Medical Assistants' Knowledge About Preparation and Administration of Intravenous Admixtures in the Teaching Hospitals of Alanbar Governorate

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ABSTRACT

The preparation and administration of the intravenous admixtures has been an important health issue which requires the health care providers to have good knowledge and skills. In Iraq, nurses have major roles in preparing and administering the IV medications. A survey consisting of 20 statements (10 for preparation and 10 for administration) was distributed to 205 nurses working in different wards in the teaching hospitals of Al-Anbar governorate. The maximum score of the knowledge was 20, the means of corrected answers were as follows; written as ward (n, mean ±SD), Neonate (34, 11.4± 2.0), Children (40, 12.9± 2.5), Internal (21, 10.3± 2.1), Surgical (28, 12.1± 1.8), Gynecology & obstetric (26, 12.4± 2.5), Emergency (32, 12.9± 1.9), ICU (19, 13.5± 2.1), and Oncology (15, 13.1± 2.1). The availability of training courses and the implementation of the continuous education programs will increase the skills of practice in nurses.

Key Words: *Knowledge, Preparation, Nurses, Administration, IV Admixtures.*

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INTRODUCTION

The intravenous admixtures are sterile solutions prepared by mixing one or more medications with a different intravenous solution, and are administered via intravenous administration sets directly to the patients' veins. And, most of the hospitalized patients need intravenous solution therapy [1].

The safety of the medications and the quality of patient care have been global issues [2]. Patient safety has been still being a neglected area especially in low or middle-income countries with unconcern about the medication errors, and some factors such as lack of policies and weak training of the medical staff may contribute to the low patient safety [3]. Several health care systems, education programs, clinical pharmacist interventions have been implemented to increase the quality of patients' care and minimize the medication errors[4].

A high number of the medication errors have been undetected because of the minimal clinical significance, but the error will be highlighted when the morbidity or mortality of the patients, and the costs of the therapy are increased [5].

Intravenous admixture therapy has been a complex process requiring the proper preparation before the administration. It has been highly associated with the medication errors which may occur at any step of the preparation and administration. Some studies elucidated that the intravenous administration errors have been related to the inadequate knowledge of the correct procedures, the different levels of the nurses' experience and their failure to follow the guidelines and protocols [6, 7].

Most of the people in some of the countries in the Middle East have low –middle income, and Iraq has been one of these countries[8]. The listed number of the studies on the medication errors in the Middle East has been documented, but there has been no available data on the medication errors in Iraq [9]. Currently, in Iraq and in the governorate of Al-Anbar, nurses have been playing a major role in the preparation and administration of the intravenous

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admixtures with little or no intervention from the clinical pharmacists.

The aim of this study was (i) to evaluate the knowledge of nurses on the preparation and administration of the intravenous admixtures and (ii) to outline the areas that are required to be evolved.

MATERIALS AND METHODS

This descriptive study was conducted in the teaching hospitals of Al-Anbar governorate from January 2018 to May 2018. The ethical approval was obtained from the University of Anbar, the college of pharmacy and from the general directorate of the health of Anbar. The nurses in different wards received a questionnaire containing 20 statements about IV admixtures (10 statements for evaluating the knowledge about the preparation and 10 statements for the assessment of the administration skills). The statements' assessment was qualitative and quantitative. Each statement could be signed with either True or False or Don't know. The total score for the questionnaire was 20. A total number of the nurses endorsed in the study was 215 working from 8 Am to 3 Pm. The distribution of the nurses was in the neonate, pediatric, internal, surgical, emergency, gynecology & obstetrics, intensive care unit (ICU) and oncology wards. The exclusion criteria included the nurses working at night shifts, the nurses working in the outpatient clinics and the nurses having long vacations during the study. The statistical analysis was done using One-way ANOVA, and the significant differences were defined at $P < 0.05$.

RESULTS

A total of 215 nurses working in the mentioned wards received and completed the questionnaires. Only 205 of the returned questionnaires were accepted to be included in the study. Considering the genders of the respondents, there were 161 females (78.5 %), and 44 males (21.4%).

