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Short Communication

Vulnerable by Weight and Age: Tackling Paediatric Dosing Errors in Modern Healthcare Systems

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DESCRIPTION

Medication errors represent a major patient safety concern in paediatric hospital settings worldwide, with drug dosing errors constituting one of the most critical types. Paediatric patients are uniquely vulnerable due to the necessity for individualized dosing based on weight, age and developmental pharmacokinetics. This complexity increases the risk of dosing inaccuracies, which can result in under-treatment or potentially fatal overdoses. In high-income countries such as the United States, United Kingdom, Canada and Australia, despite sophisticated healthcare infrastructures and advanced Electronic Health Record (EHR) systems, dosing errors remain prevalent. Literature suggests that dosing errors account for up to 50% of medication errors in paediatric inpatients [1,2]. Causes range from calculation mistakes, inaccurate or missing weight documentation, confusion between drug formulations, to failure in cross-checking doses against established guidelines [3].

The paediatric medication process involves multiple stages susceptible to errors: Prescribing, transcribing, dispensing, administering and monitoring. Among these, prescribing and administration phases have been identified as the most error-prone [4]. In emergency and critical care situations, the pressure and urgency further increase risk factors [5]. Electronic prescribing with Clinical Decision Support Systems (CDSS) has reduced error rates by automating dose calculations and alerting prescribers to out-of-range doses [6]. However, reliance on technology has limitations, including alert fatigue, data entry errors and occasional software malfunctions. In addition, some hospitals continue to use paper-based prescribing, increasing error vulnerability.

Clinical pharmacists integrated into paediatric care teams provide an additional safety layer through medication reconciliation, dosage verification and direct communication with prescribers and nurses. Studies have shown that pharmacist involvement reduces dosing errors by 30%-50% [7]. Similarly, nurse double-check protocols during drug administration enhance error detection, though resource constraints can limit consistent implementation [8]. Education and ongoing training of healthcare providers are crucial. Paediatric-specific pharmacology education, simulation training in medication preparation, and regular competency assessments help reduce knowledge-based errors [9]. Moreover, promoting a culture of safety and non-punitive error reporting encourages staff to identify system weaknesses and prevent recurrent mistakes.

Parents and caregivers also play a vital role in preventing medication errors, especially during transitions of care or discharge. Engaging families through counselling on medication regimens, dosing instructions, and possible side effects fosters adherence and vigilance [10].

Despite these measures, challenges remain in achieving zero medication errors. Variability in dosing standards across institutions, differences in drug formulations, and inconsistencies in weight measurement practices complicate standardization efforts. Additionally, the "off-label" use of medications in paediatrics adds complexity to dose determination. Future directions include further refinement of EHR-integrated CDSS with Artificial Intelligence (AI) capabilities for predictive analytics, standardization of paediatric dosing guidelines internationally and enhanced multidisciplinary collaboration. Research focusing on human factors and system-based approaches can inform safer medication practices.

CONCLUSION

Paediatric drug dosing errors continue to be a significant challenge in hospital settings, even in well-resourced health systems. Addressing this issue requires a multifaceted strategy that integrates technology, human expertise, education and family involvement. Electronic prescribing with decision support, clinical pharmacist participation, nursing safeguards and ongoing staff training are proven methods to reduce errors. Creating an open culture that encourages error reporting without fear of blame is essential for learning and system improvement. Engaging caregivers further strengthens safety nets. While complete elimination of dosing errors may be aspirational, sustained commitment to prevention strategies can

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substantially decrease their frequency and severity, thereby improving paediatric patient outcomes. Continued innovation and research will play pivotal roles in advancing paediatric medication safety in hospitals worldwide.

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