
Health system factors that affect intravenous fluid administration by nurses at a county referral hospital in Kenya

Winfridah Wangui Njung'e

Affiliation: School of Nursing, Maasai Mara University, P.O.Box 861-20500, Narok, Kenya

Correspondence: fridahwin@gmail.com

Abstract

Introduction: Many hospitalized patients receive intravenous fluids (IV) for replacement of body fluid losses and maintenance of proper fluid and electrolyte status. Proper clinical decision making, IV fluid administration and monitoring practices are critical in the prevention of complications related to IV fluid therapy. The objective was to identify the health system factors that affect the administration of intravenous fluids to patients by nurses at the medical and surgical wards at a County Referral Hospital in Kenya.

Methods: A descriptive cross-sectional study was conducted on nurses at the adult medical and surgical wards. Self-administered, semi-structured questionnaire was administered to the nurses. Data on the challenges encountered by the nurses in administration of IV fluids to the patients was collected. Relevant authorities granted approval to collect data.

Findings: Shortage of nurses (staffing) was the most significant health system factor ($p=0.0001$) in the administration of IV fluids to patients. Shortage of supplies (IV fluids and infusion sets) also affected IV fluid administration to patients ($p=0.013$)

Conclusion: Various health system factors affect administration of IV fluids to patients; with the most significant ones being shortage of nurses and supplies in the wards.

Key words: *Intravenous fluids, Administration, Nurses, factors*

Introduction

Intravenous fluid (IV) therapy refers to delivery of IV fluids, medications and other substances directly into the body circulatory system through a venous access. It is among the commonest invasive procedures which are performed on hospitalized patients worldwide (NICE, 2017). Globally, approximately 25 million people receive IV treatment by means

of a peripheral cannula yearly (Alexander & Corrigan, 2010). Intravenous administration is the fastest route for delivering fluids and medications throughout the body. According to Baid (2012), maintenance IV fluids are administered to most patients so as to prevent dehydration, prevent or manage hypovolemia, correct electrolyte imbalance or as a solvent for pharmaceutical agents and for nutrition

such as in dextrose solutions. Intravenous fluid administration is an integral aspect of nursing practice and can range from caring for a peripheral cannula to multiple and complex intravenous infusions and related equipment (Lisa & Julie, 2008). Health system factors in the administration of intravenous fluids to patients range from the availability of the pharmaceutical and non-pharmaceutical supplies and medical devices to that of healthcare personnel involved in clinical decision making and infusion therapy. Standards of practice according to the Royal College of Nursing (2016) indicate that the nurses who administer intravenous infusions must have undergone training and be competent in all practical aspects involving infusion therapy. According to Fraser, Snyman, Wessels & Nel (2007), gravitational intravenous fluid administration compromises patient health care due to irregularities in the IV fluid infusion rate.

Several studies of hospitalized patients on IV fluid therapy have suggested that IV fluid administration and monitoring practices are not up to the required standards (Walsh et al, 2008). The gaps in IV fluids administration were attributed to several challenges encountered by nurses in the delivery of IV fluids. According to Green & Han (2008), the administration of IV fluids to patients is greatly affected by proper IV fluid and electrolyte prescribing, nurses' knowledge on IV fluid therapy and institutional factors including availability of medical and pharmacological supplies and infusion regulation devices.

Findings from studies conducted by Walsh *et al.* (2008) and Ferenczi *et al.* (2007) on in-patients receiving IV fluids indicated that the IV fluid administration and monitoring practices by nurses were suboptimal. These were attributed to several challenges encountered by nurses in the administration of

IV fluids predominantly under-staffing and inadequate supplies. Thabo & Masaki (2015) performed an audit on 117 patients receiving IV fluids sampled from four adult medical wards on improvement of IV fluid input-output balance monitoring on patients by nurses. From the findings, 67% of the respondents suggested that inadequate knowledge on IV fluids was a major challenge. In Kenya, nurses are the primary health care providers in the delivery of services to patients at the healthcare facilities. Chankova, Muchiri & Kombe (2009) conducted a study in Kenya on the attrition of the health workforce in the public sector. From the findings, the ratio of a nurse to the population in the public-sector healthcare institutions was found to be 24 to 100,000 and 95 to 100,000 in North Eastern and Nairobi Provinces respectively. However, this is far below the recommended minimum mandatory nurse-patient ratios in the medical-surgical units at 1:6 (American Nurses Association, 2010a).

The Medical and Surgical units in hospitals administer the highest volumes of intravenous fluids to patients besides the critical care areas (Royal College of Physicians, 2013). The necessity for proper IV fluid administration and monitoring practices calls for a need to identify the health system factors that affect the administration of IV fluids by nurses at a County Referral Hospital in Kenya.

Methods

Descriptive cross-sectional study design was used to collect data from 52 nurses at the medical and surgical wards. The study sample derived from the target population (288 nurses) was calculated by use of the Fischer's formula adopted from adopted from Mugenda and Mugenda (1999) and Finite Population Correction for Proportions formula since the population of nurses at the study location was 60.

