

An overview in roles of pharmacist in preparation of inpatient intravenous medication and administration error recognition

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ABSTRACT

pharmaceutical errors are preventable incidents that may arise at any phase of the pharmaceutical utilization process. They are prevalent in healthcare systems and are associated with heightened morbidity and mortality risk. A variety of techniques, including various pharmacy-based therapies, have been examined to mitigate their occurrence. Pharmacist-led teaching programs demonstrate significant potential benefits. Parenteral nutrition (PN) therapy is a sophisticated and essential intervention that necessitates specialized clinical expertise, abilities, and practical experience to prevent errors in prescribing, compounding, and patient management. Pharmacists possessing sufficient clinical training and proficiency in PN therapy can play a crucial role in the management of patients undergoing PN therapy. The current review study aims to discuss and emphasize the roles of pharmacists in the preparation of inpatient intravenous medications and the recognition of delivery errors.

Keywords: prescribing, compounding, training, pharmaceutical

INTRODUCTION

Hospital pharmacy departments are required to enhance drug preparation, dispensing, and distribution systems, necessitating the formulation of thorough policies and procedures to ensure the safe distribution of all drugs and related supplies to inpatients and outpatients [1]. The frequency of reported medication mistakes is a key indicator of the quality of any drug delivery system [2]. Numerous international pharmacy organizations have conducted surveys to evaluate contemporary hospital pharmacy practices in their various nations. These surveys have assessed practices at various intervals, and their results have informed strategic actions. The American Society of Health-System Pharmacists (ASHP) performed national surveys on pharmacy practice in hospital settings regarding dispensing and administration in 2008. In 2005, the International Pharmaceutical Federation (FIP) Global Conference on the Future of Hospital Pharmacy conducted a survey evaluating several facets of hospital pharmacy practice across all 192 United Nations member countries. Comparable surveys examining European practices have been undertaken by the European Association of Hospital Pharmacists (EAHP), with the latest survey done in 2010 [5].

Notwithstanding advancements in the medical profession facilitated by sophisticated technology and computerized systems, pharmaceutical errors continue to occur. According to the National Coordinating Council for Medication Error Reporting and Prevention (NCCMERP), medication errors are characterized as “any preventable event that may result in inappropriate medication use or patient harm while the medication is under the control of the healthcare professional, patient, or consumer.” Multiple studies indicate that pharmaceutical errors are a significant cause of prolonged hospital stays, delayed medication administration, and escalating medical expenses [6]. In the United States, 7,000 to 9,000 individuals succumb annually due to drug errors. The World Health Organization estimates that the annual global cost of drug errors is 42 billion USD. The majority of documented pharmaceutical errors in the literature include prescribing errors necessitating pharmacist involvement [7]. The documented prevalence of prescribing errors was found to range from 2% to 94%. These encompass, among others, incorrect medicine, incorrect dosage, incorrect administration route, incorrect duration, and incorrect formulation [8]. A comprehensive research indicates that there may be one prescribing error per patient in a hospital environment. Pharmacists are strategically positioned to enhance drug usage and augment patient safety [9].

Review

Medications were typically given and delivered to enhance patients' quality of life and health results. Currently, healthcare practitioners and patients have seen that these given medications are linked to intolerable rates of errors and adverse consequences [10]. Prior research emphasized the issue and pinpointed causes, including inadequately organized prescriptions and the use of handwritten methods. The frequency, occurrence, and characteristics of prescribing errors for hospitalized patients were examined. The reasons and circumstances related to these errors were delineated. The pharmacist influenced the alteration of the prescribing practices of the attending physician. The efficacy of pharmacist intervention was also assessed. An educational intervention program conducted by the practicing pharmacist was implemented. The impact evaluation of the program was conducted by measuring error levels before and after each intervention [11].

Detection of medication mistakes and pharmacist intervention were critical determinants for the quality of pharmacy services offered to underserved patients. The literature indicates a paucity of information regarding this type of research within hospital inpatient pharmacy services. The current investigation indicated a diverse array of errors related to handwritten directives in teaching hospitals. The treating physicians intended these orders for critically admitted patients with one or more medical issues, some of which were potentially serious and could result in patient harm, including delays in therapeutic progress, complex medical conditions, and treatment approaches that might lead to patient mortality [12]. In addition to this, regarding the prescribing process, the majority of errors pertained to the selection of drug strength and administration frequencies. The primary cause for the high incidence rates was the insufficient knowledge of treating physicians regarding pharmacological principles, including drug metabolism and pharmacokinetics, during their education and training [13]. Medical students were not exposed to the skills and strategies necessary for prescription writing during their education and internship. The results highlighted several problems that may have occurred in patient discharge prescriptions due to the prescribing decisions made by the treating physician. The handwriting quality of the treating physicians and the utilization of ambiguous acronyms impaired the pharmacists' comprehension of medical orders. These may result in misunderstandings and delays in pharmacy services for patients in need, particularly those who are critically hospitalized [14].

Human errors in medicine delivery are becoming common, attributed to various factors, including a dearth of adequately educated personnel in numerous hospitals. Handwritten MARs are more susceptible to inaccuracies because to the necessity of transcribing and potential legibility issues. The electronic drug Administration Records (eMAR) mitigate drug errors by removing or diminishing transcribing uncertainty. The system inhibits the administration of incorrect medication to a patient or the administration of medication to the wrong patient, particularly when coupled with BCMA. A study revealed a 54% decrease in pharmaceutical administration errors with the use of electronic MARs and BCMA [15].

