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IMPLEMENTATION OF IV INFUSION AND ADMIXTURE GUIDELINES BY A CLINICAL PHARMACIST TO REDUCE MEDICATION ADMINISTRATION ERRORS IN A TERTIARY CARE HOSPITAL

Background

Pharm. D students while on internship in a tertiary care hospital in India noticed that hospital currently has no IV-administration protocols. For example, when Doctor wrote an Amphotericin B 50mg IV once daily – there were no accompanying instructions on the nature of diluent to be used, how much of it should be used and what should be the rate of infusion. The nurses receiving the above order are not aware of any protocols for IV administration. Interns learnt that nurses diluted all drugs in NS and infused over 30 to 60 minutes.

Student pharmacists identified this as potential area for intervention that can lead to better therapeutic outcomes for the patients. The interns made a list of all the IV antibiotic commonly prescribed in that hospital and developed protocols for choosing appropriate dilution fluid, ratio of dilution and rate of infusion. These protocols were displayed in the

nursing station and wards and nurses, duty doctors were educated regarding the same.

Need of IV infusion protocol

Antibiotics are common in modern medical practice. Unlike most other drugs, antibiotics should be used in a precise manner to maintain the right pharmacokinetic and pharmacodynamic profile for better clinical outcomes¹. To achieve this FDA has given complete guidelines on the usage of antibiotics - which includes their doses as per indications, route of administration, compatible diluents, duration(rate) of administration, ADR, contraindications, use in special populations and many more. Among all parameters, most healthcare professionals pay least attention to diluents and duration of administration while administering drugs to the patients.

Nurses, the authorized personnel administering the drugs are mostly unaware of the importance of these parameters. Inadequate quality management and poor peer relations contributes to some of the reasons for medication administration errors by nurses². In Indian hospitals, most of the time the antibiotics are diluted in 100 ml normal saline and infused for an average of 30 to 60 minutes irrespective of their pharmacokinetic considerations or guidelines as prescribed by FDA. This type of error is generally referred to as medication administration error. A study conducted in Gujarat, India reported that in a tertiary care hospital medication administration errors can account up to 30 % of the total medical errors³.

In order to reduce such errors, IV admixtures and infusion rate data for antibiotics used in the tertiary care hospital were collected from FDA guidelines. An antibiotic administration protocol that consisted of various antibiotics, diluents and duration are put in a single table (**Table 1**). This was approved by a senior surgeon after appropriate verification and was



allowed to be placed in intensive care units and general ward. Nurses and duty doctors were

instructed to refer the chart before administration of drugs.

Table – 1 IV admixture and infusion rates

DRUG NAME	DILUENTS	DURATION
Amikacin	NS D5%	30-60 mins
Azithromycin	NS ½ NS D5% in water D5% in ½ NS with 20 meq KCL Ringer lactate solution D5% in RL D5% in 0.3% NaCl D5% in ½ NS	Not less than 60 minutes
Cefepime	NS D5% D10% M/6 Sodium Lactate injection D5% + NS D5% + RL	30 minutes
Cefoperazone sodium + Sulbactam	D5% D5% + RL D5% + NS D5% + 0.2% NaCl D10% RL NS	15-30 minutes
Cefuroxime	D5% NS	<750mg in 50 ml 30minutes >750mg in 100ml 60minutes
Clarithromycin	NS D5% RL	60 minutes
Clindamycin	NS D5%	Based on dose
Colistin	NS D5% in NS D5% in water D5% in ½ NS D5% in 0.225% Nacl RL 10 % invert sugar solution	1- 2 hours
Cotrimoxazole	NS D5% 0.18 % NS 0.18 % NS + Glucose 4% Dextran 70 + D5% or NS Dextran 40 + D5% or NS RL	60 – 90 minutes
Doripenem	NS D5%	60 minutes



