (P>0.05) on the practices of monitoring of patients on IVF therapy; the R^2 = 0.067 depicts that the model displayed 6.7% of the variance in the independent variables (Table 7).

Table 6. Nurses Response on the Factors that Affect Monitoring of Patients on intravenous fluid Therapy

Variable	Agreed		Disagreed	
	Frequency	%	Frequency	%
Monitoring of patients on IV fluids does not impacts the quality of care	57.5168	75.68	18.48	24.32
Difficulties using inputs and output chart to monitor patients	55.0012	72.37	20.999	27.63
Lack of skills and training on the use of input/output charts	60.002	78.95	15.998	21.05
I do not use input/output chart to monitor patients because the doctor did not indicate	51.9992	68.42	24.00	31.58
Lack of an assessment and monitoring plan to guide	51.00	67.11	24.996	32.89
There is administrative supervision and monitoring of patients on IV therapy daily	41.00	53.95	34.998	46.05

Table 7. Association between Socio-demographic Characteristics and Nurses' Practices regarding IV fluid therapy Monitoring

Variables	Practice (N=671)		OR (95% CI)	P value
	Satisfactory (N=128)	Not Satisfactory (N=543)		
HOSPITAL				
District Hospital Limbe	-	222(100%)	0.71(0.67-0.75)	.11
LRH	125(51.2%)	119(48.8%)	2.04(1.79-2.32)	.42
CDC Cottage Hospital	3(1.5%)	197(98.5%)	0.42(0.13-1.34)	.21
WARD				
Surgical ward	13(6.9%)	175(93.1%)	0.23 (0.13-0.43)	.06
Medical ward	112(33.1%)	226(66.9%)	9.81 (5.66-17.03)	.11
Solidarity	3(2.1%)	142(97.9%)	0.06 (0.02-0.21)	.12

Furthermore, a multi linear regression analysis was carried out to assess the extent to which nurses monitoring of patients on IVF therapy is affected by age, qualification and years of experience. Therefore, the dependent variable (nurses' practices of monitoring of patients on IVF therapy) was regressed on the predicting variables (age, qualification and years of experience). Nurses' age and years of experience had P values of 0.815 and 0.379 respectively. Thus, age and years of experience had no significant effect (P>0.05) on the practices of monitoring patients on IVF while qualification had a significant effect (P<0.05). The $R^2 = 0.206$ depicts that the model showed 20.6% of the variance in the independent variables (Table 8).

Table 8. Summary of Findings of Multi-linear Regression Analysis for Factors affecting Patients' Monitoring on IVF Therapy

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
	B	Std. Error	Beta			Lower Bound	Upper Bound
(Constant)	2.093	.246		8.517	.000	1.603	2.583
Difficulties using inputs and output chart to monitor patients	-.128	.136	-.130	-.945	.348	-.400	.143
Lack of skills and training on the use of input/output charts	.143	.167	.132	.854	.396	-.190	.476
Lack of an assessment and monitoring plan to guide	-.233	.135	-.249	-1.723	.089	-.503	.037
a. Dependent Variable: The monitoring of patients on intravenous fluid therapy							

Table 9. Summary of Findings of Multi-linear Regression Analysis regarding Effect of Age & Qualification on Nurses' Monitoring of Patients on Intravenous Fluid Therapy

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
	B	Std. Error	Beta			Lower Bound	Upper Bound
(Constant)	2.047	.207		9.886	.000	1.634	2.460
Age group of respondents	.022	.093	.025	.235	.815	-.164	.208
Qualification of respondents	-.190	.045	-.481	-4.265	.000	-.279	-.101
Years of experience of respondents	.051	.057	.100	.886	.379	-.063	.165
a. Dependent Variable: Monitoring of Patients on Intravenous Fluid Therapy							

DISCUSSION

This study aimed at investigating nurses' knowledge and practices on input/output monitoring of patients on IVF therapy. It is worth stating that proper monitoring of a patient's input/output fluid status can minimize errors, prevent complications and enhance the provision of safe care. Thus, providing information which can assist in designing a framework to guide nursing care for such patients is mandatory. The findings of this study showed that more than half of the nurses were females. This is probably because of the image Florence Nightingale portrayed of nurses, which is being humble, kind hearted and caring. These findings are consistent with those of Hala and Manal [18] and Litchfield et al. [19] which showed that majority of the nurses were females. Most of the participants were below the age of 30 years; this is similar to the findings of several studies

including those conducted by Ghada et al [20], Litchfield et al. [19], Aslam et al. [7] and Hala and Manal [18].With regards to qualification, Diploma nurses were the most represented while a few had degrees. This finding is similar to that of studies conducted by Aslam et al. [7] and Habasa [9].