The ages of the respondents ranged from 21-52 years, the mean age of the females was 29.5 ± 3.2 (range 21- 34 years), while the mean age of the males was 33.7 ± 4.6 (range 25 – 42 years).

The results in the table (1) demonstrated that there were no significant differences when comparing each of the variables with the score of the knowledge ($p>0.05$). This meant that the nurses with the long experience years (>20) did not have higher levels of knowledge than those with the low nursing experience.

The data in the table (2) showed the response of the nurses to each statement in the questionnaire. Regarding the statements of the preparation of IV admixtures, the variable rates of the correct and incorrect answers were obtained. The highest percentage of the correct answers (81.8%) was for the statement related to the putting labels on the IV admixtures' containers, whereas the highest percentage of the wrong answers was for the statement related to the compatibility of the medication with 0.9% NaCl. Four out of ten statements which assessed the drugs' preparation got a percentage of the correct answers more than 50% for each.

Table 1: Demographic data of the nurses participated in the study

Variables	N (%)	Knowledge* Mean ± SD
Age (Years)		
20-30	93 (43.25%)	11.4± 2.6
30-40	61 (28.37%)	12.9± 2.1
>40	51 (23.72%)	14.2± 1.6
Gender		
Male	73 (33.95%)	13.3± 2.5
Female	142 (66.04%)	11.0± 2.3
Wards		
Neonate	34 (15.81%)	11.4± 2.0
Children	40 (18.60%)	12.9± 2.5
Internal	21 (9.76%)	10.3± 2.1
Surgical	28 (13.02%)	12.1± 1.8
Gynecology &obstetric	26 (12.09%)	12.4± 2.5
Emergency	32 (14.88%)	12.9± 1.9
ICU	19 (8.33%)	12.5± 2.1
Oncology	15 (6.97%)	11.1± 2.1
Working experience years		
<5	110 (51.16%)	10.8± 3.1
5-10	46 (21.39%)	12.3± 2.6
10-20	41 (19.06%)	12.8± 2.1
>20	18 (8.37%)	13.2± 2.1

Table 2: The evaluation statements of IV admixtures preparation .

Statement	T/F	Correct answer	Wrong answer	Don't know
Mixing the medications with IV fluids should be done in a special room.	T	33.3%	51.5%	15.1%
Gloves and facial mask are necessary for the preparation.	T	48.5%	39.4%	12.1%
Hand wash with alcohol or any antiseptic solutions should be done before the preparation.	T	75.8%	18.2%	6%
The tope of antibiotic vials is clean and there is no need to use an alcohol swab.	F	45%	45%	10%
All the reconstituted antibiotics are stable for 24 hours in the refrigerator.	F	21.2%	66.7%	12.1%
It is important to put labels containing the name, dose, rate of infusion on the IV admixture container.	T	81.8%	12.2%	6%
For photosensitive drug, IV container should be covered with photo resistance foil.	T	75.7%	15.3%	9%
More than 90% of the medications are compatible with 0.9% NaCl	F	6.5%	90.1%	3.4%

If the patient has three IV medications, it is better to be mixed in the same fluid.	F	69.7%	18.2%	12.1%
When the prescription containing ceftriaxone without strength, this means 1 gm.	F	48.5%	36.4%	15.1%

Table 3: The evaluation statements of IV admixtures administration .

Statement	T/F	Correct answer	Wrong answer	Don't know
The volume of IV solution is measured by milliliter (ml) or cubic centimeter (cc)	T	75.8%	15.1%	9.1%
Measuring 100 ml of IV fluid for certain antibiotic to be mixed is done by emptying out 400 ml of one pint of fluid using the naked eye.	F	15.1%	81.9%	3%
It is better to do an allergy test before the administration of any antibiotics.	T	79.3%	17.7%	3%
100 ml of IV admixture to be infused slowly over 4 hours, using microdrip is better than normal IV set.	T	30.3%	60.6%	9.1%
Half of one pint of IV admixture was administered in the morning, the remaining part stored on the bench and it is safe to be used the next morning.	F	30.3%	54.5%	15.2%
Dexamethasone ampoule 8mg/2ml, the best way to administer 1 mg to a neonate patient is done by drawing 0.5 ml of the ampoule using an insulin syringe.	F	30.3%	57.6%	12.1%
Ceftriaxone can be administered with calcium gluconate in the same fluid but at a slow rate of the infusion.	F	66.7%	24.2%	9.1%
A Rapid rate of the infusion means the administration of IV fluid in one minute.	F	57.6%	33.3%	9.1%
Medication allergy appear after 30 minutes of IV administration	F	39.4%	51.5%	9.1%
Some medications administered with caution such as aminophylline and digoxin.	T	69.7%	12.1%	18.2%

