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INTRAVENOUS MEDICATION PREPARATION AND ADMINISTRATION ERRORS AT MEDICAL WARD OF AMBO UNIVERSITY REFERRAL HOSPITAL WEST SHOA, OROMIA, ETHIOPIA

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ABSTRACT

Background: IV therapy is consisted of a set of processes that should be strictly observed before administration to the patients. Accordingly, errors incurred during any of these processes complicate the overall patient management and can even result in complications including death.

Objective: This study intended to identify the prevalence of IV medications preparation and administration errors in the medical ward of Ambo University Referral Hospital.

Setting: The study was conducted in Ambo University Referral Hospital, Ambo town, West Shoa zone, Oromia regional state which is located at 126 km to the west of Addis Ababa. It has more than 250 beds with different department and wards.

Main outcome measure: The main outcome measures in this study were the occurrence of IV medication preparation and administration related errors.

Methods: observational study design was conducted in May 2018 in Ambo University Referral Hospital. The data was collected by "Chart Review method". This study included all the hospitalized patients' treated by IV medication taken in medical ward during the study. The collected data was analyzed with SPSS software.

Results: A total of 72 patients were studied, 58(80.6%) patients were exposed to administration error and this type of error was the most frequently encountered error followed by preparation error which occurred among 20(27.8%) patients and the smallest number of patients 4(5.6%) were exposed to pre-preparation error. Wrong administration time was the dominant cause of IV ME. High Prevalence of IV medication errors have seen during administration.

Conclusion: The current study identified a high prevalence of different categories of IV medication errors during the study period. Administration errors covered the majority of the errors. In administration errors, wrong administration time were mostly the dominant errors and pre-preparation error was the least committed error.

KEY WORDS : Intravenous medication preparation; administration errors; medical ward; Ambo.

Introduction

Injection of medications into veinous blood circulation avoids the lag of time for absorption and effects rapid onset of action. Thus, IV therapy is consisted of a set of processes that should be strictly observed before administration to the patients. To this effect, errors that are experienced at any of these processes before and during preparation or administration results in severe adverse drug events such as thrombus formation, severe hypersensitivity reactions and infection, that are associated with high morbidity and even death [1]. Therefore, close monitoring for such IV medication related errors is very crucial to prevent or minimize the rate of occurrence of these adverse outcomes [2].

According to the findings from various researches, over 80% of all patients admitted in to hospital wards were administered at least one IV medication throughout their hospital stay. Moreover, it was concluded by s many studies that nearly half of the patients experienced errors during the IV medication processing or injection [2]. The factors that were associated with the occurrence of the IV medication errors included: inappropriate use or use of faulty equipments and supplies, gap of communication and collaboration between health professionals; lack of training, lack of adequate experience and absence of the required of knowledge and skills; and flawed hospital settings [3].

In the United States (US), 60% of life threatening medication errors among hospitalized patients were attributed to IV medications.[4]. In United Kingdom (UK), IV medication errors contributed to 56% of all medications errors. [5]. Among children and adolescents below 18 years of age, over half (54%) of all potential adverse drug events involved the use of IV medications [6]. Studies also found that even in hospital settings that used less IV medications than oral drugs, a disproportionately high rate of medication errors and complications were attributed to the former [7].

In general, medication errors are the 8th leading cause of death in the US accounting for more than 7,000 deaths every year [8]. A more recent research conducted in 2016 uncovered that medication error is the third leading causes of death in the United States. Accordingly, the study extrapolated that over 250, 0000 deaths per year was linked to medication error accounting for 9.5% of all deaths annually [9].

Medication errors are any preventable but unwanted incidents that could lead to unsafe use of drugs or even adverse patient outcomes. IV medication errors could be any mistake that occurs during the preparation, dispensing and administration and classified accordingly as: pre-preparation, preparation, labeling and administration [10].