Concerning years of experience, 1-4 years was the most represented in this study. This finding is in accordance with that of Aslam et al. [7] and Mohammed et al. [21] which showed that many of the participants have had less than 5 years of experience. However, our finding is contrary to Hala and Manal [18] who found that nurses who have worked for 5-10 years were the most represented. Also, most of the participants had not participated in an audit while just a few had previously participated. This is in accordance with the results of a study conducted by Hala and Manal [18] and Samah et al. [22] which showed that majority of the nurses did not participate previously in any such programme. This is an indication that there is deficiency in continuing nursing education. Meanwhile, nurses need to continue learning while providing care in order to develop their missing skills and improve on quality of care [3].

In assessing nurses' knowledge regarding patients on IVF therapy, most of the participants reported patients' history, clinical examination, clinical monitoring and laboratory investigations as methods of assessment. A few of them knew that current medication was a method of assessment and only 5.26% of the participants gave the correct response on laboratory indications for fluid gain. Again, only 1.32% of the participants knew the laboratory indication of fluid loss. This could be attributed to the fact that nurses consider the interpretation and evaluation of blood results as solely the responsibility of medical doctors while they limit themselves to only aspects related to nursing care. This is in accordance with the results of a study conducted by Hayam [16] in which nurses had adequate knowledge on the clinical signs associated with hypovolemia/hypervolemia and the actions taken for these patients.

Several studies have suggested that fluid overload has been linked to adverse outcomes and that nurses' knowledge regarding input/output monitoring of patients on IVF therapy was either poor, inadequate or unsatisfactory. According to Clinical Guideline [3] all patients on continuous IVFs requires regular monitoring which should initially include at least daily reassessments of clinical fluid status, laboratory values (urea, creatinine and electrolytes). Despite the fact that assessment of a patient's IVF needs of an appropriate IVF regimen can be complex, the job is often delegated to health care professionals with limited experience and little or no relevant training [3]. Our study revealed that only 2.6% of the participants could identify all the symptoms of fluid overload. In addition, just 3.9% of the participants could identify all the symptoms of fluid depletion. With respect to nurses' knowledge on the monitoring of patients on IVF therapy, majority of them identified the input/output chart as a monitoring tool for patients on IVF therapy. However, nurses' knowledge regarding other items on monitoring of patients on IVF therapy was inadequate. Similarly, Aslam et al. [7] and Mohammed.et al. [21] identified inadequacy in the monitoring of patients on IVF therapy. On the contrary Litchfield [19] found that nurses' knowledge of fluid and electrolyte balance in patients with congestive heart failure showed an overall good percentage of satisfactory knowledge. Furthermore, our study revealed that majority of the nurses knew that the input/output chart is used to document fluids administered to patients and whatever is excreted. In addition, nurses should be able to diagnose and respond to input/output irregularities since it plays an essential role in nursing management, as maintaining homeostasis is crucial in maintaining tissue perfusion. A study conducted by Hayam [16] in the intensive care unit demonstrated that the level of nurses' knowledge in the monitoring of patients on IVF therapy was moderately adequate (61.67%). This finding may be due to the fact that the study was carried out on patients with congestive heart failure and in the intensive care unit where monitoring is a routine [19].

According to Aslam et al. [7] nurses do not have sufficient knowledge of fluid and electrolyte administration, which affects the quality of nursing care and its impact on patients. Scales and Pilsworth in Hayam [16] stated that nurses' knowledge on input/output monitoring of patients on IVF therapy should be improved because nurses are the primary persons responsible for monitoring.

