

INTRAVENOUS ADMIXTURE PRACTICE IN SOME MAJOR HOSPITALS IN TRIPOLI
CITY

Mustafa S. Targhi, Tamader Y. Elghnimi*, Wadiaa A. Benamer, Wejdan Bzezi and Yousef M. Azzabi

Faculty of Pharmacy, University of Tripoli, Libya.

*Corresponding Author: Tamader Y. Elghnimi

Faculty of Pharmacy, University of Tripoli, Libya.

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ABSTRACT

Intravenous admixture studies are a vital part of developing a safe and efficacious sterile drug product intended for iv administration, special concerns are required for such drugs where the reversal of toxicity or unwanted effects following incompatibilities are problematic to deal with. The practice of adding drugs to intravenous fluids has many advantages. However, there are many disadvantages, some of which are potentially dangerous on the patient health, like the phenomenon of incompatibility between the added drugs and the intravenous fluids used as vehicles. The aim of this study was to evaluate the intravenous admixture practice in some major hospitals around Tripoli city; Tripoli Medical Center (T.M.C), Tripoli Central Hospital (T.C.H), Abuslem Trauma Hospital (A.T.H), Jalaal Children Hospital (J.C.H) emphasizing the awareness of the personnel involved with the good practice of this type of service and how far pharmacists are involved. The results revealed that, I.V admixture preparation and handling, as well as, I.V admixture practice in the surveyed hospitals were not uniform and consistent with many deficiencies and pitfalls that might compromise patient safety.

KEYWORDS: Intravenous admixture, aseptic technique, hospital pharmacist.**INTRODUCTION**

Intravenous admixture is a preparation of a pharmaceutical mixture consisting of one or more sterile drugs added to a bag or bottle of iv fluid commonly Normal saline Solution (0.9% NaCl) or Dextrose (5%) alone or in combination and is used for continuous infusion, under the direction of a physician monitored by nurse and controlled by trained pharmacist.^[1] Drugs that cause irritation or toxicity when administered as rapid direct iv injection are normally and routinely prepared as intravenous admixtures.^[2]

Medication errors are causing substantial global public health concern, as may result in harm to patients and increased costs to health-care providers.^[3] Studies have shown that the second most frequent type of medication errors was related to the medication administration.^[4]

The pharmacist has a major role in ensuring safe administration and appropriate utilization of medications to patients. One of the medication administration errors is intravenous admixture incompatibility which is simply defined as the reaction between medications when added to intravenous fluids or with the fluid themselves, resulting in solutions that are no longer optimal or safe for patients.^[5,6,7]

Investigations have shown that mixing an iv drug with the wrong diluents can occur in up to 80% of the cases.

This is alarming especially in the ICU where 25% of the iv incompatibilities are highly significant and 26% are life-threatening.^[5]

Joint Commission on Accreditation of Healthcare organization (JCAHO) requires all staff who prepare medications to use techniques to ensure accuracy e.g., double-checking calculations, and avoid contamination, including using clean or aseptic technique as appropriate; maintaining clean, uncluttered, and functionally separate areas for product preparation to minimize the possibility of contamination; using a laminar-airflow hood while preparing any I.V. admixture in the pharmacy, any sterile product made from non sterile ingredients, or any sterile product that will not be used within 24 hours; and visually inspecting the integrity of the medications.^[8]

JCAHO does not require that sterile products be prepared only in a clean room or laminar-airflow hood because there are circumstances when the nursing staff may need to prepare a dose of a sterile product for immediate use (or use within 24 hours) in the patient care area. However, products should not be prepared in a crowded area or the hallway, where cleanliness may be compromised.^[8]

Personnel must use safety materials and equipments while preparing medications that are hazardous (e.g., biological-safety cabinets for cytotoxic drugs). This

requirement is intended to protect the staff and environment from contamination.^[8]

For these reasons, most hospitals with good hospital pharmacy practice have centralized iv admixtures through intravenous service division of the pharmacy.^[9]

The evaluation of IV admixture practice in Tripoli hospitals is yet to be done, the objective of this study was to evaluate the intravenous admixture practice in some major hospitals around Tripoli city, emphasizing the awareness of the personnel involved on the good practice for this type of service and how far pharmacists are involved.