There are many causes that lead to IV medication errors. These are poor aseptic method, wrong medication choosing, inappropriate solvent for dilution of reconstitute medication, wrong dose or infusion volume, improper mixing of medication, inappropriate

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syringed out medication, wrong administration time and rate, wrong medication and dose administration, missed dose and others. Medication errors are more likely recorded during the morning hours. Administration error was found to be the most type of error in intravenous administered medications. The Potentially serious IV ME that can cause permanent harms to the patient, may increase hospitalization, need for additional treatment and clinically significant errors increase of additional need for monitoring. Clinically non-significant errors do not harm the patient [10, 11].

Methodology

Study Area and study period

The study was conducted in Ambo University Referral Hospital, Ambo town, West Shoa zone, Oromia regional state which 126 km to the west of Addis Ababa. It has more than 250 beds with different department and wards like medical ward, pediatric ward, gynecology and obstetrics ward, surgical ward, outpatient department (OPD). It also delivers variety of health services and clinics including the child health (MCH), dental clinic, emergency services, eye clinic, laboratory service, physiotherapy, radiology, pharmacy service, and follow up of chronic disease. The study period was from May14-26/ 2018G.C.

Study design

This was observational study conducted in Ambo University Referral Hospital. The direct observation of the preparation and administration of IV drugs was also made by a single observer.
Populations

Source population

All patients who attended medical ward of Ambo University Referral Hospital.

Study population

The study population included all patients from medical ward who took any IV medication which were reconstituted and give to the patient by the staff nurses during the study period who fulfilled inclusion criteria.

Inclusion and Exclusion criteria

Inclusion criteria

All patients admitted at medical wards with at least one IV medication.

Exclusion criteria

Patients with information not completed
Involuntary patients

Sampling technique

Convenience sampling method was used.

Data collection method

Data collection procedure

The data was collected by Chart Review, which is well suited to identify the prescribed and administered drugs for the individual patients. This form mainly contains details like patients demographics, reasons for hospitalization, drugs and solutes and method of drug administration. A data collection form was prepared based on the written IV therapy procedures to capture all actions taken from the time of IV drug preparation to the time it was given to the patients. The medication leaflets were used as the reference in terms of IV drug preparation, method of administration, stability of prepared solution, compatibility and special notes for each particular medication. The observation was conducted every day during administration times. All patient was Informed about the study objective but not the staff nurses. But, all staff nurses and sisters were informed that the study aimed to know IV medication preparation and administration.

Study Variables

Independent variables:

Socio demographic characteristics

Age,
Sex
Educational status
Residence
Ethnic group
Religion
Occupation
Disease type,

Dependent variables:

IV medication preparation errors
Administration error

Data quality control

The chart review or data extraction was undergone carefully. Before starting the data collection, data collecting format was cross matched with available information on records; then the study questions was rearranged as necessary. Incomplete chart was discarded. The collection of data was conducted by qualified health professionals after trained by principal by principal investigator.

Data analysis

All the necessary data was collected using the data extraction format. It was developed after reviewing relevant literatures, such as a Clinical, standard treatment guidelines for hospitals of Ethiopia and essential drug lists for Ethiopia. It consisted of five sections. The collected quantitative data was first checked for its completeness, accuracy, consistency if there were any missed instructions during the executing of entry. After coding the data entered, and analyzed by Statistical package for social science SPSS Version 20.0. Frequencies, proportions and summary statistics were used to describe the study population into relevant variables.

Ethics approval

After delivering of the letter of support approved by Ambo University, college of health science, department of pharmacy, the full explanation about the aim of the study was made to officials of the hospital and approval was obtained. Then the objectives and the potential of the study were clarified to the participants and formal written consent was signed by each participant before data collection was conducted. It was made clear to the participants that they have right to refuse or withdrawn from the participation at any time and their decision will not affect the quality of care they receive.