A proportionate sample from each ward was calculated and simple random sampling done to select the study participants. Validity of the data collection tools was done by pre-testing of the questionnaires and adjustments done accordingly. To ensure study reliability, data was counter-checked during entry for completeness. Qualitative and quantitative data were collected by use of self-administered semi-structured questionnaires. Qualitative and quantitative data were summarized to identify patterns and interpret meanings.

The data was sorted into a framework, coded and data entry done using the software program Nvivo to search for keywords or strings, classify, sort and arrange data. Descriptive analysis of the range of responses in categories was done and recurrent themes identified.

Quantitative data was converted to numerical form and subjected to statistical analysis using the SPSS software version 22. Bivariate analysis was done to determine relationships between variables ($P \leq 0.05$). Research ethical approval was obtained from the County Referral Hospital's Ethical Review Committee and the National Commission for Science Technology and Innovation (NACOSTI). Permission for data collection was sought from the Nursing officer in-charge of the hospital and wards. Informed consent was obtained from the study participants.

Findings

Most of the nurses who participated in the study, 61.5% (32), were from the surgical wards while 38.5% (20) were from the medical wards with majority 69.2% (36), of the nurses being female while 30.8% (16) male.

Health System Factors that Affect IV Fluid Administration

The researcher tested the level of knowledge of the respondents on the administration of IV fluids. On average, the respondents' overall level of knowledge on IV fluid administration was found to be moderately adequate (57.4%). However, the respondents with 11-20 years' experience had moderately adequate knowledge at 52.4%. The highest was among graduate nurses who had less than five years of post-qualification experience (79.7%).

Table 1 shows that 96.2% (50) of the respondents cited shortage of nursing staff as a major challenge and 32.7% (17) encountered the shortage of supplies of IV fluids, IV cannulae and IV infusion sets in their wards while 25% (13) cited lack of time as a challenge in filling the patients' fluid balance charts. . None of the respondents (0%) had a challenge of inadequate fluid charts in their wards. The study further carried a statistical test using Chi-Square (χ^2) to establish the relationship between the challenges the nurses encountered in the administration of IV fluids and completion of fluid balance charts in their respective wards.

The findings revealed a Chi-Square Value (χ^2) of 44.31 and p value 0.0001 on nursing staff shortage challenges, lack of time had a Chi-Square Value (χ^2) of 13.00 and p value 0.0001 and shortage of supplies of (IV fluid, IV cannulae, IV infusion sets) with a Chi-Square Value (χ^2) of 6.23 and p value 0.013. These findings imply that there was a statistically significant association between shortage of nurses, lack of time, and shortage of supplies and administration of IV fluids/completion of fluid balance charts.

Table 1: Respondents' challenges in IV Fluid Administration

<i>Challenges encountered</i>	<i>Frequency</i>	<i>Percentage</i>	<i>Chi-Square (χ^2)</i>	<i>P-value</i>
<i>Nursing staff shortage</i>	50	96.2	44.31	0.0001
<i>Lack of time</i>	13	25.0	13.00	0.0002
<i>Shortage of supplies (IV fluid, IV cannulae, IV infusion sets)</i>	17	32.7	6.23	0.013

Qualitative analysis of the respondents' opinions on the recommendations towards improvement of IV fluid administration to patients in their wards was done. Following of the above challenges, the respondents recommended that the County Government should employ more nurses to enhance service delivery. In addition, the respondents suggested that the supply of IV fluids at the hospital be increased and introduction of infusion control devices. The common narratives were, "Employ more nurses" and

"supply enough IV fluids". Moreover, the respondents also recommended further training on IV fluids and IV fluid administration to improve the nurses' knowledge on the different IV fluids composition and the complications associated with IV fluid therapy.

As shown on Table 2 above, the Pearson Chi-Square value was 23.512 and *P*-value of 0.001. This revealed that, there was statistically significant association between the challenges encountered by nurses and their practice of IV fluid administration.

Table 1: Chi-Square Test Results for Relationship between challenges and IV fluid administration

	<i>Value</i>	<i>Df</i>	<i>Asymp. Sig. (2-sided)</i>
<i>Pearson Chi-Square</i>	23.512 ^a	8	0.001
<i>Likelihood Ratio</i>	27.012	8	0.001

Discussion

The major factor that affected the administration of IV fluids by nurses was shortage of nurses at the medical and surgical wards. The nurse-patient ratio was found to be 1:18 per shift, on average, accompanied by student nurses. According to the American

Nurses Association (2010a), the minimum mandatory nurse-patient ratio in the medical-surgical units is 1:6. These findings concur with those of several studies conducted on hospitalized patients on IV fluid therapy which indicated that the IV fluid administration and monitoring practices were

suboptimal (Walsh et al, 2008; Ferenczi et al., 2007). This was attributed to several challenges, predominantly, under-staffing of nurses leading to excessive workload and inadequate pharmaceutical and non-pharmaceutical supplies at the wards. Intravenous fluid administration was by gravitational flow infusion sets. There were no infusion pumps and flow regulators. The respondents in this study also cited lack of time to monitor the IV fluids infusion rate, completion and discontinuation and for documentation on the patients' fluid balance charts. These findings concur with those from a study by Reid (2014), which evaluated the completion of the patients' fluid balance charts by nurses in different surgical and medical wards.