The assessment of the administration of IV admixtures included 10 statements. Half of these statements were correctly answered by nurses in a percentage more than 50% for each. The large numbers of the nurses (79.3%) made a right choice in answering the question related to doing allergy test prior to the antibiotic administration. In addition, 81.9 % of the nurses wrongly answered the questions concerned with the measuring of the volume used for the administration.

DISCUSSION AND CONCLUSION

The results of the present study revealed an average knowledge for nurses working in different wards of the teaching hospitals in Al-Anbar Governorate. The effect of gender, age, ward of work and years of experience on the average knowledge was insignificant, these findings have been also documented in other studies[10, 11]. Most of the nurses were within the age of 20-30 years. Although the years of experience had no significant influence on the average knowledge, introducing the educating programs at the early stages of the employment might increase the skills of the practice in the next years.

Nearly, half of the nurses in this study did not recognize that the mixing of the medications with IV fluids should be done in a specialized area of the preparation, which might yield a high percentage of the contamination with microorganisms. The rate of bacteremia may be high especially for the patients at the high risk of infection in preterm and neonatal patients [12].

Forty-five percent of nurses thought that the antibiotic vials were clean and there was no need for cleaning the tops of the vials with the antiseptic prior to mixing with the diluents and this is another cause of the contamination.

The stability times of some antibiotics after reconstitution have been short. The high percentage of the nurses (66.7%) believed that the stabilities of most medications were at least one day. The conditions such as temperature, humidity, and light might affect the stability of the reconstituted medications [13]. The efficacy and safety of the medications would be low, and the guidelines for the reconstitution of drugs have been required. The stability of some antibiotics such as meropenem after the reconstitution in 5% glucose water has not been more than 4 hours [14].

The compatibility of the medications with the suitable IV fluids has been an important issue. The type of IV fluids used for the preparation mainly depends on the physicochemical properties of the medications. Most of the nurses (90.1%) considered 0.9% NaCl as the suitable Iv fluid for a high number of the medications, which might result in physical, chemical and therapeutic incompatibilities.

Table (3) in this study surprisingly showed that the respondents measured the volume of fluids for the preparation by the naked eye. The inaccurate measuring might lead to the concentrated or diluted preparations and an error in the administration.

Another statement in the table (3) focused on the rate of the drug administration, where 60.6% of the nurses in the current study did not recognize the difference between the rapid and slow rate of the infusion. Using microdrip set to control the infusion rate was better than the normal IV set, especially when the slow administration was required. The wrong rate of administration was confirmed to be the most error- associated with the IV administration [15].

Nurses should pay attention when calculating the doses for a special population such as neonate. In the present study,

more than half of nurses wrongly calculated the dose of steroid (dexamethasone) prescribed for the neonate patients.

There was no doubt, the drugs with the low therapeutic index such as theophylline and digoxin need close monitoring during the preparation and administration to get a good outcome and minimize the adverse effects. But, surprisingly 18.2% of the nurses in the present study did not realize the risks of these drugs.

In general, there have been variable averages of knowledge for the nurses working in the teaching hospitals of al-Anbar governorate regarding the preparation and the administration of IV admixtures.

The availability of training courses for the newly employed nurses and the incorporation of the continuous education programs would contribute to increasing the knowledge of the nurses and consequently getting high efficacy and safety of the medications.

The limitation of the study

The survey was distributed to the nurses working in the morning shifts, so the nurses working in the other shifts were not concluded. Furthermore, most nurses participated for the first time in a survey, so it took more time to explain how to respond the survey.

Conflict of the interest

There was no conflict of the interest.

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