Results

Socio-demographic characteristics of the patients

Among the total of 72 patients who were included in the study, 43(59.7%) females and 29(40.3%) males. The age groups 25-34 and 55+ were the most frequently encountered each being 21(29.2%). Over half (51.4%) of the patients lived in rural area (table1).

Table 1: Socio-demographic distribution of IV medication error in MW of AURH

Variables	Characters	Frequency	Percentage
Age	15-24	4	5.6
	25-34	21	29.2
	35-44	6	8.3
	45-54	20	27.8
	55+	21	29.2
Sex	Female	43	59.7
	Male	29	40.3
Educational status	Illiterate	17	23.6
	Primary school	21	29.2

	Secondary school	19	26.4
	College or university	15	20.8
Residence	Rural	37	51.4
	Urban	35	48.6

Intravenous Medication Preparation and Administration Errors in medical ward of AURH May 2018

Among a total of 72 patients studied, 65(90.3%)IV medication errors were committed. Among the total of 72 patients studied, 58(80.6%) patients were exposed to adminstration error and 20(27.8%) were exposed to preparation errors. Eleven patients were received vancomycin improperly re-diluted with NS. As a product leaflet it supposed to be re-diluted by 5mg/ml solvent. Other 14 patients also administered medications which were prepared with insufficient solvent for the dilution of vancomycin and ceftriaxone (vancomycin 11 patients) and (ceftriaxone 3 patients) respectively. Wrong dose or infusion volume was occurred in 6 patients. This was due to accidentally over pressing during removal of air and leak out from loosen cannula during administration. The drugs were ceftriaxone, furosemide and vancomycin, for patients (n=2), (n=1), and (n=3) respectively [Table2].

Table 2: Prevalence of different types of IV medication preparation and administration errors in medical ward of AURH May14-26/ 2018

Types of IV medication errors	Frequency	Percent (%)
Administration error	58	80.6
Preparation error	20	27.8
Labeling error	15	20.8
Pre-preparation error	4	5.6

Subtypes of intravenous medication preparation and administration errors

Out of 58 patients who were exposed to administration errors, 50(69.4%) patients were exposed to Wrong administration time. Use of wrong solvent for dilution was the first and the second most cause of IV medication error. The area for three patients (n=3, 4.2%) was not cleaned thoroughly and when the staff nurse had inserted IV cannula for a patient, the glove was contaminated with blood and he used on the other two patients for preparation. There was a prevalence of (n=1, 1.4%) whereby a wrong drug was chosen to be given. The patient was given furosemide 40mg IV instead of cimetidine 200mg IV (Table3).

Table 3: Subtypes of IV medication preparation and administration errors in medical ward ofAURHMay14-26/ 2018

Types of errors	Subtypes of errors	Frequency	Percent
Labeling errors	Labeling of iv infusion bag	57	79.2
Administration errors	Wrong administration time	50	69.4
	Wrong administration rate	9	12.5
	Missed doses	9	12.5
	Wrong dose administration	6	8.3
	Medication leak out through the loose cannula	5	6.9
	Administration through wrong route	4	5.6
	Double dose administration	3	4.2
	Wrong drug administration	1	1.4
Pre-preparation	Poor aseptic method is used	3	4.2
	Wrong medication is chosen	1	1.4
Preparation errors	Wrong diluents/solvent is used	15	20.8
	Insufficient solvent for dilution	14	19.4
	Wrong dose or infusion volume	6	8.3
	Use insufficient solvent for re-dilution	6	8.3
	Excess amount of solvent for re-dilution	5	6.9
	Improper mixing of medication	4	5.6
	Medication leaks through the needle	3	4.2

Discussion

According to this study out of 72 patients studied, 65(90.3%) IV medication errors were encountered and 58(80.6%) of the errors were administration error whereas 20(27.8%) experienced to preparation errors. It was slightly lower as compared to a study conducted in Selayang Hospital, Malaysia where 341 (97.7%) errors were identified during a total 349 IV drug preparations and administrations[12]. This difference might be due to the data collection which didn't include the error during night time in the current study.