Parenteral nutrition (PN) therapy entails the intravenous delivery of nutritionally adequate and balanced formulations to provide vital nutrients to patients who cannot tolerate oral or enteral feeding due to impaired or inaccessible gastrointestinal (GI) tract. Over the years, PN has emerged as a significant primary and adjuvant therapy for diverse clinical diseases and disease states in both acutely ill hospitalized patients and selected long-term home care patients. PN formulations can provide a vital sustenance option for premature newborns, critically ill hospitalized patients, and individuals with permanent gastrointestinal tract loss, such as those with fistulas or short bowel syndrome [16].

Total parenteral nutrition (TPN) refers to the therapy in which the daily nutritional needs of the patient are solely provided through parenteral nutrition formulations. PN formulations can be either of conventional composition or customized to meet the patient's specific need. Despite the growing availability of standard PN formulations from industry in certain countries, many hospitals continue to compound PN formulations in-house by pharmacy personnel to meet patient requirements in numerous regions [17].

The PN formulations are intricate combinations of several components, including macronutrients (amino acids, dextrose, and intravenous fat emulsions [IVFEs]) and micronutrients (electrolytes, vitamins, and trace elements). Due to the intricate composition and direct intravenous administration, these formulations must be sterile and consist of stable, compatible components to guarantee patient safety during PN therapy. An incompatible, unstable, or contaminated intravenous infusion may cause patient injury, including significant morbidity and even mortality. Consequently, PN formulations must be prepared using stringent aseptic processes in accordance with approved pharmaceutical compounding protocols [18].

Pharmacists possess a distinctive array of abilities, encompassing clinical knowledge and skills that enable them to effectively contribute to the provision of nutrition support therapy for patients. Indeed, the professional responsibilities of pharmacists have transitioned from conventional compounding and dispensing of pharmaceuticals to the contemporary provision of direct patient care within multidisciplinary healthcare teams. Pharmaceutical care (PC) is a practice philosophy wherein the pharmacist diligently administers drug therapy to patients to attain certain results that enhance their quality of life [18].

To effectively deliver pharmaceutical care services, pharmacists must engage with other healthcare professionals and the patient in the formulation, execution, and evaluation of a therapeutic plan to enhance the patient's clinical outcomes. Consequently, the successful implementation of PC practice necessitates excellent collaboration between pharmacists and other healthcare team members to enhance patients' treatment outcomes. Similarly, PN treatment is best delivered to patients as a multidisciplinary service, when the pharmacist interacts with other healthcare providers to enhance the patient's nutritional care plan [19]. The Nutrition Support Team (NST) is a multidisciplinary group typically consisting of physicians, dietitians, pharmacists, and nurses with specialized training in nutrition support, tasked with managing parenteral nutrition therapy according to meticulously established protocols. The provision of patient-centered pharmaceutical care services by pharmacists to patients undergoing parenteral nutrition therapy has demonstrated an enhancement in clinical outcomes.

The subsequent two decades saw numerous advancements in parenteral nutrition (PN) therapy, including the establishment of home parenteral nutrition (HPN) programs, enhancements in the manufacturing quality of macronutrients such as amino acids and intravenous fat emulsions (IVFE), improvements in disposable administration devices, and the introduction of automated compounding machines that increased the safety and accuracy of PN admixture compounding. Before that significant accomplishment, the conventional approach to compounding these multicomponent mixtures involved manually employing gravity-driven transfers for large-volume additives, including amino acids, dextrose, lipids, and sterile water, while small-volume additives, such as electrolytes, trace minerals, multivitamins, and medications, were administered using syringes. The manual approach was labor-intensive and necessitated numerous manipulations of infusion containers, sets, syringes, and needles, potentially resulting in inaccurate compounding and contamination of the final admixture. The advancement of automated compounding technology for parenteral nutrition admixture compounding, facilitated by fluid pump technology and software that regulates the compounder pump, has resulted in enhanced compounding precision and safety for parenteral nutrition. It also decreased the time necessary to formulate PN compositions and streamlined the process of customizing their formulation to meet specific patient requirements [20,21].

CONCLUSION

Pharmacists have been actively engaged in delivering parenteral nutrition-related services to patients. Pharmacists require sufficient educational preparation and clinical training in nutrition support to meet the demands of their critical position in this field. Empowering pharmacists to take on a more prominent leadership position in this aspect of pharmacy practice will elevate the quality of care for patients undergoing PN therapy and enhance PN services. Medication mistakes constitute the most prevalent and preventable cause of patient damage. They can occur at multiple stages in the healthcare process, from prescription to actual drug administration. In light of the seriousness of this issue, regulatory authorities have implemented rules to mitigate the frequency of these instances. The educational intervention proved most effective when accompanied by printed handouts summarizing session content, the provision of posters or pocket-sized flashcards to prescribers, and when healthcare providers received personalized written or electronic reports regarding their medication errors. Moreover, regular instructional sessions proved to be more successful than singular sessions. These integrated strategies consistently remind healthcare practitioners to reduce pharmaceutical errors at various phases of the medication-use process. Subsequent research should examine the implications of morbidity and mortality associated with prescription errors, as well as the economic consequences of pharmacist-led education for healthcare professionals.

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