FACTORS INFLUENCING NURSES' COMPETENCE ON INTRAVENOUS FLUID THERAPY IN UNDER-FIVES WITH DEHYDRATION IN KAKAMEGA COUNTY HOSPITALS   KENYA

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Abstract

Intravenous fluid therapy is a procedure used to administer fluids to the body through the veins. The objective of this study was to analyze the factors that affect competence of nurses on intravenous fluid therapy in under-fives with dehydration in Kakamega County hospitals Kenya. The study design was a descriptive cross-sectional study and quantitative methods were adopted. . The study was conducted in Kakamega County hospitals and the sample size was proportionately chosen depending on the number of nurses who work in the pediatric departments. Participants were selected using simple random sampling method ($n = 198$). Data was analyzed using descriptive statistics and Analysis of variance (ANOVA). The main outcome measures were the factors affecting competency of nurses on intravenous fluid therapy. The findings of the study were that the majority of the respondents 84% reported that availability of resources was the major factor which affected their competence in intravenous fluid therapy. Workload was a major that was mentioned by the respondents as a factor to be observed during intravenous fluid therapy represented by 54%. 75.8% of the respondents reported training as the major factor affecting performance in intravenous fluid therapy, 57.1% of the nurses   reported that experience was their major factor affecting their performance while 1.0% reported gender being an issue affecting their performance on intravenous fluid therapy. The independent between- group ANOVA yielded a statistically significantly effect, $F (2, 197) = .237$, $p = .789$, $\eta_p^2 = .002$. Thus, the null hypothesis of no significant differences in factors affecting intravenous fluid therapy competences in nurses of different qualification at public health facilities in Kakamega was rejected. In conclusion, a replication study on nurses with different characteristics should be conducted to increase the possibility for generalization of the factors.

Keywords

Intravenous fluid therapy, nurses, Fluid therapy, Pediatrics

Background

Intravenous fluid therapy is a procedure in pediatric patients that is used to correct fluid and electrolyte imbalance in the body, administer drugs and nutrients parenteral (Kavutha, 2014). Worldwide, dehydration due to diarrhea is the second leading cause of mortality after pneumonia in children (UNICEF, 2016). Globally, children get intravenous fluid therapy every day to help maintain hydration since 1950 (Caldwell, 2014). Inappropriate use of intravenous fluids may occur in up to 20% of children receiving fluid therapy leading to brain overload and other serious complications (Hoste *et al*., 2014). In Kenya, 17% of the children die due to in appropriate intravenous fluid therapy (KDH,2014). Inappropriate fluid therapy can increase morbidity and prolong hospital stay (Kavutha, 2010). Nurses need to have knowledge on the intravenous fluid therapy for therapeutic outcome (Vijayan, 2011). They must understand the movement of fluid in both the intracellular and extracellular compartments (Davies, 2010). Poor insertion technique may cause blood stream infections, phlebitis, infiltration fluid overload, hypothermia, electrolyte imbalance and embolism. Rapid fluid therapy is lifesaving for children diagnosed with hypovolemic shock or poor blood circulation (Irimu *et al.,* 2012). Fluid and electrolyte balance is generally essential to body tissues. There is scanty of literature of the factors affecting the competence of nurses on intravenous fluid therapy in children under five. Below are some of the factors

Hospital Factors
Availability of resources may pose a great challenge in intravenous fluid therapy. For example, lack of required materials such as syringes, needles, cannulas, giving sets, different types of fluids, strapping, water for injection, charts and files for recording may lead to inappropriate fluid therapy. Lack of enough human resource may also lead to little attention towards monitoring and regulation of intravenous fluid drop factor leading to complications.

Nurses Factors
It is difficult to insert veins for small infants hence needs a nurse with high skilled knowledge and skills. Nurses may perform their work well or sometimes poorly. This will depend on the experience they have, their age, the trainings, attitude and the motivation they have in working in that department. This study assumes that nurses with long experience in pediatric care, young and healthy may be competent. Workload may also affect intravenous therapy leading to poor monitoring of the fluids during therapy.