Doxycycline	D5% NS	100mg in 100 ml 1hr 250m
Flucloxacillin	NS D5% Sodium chloride 1.8 mg/ml (0.18% with glucose) 40 mg/ml (4%) solution for injection	20 – 30 minutes
Gentamycin	NS D5% in water	30 minutes – 2 hours
Imipenem + Cilastatin	NS D5% or D10% D5% + NS D5% + ¼ NS or ½ NS Mannitol 5 % or Mannitol 10 %	20 – 30 minutes (500mg) 50 – 60 minutes (1000mg)
Levofloxacin	NS D5% D5% in RL ½ NS, D5% and 0.15 % Potassium Chloride Injection	60 - 90 minutes
Linezolid	NS D5% RL	30 – 120 minutes
Meropenem	NS D5%	15 – 30 minutes
Metronidazole	NS D5% RL	60 minutes
Minocycline	NS D5% D5% + NS RL	60 minutes
Piperacillin + Tazobactam	NS Sterile Water for injection Dextran 6 % in Saline D5% RL (only if reformulated product containing EDTA compatible with administration via Y site	30 minutes
Voriconazole	NS ½ NS RL D5% + RL D5% + NS D5% + ½ NS D5% D5% + 20 meq KCl	1 – 2 hours



Certain prescriptions which contained broad spectrum, reserved, high risk antibiotics were written with appropriate infusion duration and suitable diluents after introduction of this chart.

Especially concentration dependent antibiotics like aminoglycosides should be infused at the prescribed rate to maintain the plasma concentration with respect to its clearance. Slow infusion can cause sub therapeutic outcomes and rapid infusion may lead to toxicity including topical reactions like thrombophlebitis.

To assess the impact of implementing such thing in clinical practice, initial drug

administration details of randomly selected 30 patients per day were recorded for nearly 7 days. After instructing nurses and duty doctors regarding this chart, again 30 patients per day randomly were assessed for 7 days. The incidence of medication administration error came down within 3 days to a significant extent.

Fig 1 shows the trend of duration errors over a period of 14 days. The line of first 7 days shows the duration error occurrence in the patients before implementation whereas the next 7 days shows the data after implementation. All these data were obtained from the case sheets and by oral interview from the nurses.

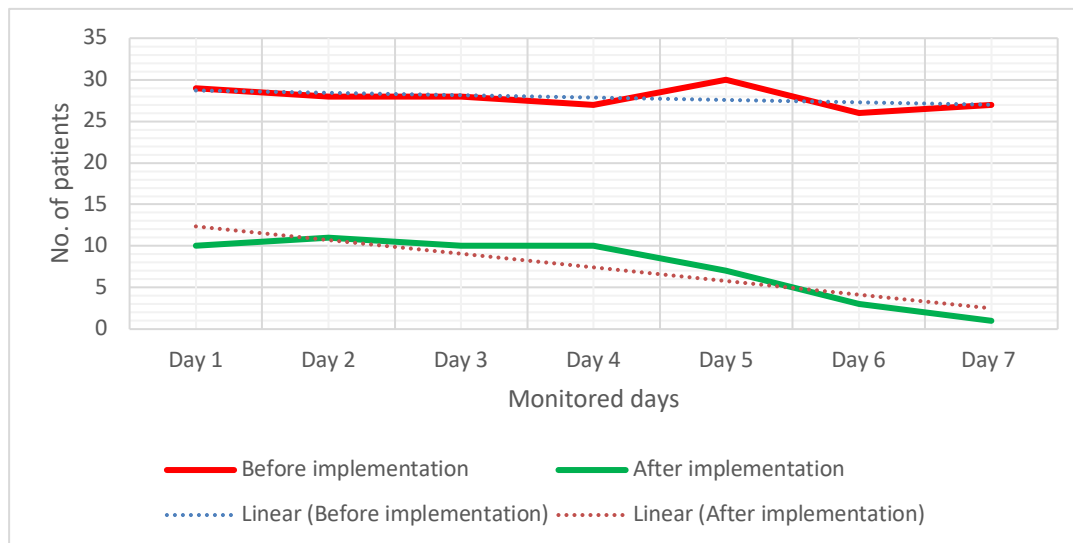


Figure 1 Number of duration errors

The dilution errors can lead to incompatibility and results in drug wastage. Such wastage adds to significant increase in cost of therapy and therefore needs to be prevented. From **Fig 2** it

is evident that once antibiotics administration protocol was implemented very few dilution errors occurred and that has also been decreased to zero.

