

Review Article

Clinical Pharmacist Role in Intravenous Administration Errors: A Review

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Abstract: Potential activation of clinical pharmacist role is of great importance in reducing the IV administration errors which are well-known problem in hospitals. IV errors have been shown to be frequent and serious. The purpose of the review was to describe the role of a clinical pharmacist involvement in IV dose preparation and administration. Many observational studies have been identified the pharmacist need in reduction of IV errors. Greater safety of this medication process can be achieved through clinical pharmacist interventions like training and supervision of nurses, raising nurse's awareness of IV error rates through reporting and implementing standard policies and procedures for IV medication administrations. With this information, the review focused on role of clinical pharmacist in intravenous administration errors.

Keywords: clinical pharmacist, IV errors.

INTRODUCTION

Intravenous administrations errors occur frequently and are more likely to result in serious harm and death than other type of medication errors [1]. IV medications are considered to be particularly dangerous because they usually go directly in to patient vein with immediate onset of systemic effect and difficulty of reversing the pharmacologic effects after IV administration. The direct observation method, which was developed by Barker and McConnell in 1962, was confirmed to be able to detect more medication errors than chart review and incident report method. Clinical pharmacists are uniquely trained in providing comprehensive drug management to patients, and their role in the care of hospitalized patients has evolved over time [2]. In recent years no summary overviews have focused specifically on clinical pharmacist intervention in IV administration. The purpose of the publication is to provide a brief review on importance of pharmacist role in reducing IV administration errors.

Recent observation studies on pharmacist interventions in reducing intravenous errors

Qian Ding, *et al.*; in 2015 conducted a study on incidence of intravenous medication errors in a Chinese hospital to measure the frequency, cause and potential risks in the preparation and administration processes of IV medications. A total of 589 ordered IV doses plus 4 unordered IV doses as prepared and administered were observed by a trained observer

during IV rounds. From 12.8% over all error rate, 5.4% wrong dose, 3.7% wrong time, 2.7% omission, 0.7% unordered dose and 0.3% extra dose were detected in the study wards. The authors concluded that a typical inpatient in a Chinese hospital was subjected to about one IV error every day and it is necessary to engage pharmacists in the IV dose preparation and administration process [3].

Another research conducted by Nguyen HT *et al.*; in 2014, examined the effect of a clinical pharmacist-led training program on intravenous medication errors in an intensive care unit (ICU) and a post-surgical unit (PSU). 1204 intravenous doses were included, 516 during the baseline period and 688 during the follow-up period. The prevalence of clinically relevant erroneous doses decreased significantly on the intervention ward (ICU) from 64.0% to 48.9% ($p < 0.001$) but was unchanged on the control ward (PSU) (57.9% vs. 64.1%; $p = 0.132$). They found that the pharmacist-led training program was effective in reducing clinically relevant intravenous medication errors. Further quality improvement strategies are needed and should include other approaches such as changes in the working environment and the promotion of a safety culture [4].

Vijayakumar *et al.*; in 2014 conducted a prospective observational study to ascertain the drug-related problems (DRPs) involved in IV medication

administration and further to develop strategies to reduce and prevent the occurrence of DRPs during IV administration. Out of 110 patients nearly, 46.3% patients were reported with DRPs. Among the DRPs, 40.9% were incompatibilities, 12.7% with complications, errors in rate of administration were 10.9%, and 8% dilution errors. The study suggested that permanent supervision and involvement of Clinical Pharmacist will improve the quality of preparation and administration of IV medications and will also reduce the DRPs [5].

Mohammad Abbasinazari *et al.*; in 2013 performed a prospective cross sectional study to evaluate the frequency of errors in preparation and administration of intravenous medications in orthopedics, general surgery and gastroenterology wards of a teaching hospital in Tehran. From a total of 357 preparation and administration episodes, the most common type of error (20.6%) was the wrong administration rate of the drug bolus. This study revealed that the errors usually happened in the preparation and administration of IV drugs. They suggested that Involvement of a pharmacist can be a solution to reduce the rate of errors by training the health care professionals and establishing a non-punitive system of reporting medication errors to encourage documenting the errors and implementing the risk management protocol [6].

Ong W M *et al.*; in 2013 did a prospective observational study with the objectives to determine whether medication errors occur in IV drug preparation and administration, to determine the associated factors and identify then strategies in reducing these medication errors. 341 (97.7%) errors were identified during observation from a total 349 IV drug preparations and administrations. The most common error was wrong administration rate of intravenous bolus doses. They suggested that errors could be reduced by having proper guidelines and training on IV procedures, awareness among the staff nurses, more common use of IV infusion control devices and by giving full concentration during the process [7].