Age
Age is an important factor that can determine competence of nurses on intravenous fluid therapy. The new constitution allows nurses who are part of civil servants to practice until the age of sixty years (Constitution of Kenya, 2010). A study was conducted to determine variables associated with IV insertion difficulty, failure, and success, and to learn special techniques nurses use to facilitate IV insertion. Data was collected on 339 IV insertions in hospitalized patients and analyzed to determine the effects of these variables on IV infusion. Older nurses had more years of experience and were rated higher in insertion skill. They had significantly more successful insertions than their younger and less-experienced and less-skilled counterparts (*P*< .001). This study identified nurse, patient, and IV variables associated with IV insertion success and failure. The researcher recommended that future research is needed to confirm and expand these findings and to develop interventions to improve IV insertion skills and outcomes. However, older nurses may on the other

hand have degenerative dysfunction of some organs which may affect their performance, such as visual and hearing impairment. Younger nurses may also   perform well or not. The study will determine whether the age has any relationship with nurses' competence on intravenous fluid therapy in pediatrics.

Education Level

Nurses working in pediatric units have different levels of education. These include   master degree in nursing, Bachelor of Science in nursing, diploma and certificates in nursing   according to the Nursing Council of Kenya. Some have specialized in pediatric Nursing, others have trained on intravenous fluid therapy and other short courses. It may be assumed that nurses with   higher level of education may be competent than those at lower levels. The researcher wants to find out whether there is any relationship between educational level and nurses competence in intravenous fluid therapy in pediatrics.

Experience

 Nurses like hands-on practice, and they can improve both their self-confidence and their IV technique through the repetition. It is assumed that nurses who have had a lot of experience in managing children or working in a pediatric ward may have a high experience in managing intravenous fluid therapy unlike the one with less experience. They get experience on intravenous tubing, programming the pumps, and making adjustments. This study intends to determine whether there is any relationship between nurses' competence and experience in intravenous fluid therapy in children.

Trainings

Nurses undergo an integrated management of childhood illness training which include intravenous access, tools and procedures. Discussions of anatomical, physiological, and infection-control principles; legal and ethical aspects of infusion practice are described. IV pumps, a mannequin arm, and intravenous access simulators are used. This hands-on section reinforces the technical and cognitive aspects of intravenous   procedures. It also illustrates aspects of pediatric physiology and psychology, presents a context for discussing aspects of establishing rapport with patients and their parents. Documentation is significant because it can supply legal protection for both nurses and institution. Intravenous pump   is used to connect and adjust the actual devices to control drug flow. Nurses are oriented to both mini (syringe) and large volume infusion pumps used by the hospital. Large-volume pumps use a weight-based program and the mini (syringe) pumps use smart pump technology to reduce errors in programming Mannequin gives hands-on practice in palpating and securing the IV with a clear transparent dressing that allows better visualization of the site. The intravenous site is covered by tape or other securing devices except a clear plastic shield that can be easily removed and that prevents the child from touching the site. Nurses need to understand the design and safe practice of these devices. Simulator is used for realistic practice on starting the IV, including: choosing a site, needle angle, the feel of insertion, and perfecting technique. This helps on anatomy support discussions of child physiology and how to properly document patient care. Research supports simulator validity for IV training. A clinical study found that simulation "was judged to be adequately realistic and highly useful for training. Pediatric simulators are important in the practice and mastery of procedural skills, but the largest benefit of simulation is the simultaneous integration of technical and cognitive skills. The ability to recognize and evaluate threatening situations, choose appropriate interventions, and then perform required technical skills in real time makes pediatric simulation invaluable."

Client and Caretakers Factors

Caretakers may also become uncooperative and remove the fluid during infusion due to lack of knowledge and ignorance on importance of the therapy. Some religions do not allow medical therapy hence some parents may resist and disrupt the intravenous fluid therapy in dehydration.

Little has been done to determine the factors that affect nurses competence on intravenous fluid therapy in under-fives. Therefore, the researcher finds it necessary to conduct this study. The objective of the study was to analyze the factors that affect competence of nurses on intravenous fluid therapy in under-fives with dehydration.