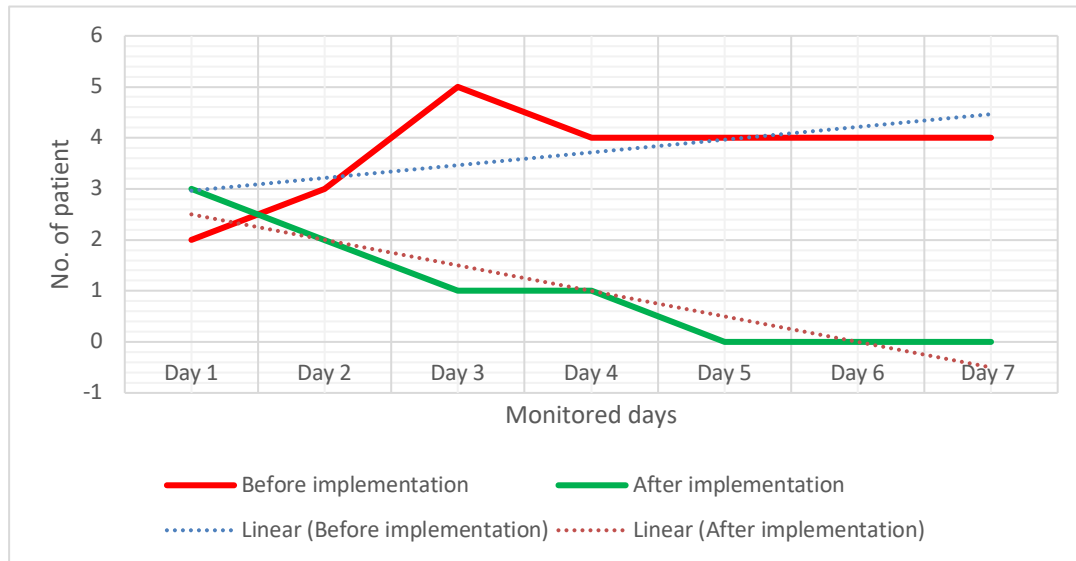


Figure 2 Number of dilution errors

When considered together, medication administration errors decreased from 79% [prior implementation] to 20.7 % post administration of antibiotic administration protocol. More than 50 % medication

administration errors with respect to diluents and infusion duration were prevented by introduction of IV admixtures chart and proper education of the nurses by a clinical pharmacist.

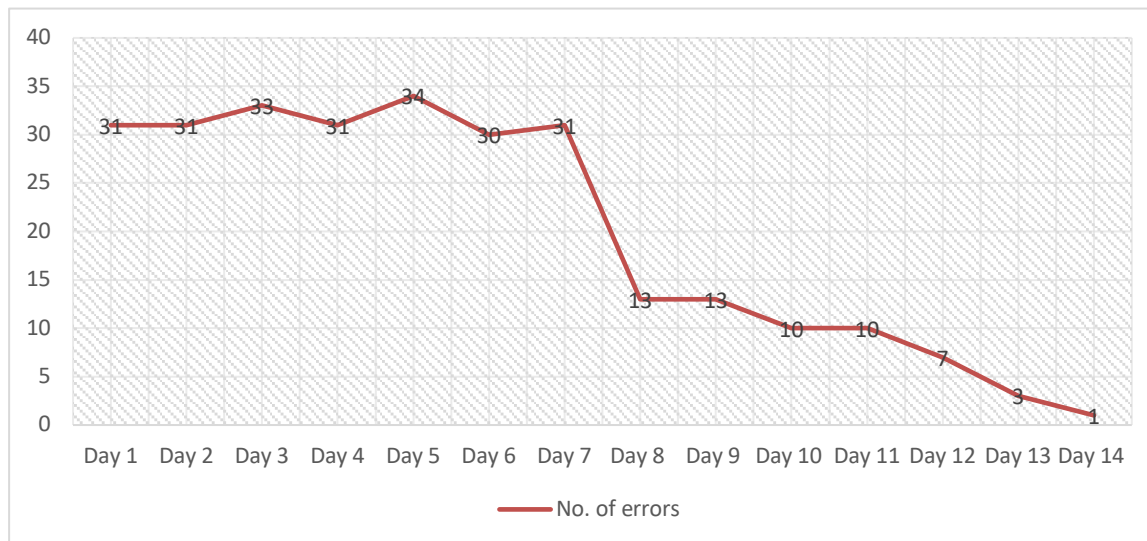


Figure 3 Overall medication administration errors

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