2. MATERIALS AND METHODS

This 2009 retrospective study was carried out in some Tripoli's major hospitals; Tripoli Medical Center

(T.M.C), Tripoli Central Hospital (T.C.H), Jalaal Children Hospital (J.C.H), Abuslem Trauma Hospital (A.T.H), through interviews with the health care personnel involved in intravenous admixture services to collect data on the following points:

1. Commonly used large volume solution(s) (L.V.S) as vehicles for drug admixtures.
2. Location and facility for the preparation.
3. Personnel performing the admixtures.
4. Handling and preserving the admixtures.
5. Level of knowledge on intravenous admixture compatibility problems.

3. RESULTS AND DISCUSSION

The most commonly used large volume solutions and the added drugs are summarized in the tables (1-4):

Table-1: Commonly used large volume solutions and the added drugs in T.M.C.

Large volume solutions	Added Drugs
Dextrose 5%	Carboplatin, Gentamycine, Meropenem, Amikacin, Ceftriaxone
Normal saline	Adrenaline, Cyclophosphamide, Oxaliplatin, Etoposide, Furosemide, Atropine, Dopamine, Erythromycin, Amikacin
Lactated ringer solution	Paclitaxel
sodium chloride 0.18% and glucose 4% / sodium chloride 0.45% and dextrose 5%	Cisplatin
Normal saline or dextrose 5%	Daunorubicin, vincristine

Table-2: Commonly used large volume solutions and the added drugs in T.C.H.

Large volume solutions	Added Drugs
Dextrose 5%	Tranexamic acid, Vit K, Ranitidine- Metoclopramide, Diazepam, Lidocaine
Normal saline	Ceftriaxone, Acyclovir, Omeprazole- Cimetidine, Ranitidine, Metoclopramide, Erythromycin, Na fusidate
Lactated ringer solution	Metoclopramide
Dextrose saline 0.45%	Multivitamin
Normal saline or Dextrose 5%	Omeprazole
Dextrose 5% or dextrose saline 0.45%	Vit B complex
Normal saline or Dextrose saline 0.45% or Dextrose 5%	Methylprednisolon, Vit B12, Vit K , Ranitidine, Cimetidine, Omeprazole, phenytoin, Kcl, Metoclopramide

Table 3: Commonly used large volume solutions and the added drugs in J.C.H.

Large volume solutions	Added Drugs
Dextrose 5% Normal saline	Meropenem, Kcl methyl predenisonol ,Metronidazole, Methylprednisolon

Table 4: Commonly used large volume solutions and the added drugs in A.T.H.

Large volume solutions	Added Drugs
Dextrose 5% Normal saline	Meropenem, Erythromycin, Amikacin, Hyoscine Butyl Bromide, Ceftriaxone, Na fusidate

In all hospitals, The most common IV fluids used as vehicle were normal saline 0.9%, dextrose 5% and their combinations of various concentrations, and limited use of ringers and lactated ringers solutions, the reasons for their choice were based on; habituation, abundance and safety

For the location and facility for the preparing admixtures; neither special room was set aside for the preparation, nor aseptic techniques was followed in all hospitals; all preparations were carried out in ordinary nurse rooms, with the exception of neonate department of J.C.H. which have assigned a specific ordinary room for preparation with no aseptic or clean technique.

Personnel performing the admixtures; we found that, nurses took all responsibility for iv admixture preparation without direct pharmacist supervision or review.

Handling and Preserving the admixtures; the study revealed that, all preparations were used within 24 hours on the reasons, to avoid contamination problems, unavailability of suitable storage conditions are such as refrigerators with various controllable temperatures. However, we noted that some preparations were stable for over 24 hrs even in ordinary refrigerators but were routinely discarded, this means financial loss specially for expensive drug admixtures even if the drug is stable after 24 hours to avoid contamination.