Methods

Ethical approval was obtained from Masinde Muliro University of Science and Technology ethical board, National commission for science and technology, the Kakamega county commissioner and from the   director, medical services, Kakamega County.

Research Design

The study design was a descriptive cross-sectional, that utilized quantitative method. This particular design was ideal since the research entailed collecting and comparing data from the phenomena at the same time of study. Kothari (2004) describes descriptive surveys as formalized and typically structured fact-finding enquiries, involving asking questions (often in the form of a questionnaire) to a group of individuals, adding that the major purpose is description of the current state of affairs as it exists at present and describe "what exists" with respect to variables or conditions in a situation. Therefore, the descriptive survey was deemed the best strategy to fulfill the objectives of this study. The study was not expected to measure changes in intravenous fluid therapy practice at different points in time, further logistical and time issues also influenced the design choice.

Study setting

The study was conducted in Kakamega County hospitals. Kakamega County is one of the 47 counties found in Kenya with the second largest population of 1,660,651 (Census, 2009). It is found in western part of Kenya 0.2837◦ N and 34.7515◦ E. It borders Vihiga County to the South, Busia County to the West, Bungoma County to the North and Uasin Gishu and Nandi counties to the East. It covers a surface area of $3050.3KM^2$. The County has both rural and urban population; the majority 700, 300 (83.3%) being in the rural area. Its population density is 515 per square kilometer. Pediatric health services are sponsored by the national government by offering free medical care to all under-fives in the country, County government and none governmental organizations. It is an agricultural region and the major economic activities practiced are livestock rearing, maize and sugarcane farming. Kakamega County has one county teaching and referral hospital and twelve Sub county hospitals. The hospitals that were selected for the study included Kakamega County General Hospital which is the only teaching and referral hospital in the County and six sub-county hospitals which were randomly selected from twelve Sub county hospitals to achieve the required sample size for the study.

Participants

A descriptive cross-sectional study design was conducted in Kakamega County hospitals Random sampling was used to select the six sub county hospitals from the twelve sub county hospitals found

in the county. Quantitative methods were adopted. The study was conducted for a period of thirteen weeks from 2nd March 2017 to 29thMay 2017.

Simple random sampling was used (Random number table) to select the six out of the twelve Sub county hospitals to be included in the study in addition to Kakamega County General Hospital. The sample size was proportionately chosen depending on the number of nurses who work in the pediatric departments in each facility. Participants were selected using simple random sampling method. In KCGH, purposive sampling method was used basing on the sections that manage pediatric patients. Simple random sampling method was used to select individual participants for the study. Cochran (1963) formulae was used with an attrition rate of 10% then the population correction factor formula to get the actual sample. Size of 200 from the known population of 283. Research Instruments The questionnaires and observation schedule were used to collect the data.

$$n_o = \frac{z^2 pq}{e^2}$$

$$n_o = \frac{(1.96^2)(0.5)(0.5)}{0.04^2}$$

$$n_o = 600.25 + (10\% \ attrition) = 660.025 = 660$$

Since the target population was less than 10,000, the sample size was adjusted using the following formula.

Finite Population Correction For Proportions

$$n = \frac{n_o}{1 + \frac{(n_o - 1)}{N}}$$

$$n = \frac{660}{1 + \frac{(660 - 1)}{283}}$$

$$n = 197.89$$

$$n=198$$

Z=1.96, P=0.5(for maximum variability), e=0.05(5% margin of error), n_0=estimate

population sample, N=actual population, n=desired sample size

Data Collection Procedure

The study used self-administered questionnaires. The questionnaire was adopted from *Fulcher & Frazer,* 2007. It was then modified to suit research objectives. Two research assistants were trained on how to use the tool when collecting data.

Research Instruments

The questionnaires (Appendix V) were used to collect data from nurses which was adopted from (*Fulcher & Frazier*, 2007) and modified to suit the research objectives. Each item in the questionnaire was developed to address a specific research question. The questionnaire captured demographic information and factors that affect nurses' competence on intravenous fluid therapy. The questionnaires were administered to the respondents and requested them to fill and return them after answering all questions. To increase the validity and reliability of the instruments, the

questionnaire was evaluated by experts. Then based on the feedback the final questionnaire was prepared for pilot study. The pilot study was conducted in Vihiga county Hospital sub-county hospital. The reliability of the scale of the 10 items was found to be: Internal consistency = (Cronbach's α = 0.840).

