

# The Contribution of Clinical Pharmacy Services in Reducing Medication Errors in Pediatric Hemato-Oncology

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## Introduction

Medication errors are a significant concern in healthcare settings, particularly in specialized areas such as pediatric hemato-oncology. These errors can have devastating consequences, especially in children undergoing treatment for hematological and oncological diseases, where the therapeutic window for many drugs is narrow and the treatment regimens are complex. Clinical Pharmacy Services (CPS) have long been recognized as critical components in enhancing patient safety by minimizing medication errors, optimizing therapeutic outcomes and ensuring the proper use of medications. In pediatric hemato-oncology, CPS plays a vital role due to the unique challenges involved, including the vulnerability of children, the complexity of cancer therapies and the intricacies of managing blood disorders [1].

Pediatric hemato-oncology involves the treatment of children with blood cancers (such as leukemia and lymphoma) and other hematological disorders, such as sickle cell anemia or hemophilia. The treatment for these conditions is often multifaceted, involving chemotherapy, immunotherapy, targeted therapy and sometimes stem cell transplants. These treatments are not only complicated but also associated with various side effects, including toxicity, which necessitates close monitoring and meticulous medication management. The complexity of managing pediatric hemato-oncology patients is multifactorial. First, pediatric patients are physiologically different from adults, with varying pharmacokinetics and pharmacodynamics, which affect how drugs are absorbed, distributed, metabolized and excreted. This variation requires careful dose adjustments, especially in chemotherapy, where the doses are frequently weight-based or calculated using Body Surface Area (BSA). Inaccurate dosing or administration of incorrect medications can lead to serious adverse outcomes, including treatment failure, increased toxicity, or even fatality [2].

## Description

Clinical pharmacy services are designed to ensure the safe and effective use of medications through direct patient care. Clinical pharmacists in pediatric hemato-oncology settings play a crucial role in reviewing medication orders, counseling patients and families, providing drug information, monitoring drug therapy and preventing medication errors. These services are particularly important given the fragile nature of pediatric hemato-oncology patients. One of the primary functions of clinical pharmacy services in reducing medication errors is conducting thorough medication reviews and order verification. Pediatric hemato-oncology involves numerous medications, including cytotoxic agents, pain management drugs, antibiotics, antifungals and supportive care medications. Each of these drugs requires accurate dosing, appropriate route of administration and proper monitoring for potential adverse effects. Clinical pharmacists review physician orders for accuracy and ensure that the prescribed doses are appropriate for the patient's age,

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weight and clinical condition. This proactive verification helps identify potential dosing errors, drug interactions, or contraindications before the medications are administered. In pediatric hemato-oncology, where a small error can lead to significant harm, such as overdosing chemotherapy agents, the clinical pharmacist's vigilance is indispensable. Children undergoing cancer treatment require highly individualized therapy. The process of calculating drug dosages based on weight, BSA, or other factors must be precise to avoid errors. Clinical pharmacists are trained to understand the nuances of pediatric pharmacology and play a critical role in ensuring that the dosing of chemotherapy and supportive medications is accurate [3].

The monitoring of drug therapy is essential in pediatric hemato-oncology, given the narrow therapeutic indices of many chemotherapeutic agents and the potential for severe ADRs. Clinical pharmacists regularly assess patients for signs of toxicity, drug interactions, or other complications. They review laboratory results, such as liver and kidney function tests, to adjust medications accordingly and mitigate the risk of harm. Pharmacists also monitor for potential drug-drug interactions, which are common in pediatric hemato-oncology patients who are receiving multiple medications. Many chemotherapy agents, for example, can interact with antifungal drugs or antiretroviral medications, affecting their effectiveness or causing toxicity. By conducting regular medication reviews and working closely with the medical team, clinical pharmacists can prevent these interactions from leading to significant harm. An often-overlooked aspect of medication safety is patient and family education. In pediatric hemato-oncology, where patients are children and their families are typically responsible for administering medications at home, education becomes a key factor in preventing medication errors. Clinical pharmacists work closely with families to ensure that they understand the proper administration of medications, potential side effects and the importance of adherence to treatment protocols. Pharmacists also educate caregivers on the signs of complications or ADRs that may require medical intervention, empowering families to make informed decisions and respond promptly when issues arise. For example, parents need to be aware of the signs of infection or bleeding complications that might necessitate immediate medical attention, particularly when their child is receiving immunosuppressive therapy [4].

Medication errors in pediatric hemato-oncology can result from breakdowns in communication between healthcare providers. Clinical pharmacists are an integral part of the multidisciplinary healthcare team, collaborating with physicians, nurses, dietitians and other specialists to ensure the safe administration of drugs. This collaboration includes discussing complex cases, recommending alternative therapies and providing expert advice on drug interactions, pharmacokinetics and pharmacodynamics. Pharmacists also participate in rounds, where they can offer real-time drug information and help optimize therapy based on the most current evidence. By participating in these discussions, pharmacists help prevent medication errors arising from insufficient information or misunderstandings about drug therapy. Clinical pharmacy services in pediatric hemato-oncology often integrate advanced technology, such as Computerized Physician Order Entry (CPOE), barcoding medication administration and Clinical Decision Support Systems (CDSS), to further reduce the risk of medication errors. These technologies help to ensure that the correct medication is given at the right time and in the correct dose. Pharmacists help optimize the use of these systems, providing input on how to streamline medication safety protocols and integrating them into routine care practices [5].

## Conclusion

The role of clinical pharmacy services in reducing medication errors in

pediatric hemato-oncology is undeniable. Through vigilant medication review, dosing adjustments, drug monitoring, patient education and collaboration with the healthcare team, pharmacists play a crucial role in ensuring that the complex medication regimens used in pediatric oncology are safe and effective. Their expertise in pharmacology, medication management and error prevention helps mitigate the risks associated with chemotherapy and other treatments, ultimately improving patient safety and treatment outcomes. Given the sensitive and fragile nature of pediatric hemato-oncology patients, the presence of clinical pharmacy services in these settings should be regarded as an essential aspect of quality care. As treatment protocols continue to evolve, the role of the pharmacist will remain central in reducing medication errors and ensuring the best possible outcomes for these vulnerable patients. Future research should continue to evaluate the impact of clinical pharmacy interventions on medication safety in pediatric hemato-oncology, helping to refine and strengthen these services for the benefit of both patients and healthcare providers.

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## Acknowledgement

None.

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## Conflict of Interest

There are no conflicts of interest by author.

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