Ahmad Fuad Shamsuddin *et al.*; in 2012 conducted a study in University Kebangsaan Malaysia Medical Centre to determine knowledge levels of nurses with regards to preparation and administration of IV medications. During the survey, less than 50% of respondents obtained correct answers for calculation and dosing of IV medications. They identified that training programs for nurses should give greater emphasis on these skills. The involvement of medication experts such as pharmacists in nursing training programs would be beneficial in addressing issues relating to IV medications [8].

Mohammad Abbasinazari, *et al.*; in 2012 observed the effect of information provision on reduction of errors in intravenous drug preparation and administration by nurses in ICU and surgical wards by nurse's education via installation of wall posters and giving informative pamphlets. The study highlighted the nurses' education can reduce the number of errors. They suggested that continuous education and competency assessment for nurses can reduce IV errors and permanent supervision of pharmacists can play an important role in improving the quality of preparation and administration of IV medications [9].

IV errors: What pharmacist needs to be done?

Permanent supervision by pharmacist

Routine checking by a pharmacist can improve the quality of preparation and administration of IV medication. ⁹ The clinical pharmacist can encourage the nurses in;

- Ensure safe environment for the medication preparation by placing labels like “do not disturb” to discourage the visitors to interrupt the nurses during medication preparation.
- The reduction of distraction and interruptions during medication administration.
- Assistive use of calculators to facilitate the resolution of calculation.
- Double checking of medication by two separate nurses, particularly for high risk medications.
- Implementation of five rights when preparing medications.
- Apparent separation of medications with similarities either in color or in name, by putting label on them.
- Check if medications have been administered to proper patient.

Intravenous errors can also be reduced by implementing additional label checks by both pharmacy personals and nurses at the bedside prior to medication administration [10].

IV preparation in the pharmacy

Preventive strategies of medication errors include the standardization and simplification of medication procedures. Medication safety aims at the reduction of medication error rates, their earlier identification before patient gets harm and their timely treatment. Preparation of IV medication in the pharmacy can reduce the incidence of errors, because;

- A controlled sterile preparation area can be used within a laminar flow hoods in a segregated space in the pharmacy.
- Pharmacy technicians can receive special training in aseptic technique and calculations.
- Pharmacist can supervise and observe how products are prepared.

- Dosage calculation and medications can be verified for accuracy by the pharmacist.
- Delivery of premixed medications from pharmacy to nursing wards reduces need of further preparation by the nursing staff (especially pediatric medications that require precision in dosage calculation) [11].

Pharmacist-led education and training programs

Another protective measure against medication error considers being the improvement of dosing calculation skills through nursing education. Continuous education programs on aspects of IV medications and related safety issues for nurses are also important. Most intravenous errors have been shown to be related to insufficient knowledge at practical procedures, deviation from protocol/guidelines and nurses experience. This suggested that educational interventions targeting the specific errors prone stages could be useful to improve medication safety. Continuous education and competency assessment for nurses may lead to less error in IV drug preparation and administration, therefore short continuing training program regarding IV drugs preparation and administration is recommended. The reduction of frequency of IV error is achievable by establishment of medication administration policies, educational programs with pharmacology topics and communication of patient and nurses during and after medication administration [12].

Medication error reporting and analysis

Medication error reporting is an essential aspect of limiting medication error occurrence and the development of medication error prevention strategies. Every medication that goes unreported represents an error that will continue to be replicated and continue to put patients at risk. By providing to nurses the opportunity of voluntary report their medication errors without mentioning their name makes them feel comfortable and increase the possibilities to report their errors [13].

Use of bar-coded medication administration

Bar-coded medication administration systems require that the nurses who administer the medication at the bed side should scan the patient's identification bracelet and the unit dose of medication being administered. This reduces the medication errors by ensuring five rights of medication administration. Hospital wide data have shown that bar-coding can eliminate transcription errors, which reduce 50.8% of potential ADEs and 27.3% of time administration errors [14].

CONCLUSION

Intravenous medications are pharmaceutical preparations having the highest risk of possible

medication errors. These drugs are typically associated with complicated preparation, administration and monitoring. Clinical pharmacist has been identified as the key health professionals to ensure safe medicine use. Medication errors in intravenous administration can be prevented by routine checking of IV administrations in the ward, pharmacist led training programs to nurses, frequent error reporting system, preparation of IV medications in pharmacy, implementation of standard guidelines/protocols for administration and bar-coding technologies.

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