Data Analysis

Data analysis was done using the statistical program for social sciences (SPSS) version 22. Inferential and descriptive statistics were used to analyze data. Descriptive analysis of data was done using the mean, frequencies and percentages. In this study association between the study variables was assessed by a two-tailed probability value of $p<0.05$ for significance. Schlomer *et al*. (2010) outlined guidelines for best practices regarding the handling and reporting of missing data within research. Visual inspection of the data illustrated that missing data appeared to be missing at random. After visual inspection, in order to further examine the pattern of missing data, the researcher evaluated whether the data was missing completely at random (MCAR). The researcher utilized Little's MCAR test (Schlomer *et al*., 2010) which employs a chi-square statistical analysis and assumes the null hypothesis, that missing data is missing completely due to randomness. In this case, failing to reject the null hypothesis indicates that the data was most likely not missing in a random way. For this study, Little's MCAR test results showed that Factors that affect intravenous fluid therapy (χ^2 [112] = 86.447, p = .965) was not significant indicating that the variables were missing completely at random, the researcher proceeded to address the missing data. To avoid reducing the variances of the scores by replacing missing items using subscale means, the missing data items were instead imputed using the Expectation- Maximization (EM) algorithm within SPSS 23; EM is considered a superior method for conducting missing data imputation when one has MCAR data (Schlomer *et al.,* 2010). Their guidelines were considered when reviewing the missing data for the current research study. The data was tested for assumptions of normality using the Shapiro Wilk test, Skewness and Kurtosis were also checked. Homogeneity of variance was checked using the Levene test. All assumption for conducting the above parametric tests were met before undertaking the test. Chi-square test and logistic regression tests were used. Data was analyzed using Statistical Package for Social Science version 23. Thereafter, the numerical numbers representing responses from the questionnaires were transferred to a code sheet so as to obtain quantitative results from the closed ended questions. Categorical variables were compared using chi-square tests. Alpha level for all the computations was considered $p <0.05$.

Results

The study asked the respondents to indicate their background characteristics based on the position they held at the gender, religion, age bracket, marital status, institution of training, year of qualification, level of education, sections of work and pediatric experience. The summary of their responses is given in Table 1.1.

Table 1.1.

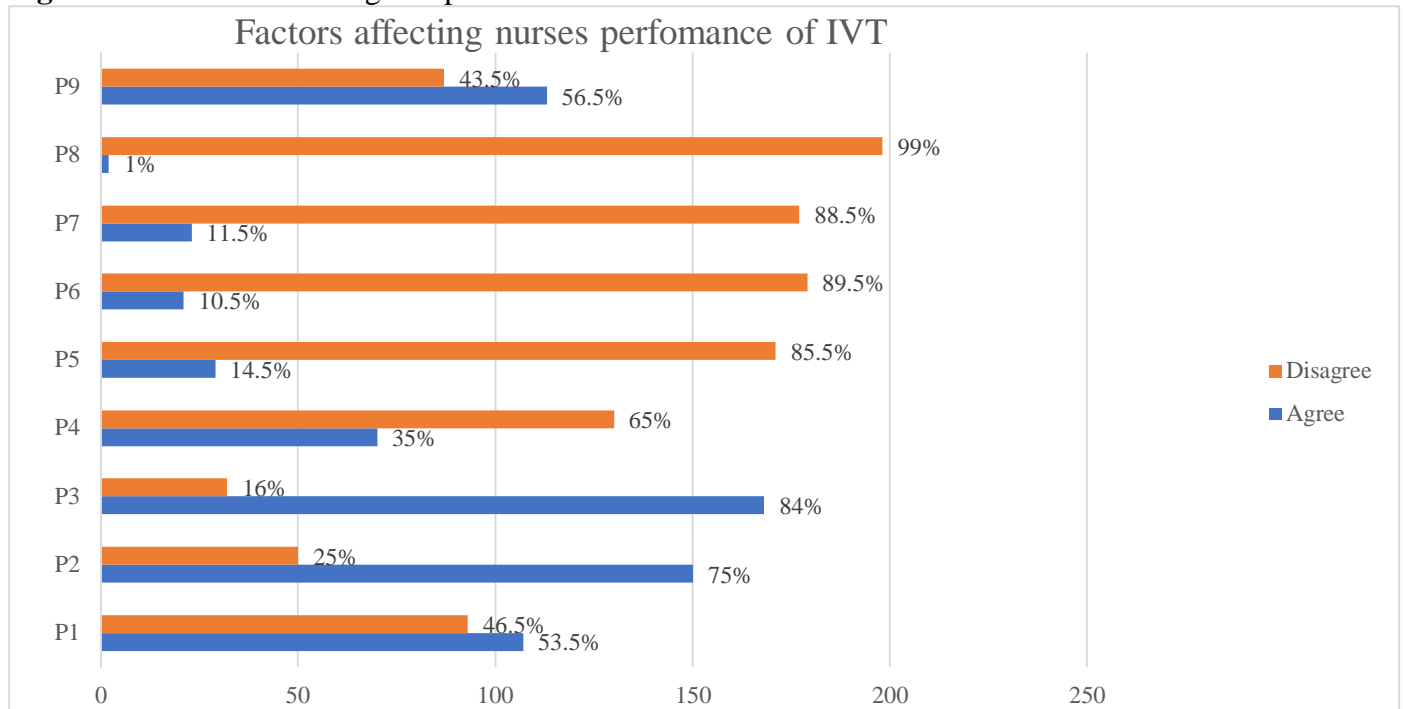*Background characteristics of respondents*

