

An Insight to Intravenous Drug Incompatibilities For Better Patient Care

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Abstract – This article aims to improve the knowledge of incompatibilities and compatibilities among intravenous drugs to improve the quality of life, reduce drug interactions, complications, minimizing therapeutic error due to incompatibility among intravenous drugs. Providing an insight to health-care professionals regarding appropriate usage of intravenous drugs concomitantly, creating awareness and justifying the role of clinical pharmacist. Since, critical care settings are more prone to complications due to incompatibilities among intravenous therapy, this approach may prove to be helpful for understanding the need to minimize undesirable effects and promote patient safety.

Keywords – Incompatibility, intravenous, clinical pharmacist, undesirable effects.

INTRODUCTION

The simultaneous dilution/administration of more than two intravenous drugs may affect the therapeutic efficacy of the drug and patient safety. This is said to be IV drug incompatibility^[1]. Intravenous drug incompatibility may result in toxic effects that can further affect the efficacy of the involved drugs. The ICU patients in our hospital are given with at least two different IV drugs^[2]. When two drugs are given together, they may interact, leading to hazardous effects in patients under treatment. This occurs physically, chemically or therapeutically. This can be seen visually observed by any kind of colour change, turbidity or precipitation. Precipitate formation has become common with multi-drug IV therapy. Newton described physical incompatibility as two: visible (precipitation, color change, turbidity) and sub-visible (pH change, decrease in drug concentration^[3]). IV drug incompatibility is a concern even in critically ill children. For example, in a study conducted in critically ill pediatric population, out of 62% concurrent IV administrations, 9% were compatible, 8% incompatible, 8% needed pharmacist consultation, and 21% had unknown compatibility. The increased percentage of unknown compatibility data of certain drugs adds complexity to the routine bedside management and identifies information gaps for future research^[4]. To detect incompatibilities with ease, various tools and devices are made available such as Trissel's handbook, King guide to parenteral nutrition, French Stabilis database etc^[5]. A study conducted by *Lulu Dai et al.*, showed the relevance of 2D-LC/MS methods to investigate the presence of impurities that were formed of using incompatible PVC infusion tubing and PEG vehicle, which further caused hindrance in the micro-dose drug delivery^[6]. The knowledge of incompatibilities among intravenous drugs are limited, as many of them are not visible. Complications like systemic inflammatory response syndrome and various other life-threatening events. Incompatibilities are common even in pediatric ICU^[7]. So, a clinical pharmacist has to involve in finding out data regarding this, preparing protocols and following them appropriately to avoid patient related health issues. In various Indian hospital setting, many deaths occur due to IV incompatibility and reports regarding it are sometimes incomplete or insufficient. To control such deaths, we need to present the complete data regarding this issue. This would create an awareness and promote rationale drug therapy by identifying the appropriate IV drug to be administered concomitantly. This would reduce the potential harm to critically ill patients. This kind of studies, identify and understand the strengths and weaknesses of the literature in this field, which makes it an essential one^[3].

Y-SITE COMPATIBILITY OF LEVETIRACETAM WITH OTHER IV MEDICATIONS

Levetiracetam (antiepileptic) has low side effects and positive therapeutic outcome in critically ill patients, which makes it very beneficial in ICU settings. But the co administration of levetiracetam with other IV drugs have been a challenging one^[8].

TOTAL PARENTERAL NUTRITION

TPN admixtures have various physicochemical interactions. Therefore, when an IV medication is given along with TPN, there is an increased risk of occurrence of incompatibilities. Chemical degradations can interfere with the effectiveness of TPN. This may fatally affect the patients with critical illness. The results of the studies based on the consequences of incompatibilities must be documented appropriately. The need for standardized methods for compatibility check must be evolved^[9].

COMMON CLASSES OF DRUGS USED IN ICU SETTING:

Proton pump inhibitor
Antipyretic
Analgesics
NSAID
Ant platelets
H2 receptor antagonist

Cephalosporin antibiotics
 Anti-diabetics
 IV fluids
 Anti-emetics.

ROLE OF CLINICAL PHARMACIST

Proper information about the IV administration can be a great help in improving patient care. Closely monitoring the use of IV drugs together can set a standard in identifying and preventing such problems. Therapeutic incompatibility can be best identified by alteration in respiratory rates, toxic shock, thrombophlebitis, multiple organ failure, sepsis etc., and physical incompatibilities by precipitate formation, color change etc. in the catheters and IV fluid bags used in critically ill patients. This result in reduced drug effectiveness that further interferes with the patient's well-being. As clinical pharmacists, it's our role to monitor such alterations in vital signs like blood pressure, respiratory rate, pulse rate, temperature and promote the appropriate use of IV drugs concomitantly. We can enlighten the knowledge of health-care professionals about the complications of IV drug incompatibilities. Some of the examples of such complications are:

- Systemic inflammatory response syndrome
- Organ failure
- Bacteremia
- Sepsis
- Phlebitis
- Length of stay^[8].

There is a need to keep the knowledge updated among health care professionals by recommending teaching sessions based on drug related problems and IV administration. Physicians have a good amount of knowledge regarding drug combinations that are incompatible. But this knowledge, has to be improved and updated. The involvement of clinical pharmacists in this field can be of immense help to other health care professionals in safeguarding the patients health^[7].

PREVENTION OF INTRAVENOUS DRUG INCOMPATIBILITY

Preferably, triple-lumen catheters can be used to prevent incompatibilities among IV medications. This system is of immense help in critically ill patients. The length and size of the catheter must also be considered. The shorter the length and size of the catheter, the more complex will be the drug delivery. According to an article by *Gerardo Reyes et al*, triple-lumen catheters proved to prevent precipitation due to the concomitant administration of two incompatible drugs: phenytoin and TPN^[1]. A compatibility chart, thoroughly revised by clinical pharmacists is necessary in every ICU setting, that may be helpful as an alert for clinicians while prescribing the IV drugs. This is an effective method of preventing IV incompatibilities. Flushing the IV line with compatible fluid can also prevent incompatibilities.^[10] Locking solutions such as 0.9% sodium chloride, thrombolytic agents etc., prevents occlusion of the IV line due to the precipitates formed by incompatible drug combinations and also clean the catheters^[11].

CONCLUSION

The risk of developing incompatibilities is higher in intensive care units due to co-administration of multiple IV drugs in a particular patient. To prevent this, they must be delivered cautiously. Therefore, it is the responsibility of clinical pharmacists to assure the minimum occurrence of IV drug incompatibilities and promote patient safety.

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