The area for three patients (n=3, 4.2%) was not cleaned thoroughly and IV sets were placed on the uncleaned bed during IV infusion preparation. When IV cannula has inserted for a patient, the glove was contaminated with blood and used for other two patients for preparation. Always being suspicious for risk of infection is recommended though the IV drugs are generally being prepared for immediate use. To this effect, a recent study in a German hospital found many contaminated multiple dose vials in ward areas, and poor handling and storage of these types of medicine[13].

There was a prevalence (n=1, 1.4%) whereby a wrong drug was given to a patient from the nearby patient. The patient was given furosemide 40mg IV instead of cimetidine 200mg IV. The observer had checked the prescription to confirm the medication. It was found that the IV furosemide ampoule was confused with IV cimetidine vial. On the study conducted at Selayang Hospital, Malaysia, there was one wrong drug attempted which is comparable with our finding [12].

During IV medication preparation for twenty patients, at least there was one cause of preparation error. Wrong diluent was used for vancomycin and ceftriaxone in 15 patients during the observation of IV medication preparation. Eleven patients received improperly re-diluted IV medications and other 14 patients were administered with medications prepared with insufficient solvent. For six patients, sub-therapeutic dose of drug was given due to accidentally over pressed syringe while pushing in the air and thus a fraction of the drug solution spilled out; or the patency of the IV peripheral lines was not checked, thus some of the drug leaked out from the loosen cannula during administration. It was comparable with a study conducted Selayang Hospital, Malaysia, where 341 (97.7%) preparation errors identified during observation of total 349 participants [12].

Fourteen patients (19.4%) were administered IV medications which were diluted with insufficient amount of solvent and 5 patients were administered with not properly mixed medication after the diluents

were added for the reconstitution. It was comparable with a research evaluating medication errors in French, greater than with a study in UK and less than from that of German hospitals, the incorrect diluents was utilized in 18%, 1% and 49% of medications used intravenously in each of these hospitals respectively.

Fifteen patients (20 .8%) received unlabeled IV infusion. This is slightly lower than the study done in UK and German which is 43% and 99% respectively. This difference might be due to immediate administration of the drug after they had been prepared. It was comparable with the study done in French which is 20%[13].

Fifty eight patients (80.6%) experienced administration error which was higher as compared to the findings in Shahid-Sadoughi hospital in Yazd; 843 IV doses, administration (9.23%) [14].This difference might be due to the difference in the study area as critical care ward with possibly more errors was not included in current study.

Another 50 patients (69.4%) encountered wrong administration time. It was the most common error, which mostly happened at 6.00am planned time and waking up late from sleep was the main reason for the error. Three (4.2%) patients had taken double dose because the nurses wrote the scheduled time only instead of the administration time on the medication record chart. The above events were slightly higher as compared to a study conducted in Beijing, China that identified most frequent errors by category were wrong dose (5.4%); wrong drug (0.7%) and double dose (0.3%)[15]. Wrong administration rate was identified among 9 patients (12.5%) which is lower as compared a study conducted in Australia, 79% of errors were incorrect administration rate[16]. On the other hand, 9 patients (12.5%) missed administration of at least one dose. This is small as compared with study conducted at ARH, in Mekelle city, Tigray ,Ethiopia,where 134 patients missed dose (n=162, 95.8%) being reported as the most common error [17].

Conclusion

A high rate of IV medication errors at different stages of observation was found in this study. Four types of errors were identified including administration, preparation, labeling and pre-preparation errors. Administration errors were the most frequently identified types of IV medication errors followed by preparation errors. The most frequent cause of administration errors and preparation errors were delayed administration time and inappropriate use of solvent for the dilution of reconstitute medication respectively.

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Conflicts of Interest

No fund was received to conduct this study. We declare no conflict of interests.

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