Demographics		Frequency	Percent
Gender	Male	88	44%
	Female	112	56%
	Total	**200**	**100.0**
Gender	20-29	21	10.5%
	30-39	106	53.0%
	40-49	54	27.0
	50 and above	19	9.5%
	Total	**200**	**100.0**
Religion	Christians	160	80%
	Muslims	40	20%
	Total	**221**	**100.0**
Marital Status	Married	118	59.0%
	Single	64	32.0%
	Divorced	1	0.5%
	Separated	12	6.0%
	Widowed	5	2.5%
	Total	**200**	**100.0**
Training Institutions	Public	141	70.5%
	Private	59	29.5%
	Total	**200**	**100.0**
Year of qualification	1981-1990	18	9.0%
	1991-2000	42	21.0%
	2001-2010	73	36.5%
	later than 2011	67	33.5%
	Total	**200**	**100.0**
Level of education	Certificate	68	34.0 %
	Diploma	101	50.5%
	Degree	31	15.5%
	Total	**200**	**100.0**
Sections (Wards)	Pediatric medical	104	52.0%
	Pediatric surgical	30	15.0%
	Casualty	15	7.5%
	Outpatient department	37	18.5%
	Neonatal baby unit	14	7.0%
	Total	**200**	**100.0**
Pediatric Experience	1-3	111	55.5%
	4-6	55	27.5%
	7-9	20	10.0%
	over 10	14	7.0%
	Total	**200**	**100.0**

Workload was a major that was mentioned by the respondents as a factor to be observed during intravenous fluid therapy represented by 54%. 75.8% of the respondents reported training as the major factor affecting performance in intravenous fluid therapy, 57.1% of the nurses   reported that experience was their major factor affecting their performance while 1.0% reported gender being an issue affecting their performance on IVF therapy. 11.6 %   reported that age affected their

performance on IVF therapy. Majority of the respondents84% reported that availability of resources was the major factor which affected their competence in IVF therapy, while 14.5% reported that a conducive environment was the major factor affecting their competence.

The descriptive statistics associated with factors affecting competence of IVF across the three levels of education groups are reported in Table 1.2. It was seen that the Bachelor's degree group was associated with the numerically highest mean (M=3.48 SD=.962) and Diploma group was associated with the numerically lowest mean (M=3.37 SD= .977). In order to test the hypothesis that the qualification (certificate, diploma and degree) had an effect on the factors influencing IVF competence, a between- groups ANOVA was performed.