Only a few of our respondents said they monitor patients using the input/output chart; they demonstrated an overall unsatisfactory practices. The results of the present study may be due to the fact that input/output monitoring may not be considered as important as other aspects of nursing care. Nurses may also expect the medical doctor to request for monitoring. Again, some nurses may think that they are competent in assessing the patients by observation without the use of an input/output chart. Aslam et al. [7] reported an overall poor practices of 208 nurses. However, a study conducted by Litchfield et al. [19] demonstrated an overall adequate practices.

On the aspect of recording information on patients' files, majority of the patients' identification were completed. It is important to state that inaccurate records of fluid balance may lead to inappropriate administration of diuretic therapy. This may result in fluid imbalances that affect the patients' hemodynamic stability. Therefore, it is essential that the nurse implements appropriate recording, accurate calculation and fluid balance monitoring [16]. A study conducted on completion of IVFs administration regimen in adult Medical and Surgical Wards showed that majority of the observational checklists indicated that 88.3% of the fluid charts did not have patient's name and hospital identification

completed [23]. These few inconsistencies in the proper documentation of major patients' identifiers are crucial in prevention of medication errors [24].

Concerning recording the reason for commencement of IVF, only 14.3% were indicated. This is far less than 81.1%, which increased to 87.5% following an intervention in a study conducted by Walker et al. [25.]. It is worth mentioning that to know when to start giving fluids, when to stop giving fluids, when to give the right fluids at the right time, in the right way, and use the right monitor correctly is important in order not to do any harm to the patient [26].

A document developed by the Royal Cornwall hospitals NHS Trust [26] on Fluid Balance for Adult In-patients states that successful fluid input/output balance is dependent on timely and appropriate rationale for commencement or discontinuation of IVFs. Therefore, all members of the nursing team are expected to be alert, able to determine a timely and appropriate rationale for starting and stopping an input/output chart. In addition, clinicians are reliant on accurate 24 hour totals to inform clinical decisions in relation to fluid management, including the prescription of IVFs. This will prevent the serious complications associated with over or under hydration [27].

Our study revealed that only 0.7% of patients' weights were recorded by nursing staff; this is far lower compared to the findings of a similar study [23] which showed that the patients' body weights were documented in only 20.2% of the reviewed patients' fluid charts. Another study conducted by Walker et al. [19-28] found that patients' weights recorded by nurses showed 28.3%. Changes in body weight and serum sodium concentration are useful parameters to assess water balance and, accordingly plan initial IVF therapy. Other parameters such as blood pressure, acid base status, kidney function, and the presence of diabetes should also guide the selection of IVF therapy [16]. Variations in the patients' body weight measurement practices by nurses are undesirable because patients' body weights inform clinical decisions as well as medication dosages and the monitoring for IV fluid-related complications. In addition, weight measurement is one of the most sensitive indicators of patients' volume status changes [19].

Results of our study showed that majority of the fluid type and amount of fluid was documented followed by rate of flow; finish time documentation was very poor (7.9%) and there was no space for the batch number. Similarly, results presented in a study conducted by Aslam [7] showed that nurses mostly documented the fluid type (77.88%), amount of fluid (76.92%) while the lowest scores were registered in the other parameters.

Assessment of nurses' practice for patients on IVF therapy demonstrated a wide variation with the majority of adequate nurses' practice in the areas of assessment and documentation of the patients' vital signs; that is, pulse and blood pressure. Fluid balance is an essential tool in determining hydration status, recording intake/output tends to be one of the key activities undertaken at the bedside and is used in conjunction with the recording of vital signs and certain laboratory results to set required fluid intake levels. Accuracy in recording intake/output is vital to the overall management of certain patient groups and facilitates the assessment and evaluating patients' conditions. This will enable correct prescription of IVFs [29].

Litchfield et al. [19] found that the highest percentages of adequate practices was related to vital signs while nurses had deficit knowledge and practice related to peripheral circulation evaluation of mucous membranes and signs of ineffective breathing patterns. According to him, these are areas of major importance in the prevention of fluid and electrolyte imbalances. From our study it was revealed that the laboratory investigations mostly conducted were Full Blood Count and Hematocrit while Urea, Creatinine and electrolytes were the least conducted. It is important that the nurse makes an early assessment of the patients' water and electrolyte needs to detect signs of electrolyte imbalances [19].