The findings on the overall average level of knowledge on IV fluid administration by the nurses at the adult medical and surgical wards were consistent with those of a recent study conducted by Ayse (2014) at Afyon Hospitals in Turkey which established that the nurses' level of knowledge on IV fluid therapy was satisfactory (67.7%). Amongst those nurses, 88.8% had not received in-service training regarding IV fluid administration which is in line with findings from this study where 81% had not undertaken any specialized training on IV fluids. Further, findings from this study indicated that the nurses' level of knowledge on IV fluid administration decreased with an increase in the post-qualification duration ($p=0.001$). Similar results were realized in a study by Johanna et al., (2011). These findings indicated that nurses forget the information they acquire during nursing training as time progresses.

Conclusion

The study findings showed that there are various health system factors that affect administration of intravenous fluids to patients; with the most significant one being

shortage of nurses at the wards. Other health system factors that affect the administration of IV fluids to patients by nurses include: level of knowledge on IV fluid administration, availability of IV fluids, cannulae, infusion giving sets and medical devices such as flow regulators and patient monitors.

Recommendations

The health system factors play a key role in ensuring proper clinical decision making and IV fluid administration practices in order to improve patient outcomes. The hospital administration in conjunction with the County Government should put in place measures to adequate staffing, medical supplies and in-service training of nurses on the various aspects of IV fluid therapy.

Relevance to Nursing and Midwifery

Knowledge and understanding of health system factors that affect Intravenous fluid administration to patients is crucial to nurses for:

- ✚ Planning based on needs identification, for example, the continuous nursing education
- ✚ Resource allocation (human personnel and supplies)
- ✚ Patient safety through proper services based on knowledge, monitoring and practices
- ✚ Formulation of unit-based policies, guidelines and procedures
- ✚ Mitigation of medicolegal issues in healthcare and nursing
- ✚ Further research and evidence-based practice in nursing care of patients

References

- Alexander, M., & Corrigan, A. (2010). *Infusion Nursing: An Evidence- Based Approach*. 3rd Ed. Elsevier publications. United States.

- American Nurses Association (ANA). (2010a). *Safe staffing saves lives*. Retrieved from [http://www.safestaffing.org/What is ANA Doing/FederalLegislation.aspx](http://www.safestaffing.org/What%20is%20ANA%20Doing/FederalLegislation.aspx)
- Ayse, K.V. (2014). Evaluation of Knowledge on Intravenous fluid therapy of Nurses. *European Journal of Research on Education*, 14, 135-138.
- Baid, P. (2012). Fluid assessment and associated treatment: *Care of the Acutely Ill Adult*. (pp.205-240). 2nd Ed. Oxford: Oxford University Press.
- Chankova, S., Muchiri, S. & Kombe, G. Health workforce attrition in the public sector in Kenya: a look at the reasons. *Hum Resour Health*. 2009; 7:58.
- Fraser, N., Snyman, J. R., Wessels, F., & Nel, G. (2007). Intravenous fluid therapy: a randomized controlled trial to investigate the effectiveness of the IV (2) flow medical device. *J Clin Nurs* 2007 Sep; 16(9):1593-601.
- Ferenczi, E., Datta, S., & Chopada, A. 2007. Intravenous Fluid Administration in Elderly Patients at A London Hospital: A Two-Part Audit Encompassing Ward-Based Fluid Monitoring And Prescribing Practice By Doctors. *Int. J. Surg*; 5:408-412.
- Green, B., & Han, Y. (2008). Factors Predictive of Intravenous Fluid Administration Errors in Australian Surgical care wards. *The International Journal of Healthcare Improvement*, 14, 179-184.
- Johanna, W., Marilyn, R., & Dave, P. (2011). Errors in the administration of intravenous fluids in hospital and the role of correct procedures and nurse experience. *BMJ QualSaf*, 20, 1027-1034.
- Lisa, D., & Julie, L. (2008): *Intravenous Therapy in Nursing Practice*. 2nd Ed. Oxford, UK: Blackwell publishers.
- Masaki, V., & Thabo, M. (2015). Improvement of Fluid Balance Monitoring through Education and Rationalisation. *BMJ QualImprov Report*. 2015;4: doi:10.1136/bmjquality.u209885.w4087
- Mugenda, O.M., & Mugenda, A.G. (1999). *Research Methods: Quantitative and Qualitative Approaches*. Nairobi: Act Press
- National Institute for Health and Care Excellence (NICE) (2007). *Intravenous fluid Therapy in Adults in Hospitals*. Clinical guideline [CG174]. May 2017.
- Reid, J. (2014). Improving the monitoring and assessment of fluid balance. *Nursing times*: 100(20): 36-39.
- Royal College of Physicians. (2013). *Intravenous Fluid Therapy in Adults in Hospital: Intravenous Fluid Therapy. NICE Clinical Guidelines*, No. 174. National Clinical Guideline Centre (UK).
- Walsh, S.R., Cook, E.J., & Farooq, N. (2008). Perioperative fluid management: prospective audit. *Int. J. Clin. Pract.*, 62, 492-497.