Level of knowledge on I.V admixture practice; most (if not all) personnel involved with iv admixtures (physicians & nurses) have either wrong or unacceptable or the necessary information and skills on the components of good iv admixture practice requirements (area, policies & procedures, personnel, system and, storage).

CONCLUSION

It can be concluded that normal saline and dextrose 5% are commonly used as vehicle for reconstitute the drug for admixture preparation in all hospitals despite its acidic nature (pH 3.5- 6.5) that may pose problems for some drugs such as alkaline salts of weak acidic drugs such as Na-phenytoin. laminar air flow cabinets and the implementation of aseptic techniques are not available in all hospitals, moreover, personnel involved in the admixture preparation (nursing staff) have very little or information neither on the practice of iv admixture compatibility, nor on aseptic operation or technique required for such practice, in addition, no role what so ever for pharmacists in intravenous admixture practice, also, there were no proper preserving and storage facilities and conditions for the prepared admixtures, finally no consultation to iv incompatibilities charts or references to evaluate the admixtures for compatibilities, this might definitely put patients safety at great risk.

RECOMMENDATION: As an outcome of this study we recommend the following set of measures;

1. The pharmacy departments should play an active part in patient care by making their services and expertise available to other departments.
2. The pharmacists should communicate and cooperate effectively with the other members of the health care teams.
3. Proper areas and aseptic techniques for intravenous admixture preparation and the refrigerators must be available and professionally operated to ensure safety and efficacy of intravenous therapy.
4. The pharmacists and nurses should keep updated reference files and charts of iv admixture dilution and compatibilities for choosing proper fluid and conditions for each added drug.^[10,11,12]

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REFERENCES

1. Mohammad Albaz I.V. ADMIXTURE. <https://prezi.com/rjzrxzawm-k/iv-admixture/>. Retrieved, 2020.
2. John F. Sterile Products. In: Shargel L, Souney PK, Mutnick AH, Swanson LN. Comprehensive Pharmacy Review. 7th ed. New Delhi: Wolters Kluwer Pvt Ltd, 2010; 566-85.
3. Wheeler S J, Wheeler D W; Medication errors in anesthesia and critical care. *Anaesthesia*, 2005; 60: 257- 273.
4. Tissot E, Cornette C, Limat S et al. Observational study of potential risk factors of medication administration errors. *Pharm World Sci*, 2003; 25(6): 264-268
5. Nemecek K, Kopelent-Frank H, Greif R; Standardization of infusion solutions to reduce the risk of incompatibility. *Am J Health-Syst Pharm*, 2008; 65: 1648-54.
6. Small GA, Marshall I. Intravenous additives. In: Lawson DH, Richards RME. *Clinical Pharmacy and Hospital Drug Management*. 1st edition. Britain: The University Press, Cambridge, 1982; 239-60.
7. Secoli SR, Perez Esquirol E, de Las Heras-Matellan MJ, Vendrell- Bosh L, Ballarin- Alins E. Incompatibilities in intravenous therapy: what can be done to prevent them? *Enferm Clin*, 2009; 19: 349-53.
8. Joint Commission on Accreditation of Healthcare Organizations: *Critical Access Hospital, 2006. Medication Management*. www.jcaho.org.
9. William E. Hassan .V. *Hospital pharmacy*, 4th edition, Leas Febiger, 1981.
10. Phillips, Lynn, *Manual of IV therapeutics*. 4th edition. Philadelphia: Saunders, 2005.
11. Peter Murney, et al. To mix or not to mix- compatibilities of parenteral drug solutions: *Aust. Prescr*, 2008; 31(4): 91-101.
12. Cayo L. *Compatibility of Commonly Used Intravenous Drugs*. *Pharmacy Practice News*, 2009: 1-6.