With regards to monitoring, results of our study revealed that only 11.3% of fluid intake was recorded, 8.6% of output and 4% of fluid balance calculated. This is consistent with results of a study conducted by Susanna et al. [4] on Documentation of Fluid Balance of Patients on IV therapy, which showed incidents of incomplete or non -documentation of IVFs administered in the intake/output chart. Also, Vincent et al. [30] conducted an audit on 117 patients, which revealed that less than half of input/output charts were completed. On the other hand, findings from a study conducted on IV use in the acutely unwell adult medical inpatient found that completion of fluid balance charts by nursing staff was 62.3% which increased to 70.8% after an intervention[28]. It was noted in this study that accurate completion of fluid balance charts led to a greater assessment and documentation of fluid balance status by medical staff compared to patients where the charts had not been completed [28].

A study conducted by Ghada et al [20] to investigate the recording and accuracy of fluid balance monitoring found that the majority 79% of the audited 24 hour input/output records were incorrect. According to Clodagh these findings indicate that treatment decisions are mostly based on inaccurate fluid balance information which may lead to negative patients' outcomes [13]. On the contrary, Hayam [16] recorded more than 65% accuracy in the intensive care unit (ICU). This result may be so because intake and output monitoring is considered a routine monitoring in the ICU. Intravenous fluids (IVFs) are routinely used in ICUs and hospitals in order to restore effective blood volume and maintain organ perfusion [16, 19].

Workload, lack of measuring equipment and lack of skill/ training were reported by nurses as the major challenges encountered during monitoring of patients on IVF therapy. This is consistent with several studies including studies carried out by Susanna et al, [4], Ghada et al.[20]; Hayam [16]; Dominiko [9]. On the contrary, Samah /Ebrahim [31] identified nurses' knowledge and the number of medications administered as factors influencing nurses' practice. He explained that, adequacy of practice decreases with increasing numbers of medications administered due to the fact that larger number of medications need more attention for drug interactions and more monitoring efforts. On the other hand, a larger number of medications indicate a higher severity of the patient's condition which necessitates more care. Ghada et al [20] stated that, the solutions to improve intake/output monitoring are training of all staff, clear standardised charts, clear prescriptions from physicians and a calculator at bedside. Also, in a study by Vincent et al [30] nurses suggested that more guidance from the medical team regarding monitoring and more education would be helpful.

However, a linear regression analysis showed that all the independent variables had P values greater than 0.05 except for qualification. Therefore, qualification was the only variable that had a significant impact (P =0.000 <0.05) on the practices of monitoring patients on IVF therapy in the current study. The R^2 = 0.206. The bivariate analysis also showed no significant relationship between practice, hospitals and wards. According to Clinical Guidelines [3] the difference between one's knowledge and experience is the fact that educators cannot provide all the necessary resources in college settings.

CONCLUSION

Nurses' in the medical and surgical wards in Fako Division lacked knowledge in certain areas of patients' assessment regarding input/output monitoring of patients on IVF therapy; generally, their practice was unsatisfactory. Qualification had a significant impact on nurses' practices (P<0.05). Therefore, nurses need to continue learning during their work to help them develop their nursing skills and qualification. Thus, an educational intervention on input/output monitoring of patients among nurses in Fako Division is advised. Nurses should receive education on fluid therapy management and be competent in recognising, assessing and preventing consequences of mismanaged IVF therapy. Clear incidents of fluid mismanagement should be reported through standard critical incident reporting to encourage improved training and practices. In addition, clinical guidelines/protocols need to be introduced in the wards to create and maintain awareness and facilitate compliance. Moreover, nurses should always strive to improve on their critical thinking and advanced problem solving skills, as well as practice base on research evidence in order to provide high quality patient care.

Limitations of the Study

A retrospective study is limited; there is a possibility of working with inaccurate or missing data. Also, there might have been bias in responding to the questionnaire because nurses' knowledge in this study did not reflect their practices. However, the findings of this study were limited to a small sample size of 76 which may not represent the population of nurses in Fako Division. An observation study should be conducted since the researcher would be able to assess the actual nurses' practices.

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