Figure 1.1: Factors affecting competence of nurses on IVT

Factors affecting nurses perfomance of IVT

	Agree	Disagree
P9	56.5%	43.5%
P8	1%	99%
P7	11.5%	88.5%
P6	10.5%	89.5%
P5	14.5%	85.5%
P4	35%	65%
P3	84%	16%
P2	75%	25%
P1	53.5%	46.5%

Key

P1- Workload affects my competence of IVF

P2- Training affects my competence of IVF

P3- Availability of resources affects my competence of IVF

P4- Manpower affects my competence of IVF

P5- Working Environment affects my competence of IVF

P6- Motivation affects my competence of IVF

P7- Age affects my competence of IVF

P8- Gender affects my competence of IVF

P9- Experience affects my competence of IVF

Prior to conducting the ANOVA, the assumption of normality was evaluated and determined to be satisfied as the three groups distributions were associated with skew and kurtosis less than |-1.0| and

|1.0| respectively (Howel, 2006; see table 4.6). Furthermore, the assumption of homogeneity of variances was tested and satisfied based on Levene's F test, F test (2, 197) = .049, *p*= .952.

The independent between- group ANOVA yielded a statistically significantly effect, F (2, 197) = .237, p = .789, η_p^2= .002. Despite the statistically significant difference, statistical power was not adequate and was equal to .087. Thus, the null hypothesis of no significant differences in factors affecting IVF competences in nurses of different qualification at public health facilities in Kakamega was rejected, and only 2% (η_p^2= .002) of variance in factors was accounted for by group membership.

Table 1.2.
Descriptive statistics for factors affecting IVF competence across qualifications

Professional cadre	n	M	SD	CI 95%	Skewness	Kurtosis
Certificate	187	3.46	1.125	3.18-3.73	-.210	-.740
Diploma	11	3.17	.977	3.17-3.56	-.403	-.151
Degree	23	3.48	.962	3.13-3.84	-.672	.238
Note. M= mean; SD = standard deviation; CI = confidence interval						

The null hypothesis was rejected (p > 0.05) leading to the conclusion that there exist a significant difference in factors influencing IVF competence amongst Nurses of different qualifications in Kakamega County, Kenya.

Discussion

The objective of the study was to analyze the factors affecting competence of intra-venous fluid therapy among nurses in Kakamega county. From the results, 75.8% of the respondents mentioned trainings as a major factor affecting their performance on IVF therapy. Nurses need updates and refresher trainings on pediatric intravenous fluid therapy practice. This has also been reinforced by the licensing body so that before the license is renewed, one produces an evidence on progressive learning through the workshops and trainings undertaken (NCK, 2009). It is the duty of the individual to plan and meet the requirements through updates by attending continuous medical education, upgrading and even on job training. This can help in improving both the knowledge and practice leading to competent practice. Conducive environment and availability of resources were also among the factors affecting performance of nurses on intravenous fluid therapy. The hospital administration should ensure the hospital environment is conducive to allow nurses perform to their best. This can be done by ensuring all that is required for standard practice is available. Lack of resources can demoralize staffs hence the result is the poor practice. Workload was affecting nurses' competence on IVF therapy due shortage of manpower. The staffing department should increase the number of nurses in pediatric units to allow a standard nurse to patient ratio required by international standards of 1:4-8 (WHO, 2009). This will allow better healthcare for all and so therapeutic outcome. The results showed that not only one factor could influence the nurses' competence on intrav;enous fluid therapy but a group of interrelated factors.

Conclusion & Recommendation

This study design utilized a simple yet direct approach to survey the factors affecting nurses competence of intravenous fluid therapy. A replication study on nurses with different characteristics should be conducted to increase the possibility for generalization of the factors. A prospective study

should also be performed to investigate the nurse-associated factors such as catheter insertion skill. Based on the research results following recommendations are presented:

1. In-service training should be provided by expert nurses.

2. Nurses should receive university education to acquire the necessary knowledge and skills to administer the profession.

3. Nurses should have the habit of following the changes and developments from professional publications.

4. Nurses should change their departments regularly in order to recognize different patients, diseases and the different application techniques.

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