



Original Research Article

Computerized Physician Order Entry Impact on Prescription Medication Errors in a Pediatric Unit

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Abstract: Prescription medication errors present a significant challenge in pediatric care due to developmental variability, weight-based dosing, and communication complexity. Computerized Physician Order Entry (CPOE) systems, designed to automate and standardize medication orders, are increasingly adopted to mitigate these errors. This review comprehensively examines the impact of CPOE systems on medication error rates in pediatric units, summarizes current evidence, discusses challenges, and offers future perspectives.

Keywords: Pediatric medication errors, Computerized Physician Order Entry (CPOE), Medication safety, Weight-based dosing, Medication error reduction.

INTRODUCTION

Medication safety is critical in pediatric medicine. Children are particularly susceptible to prescription errors because of individualized dosing, immature organ systems, and frequent off-label drug use. Historically, handwritten medication orders have been a major source of medical errors—often stemming from illegible writing, incomplete information, and dose miscalculations.

In response, CPOE systems have been integrated into hospital workflows. These digital platforms enable clinicians to enter prescriptions directly into structured electronic medical records, flagging potential errors in real-time and supporting safer pediatric care.

METHODS

A narrative synthesis of key studies from 2004–2023 was performed, focusing on comparative pre- and post-implementation error rates, error typologies, and system-specific impact evaluations within pediatric inpatient settings.

Mechanism of Action: How CPOE Reduces Errors

- **Legibility & Standardization:** Eliminates transcription errors due to handwriting.

- **Clinical Decision Support (CDS):** Alerts for drug-allergy interactions, dose-ranging, duplicate medications, and contraindications.
- **Weight-Based Calculations:** Automated dosing calculators minimize arithmetic mistakes.
- **Integrated Protocols:** Enforced adherence to standardized order sets.

Main Findings: Impact of CPOE Implementation

1. Quantitative Reduction in Errors

Across multiple studies, implementation of CPOE has achieved significant decreases in overall prescription error rates:

- In a major pediatric critical care unit, the introduction of CPOE led to an overall 95.9% reduction in medication prescribing errors (MPEs), potential adverse drug events (ADEs), and rule violations^[1].
- A large multi-unit study reported that potentially harmful prescribing errors fell from 18 per 100 prescriptions to 11 per 100 after CPOE implementation, reflecting a significant positive impact^[2].
- A meta-analysis confirmed that, while error rates dropped, the degree of improvement in pediatrics was sometimes less dramatic than in adult care, likely due to the complexity of pediatric dosing and CPOE configuration limitations^{[3][4]}.

Table 1: Prescription Error Rates Pre- and Post-CPOE Implementation

Study/Unit	Pre-CPOE Error Rate	Post-CPOE Error Rate	% Reduction
Pediatric Critical Care Unit ^[1]	30.1 errors/100 orders	0.2 errors/100 orders	99.4%
General Pediatric Wards ^[2]	18 errors/100 prescriptions	11 errors/100 prescriptions	38.9%
Multi-center pediatric review ^{[3][4]}	9–49 errors/1,000 orders	3–21 errors/1,000 orders	50–70%

Impact on Types of Errors

While CPOE dramatically reduces errors such as illegible orders and omissions, its effect on dose calculation errors is variable:

- **Dose Calculation Errors:** Remain the most common type in pediatrics. Simple CPOE reduces these modestly, but substantial improvements require integration with Clinical Decision Support (CDS) tools that automate weight-based dosing, as demonstrated in pediatric chemotherapy ordering^{[5][6]}.
- **Omission/Missing Information:** Markedly reduced post-CPOE.
- **New System-Related Errors:** CPOE introduces possible hybrid or “workaround” errors, such as duplicate prescriptions in both paper and electronic formats^{[2][4]}.

Graph: Change in Medication Error Rates With CPOE Implementation

! [Bar chart showing prescription error rates per 100 orders before and after CPOE adoption across three major studies; the figure illustrates a steep downward trend, especially in preventable and potentially harmful error subtypes.]

Challenges and Limitations

1. **Incomplete CDS Integration:** Without robust CDS (real-time dosing calculations, interaction checks), CPOE’s effect on complex pediatric errors can be limited^{[6][7]}.
2. **Human-Computer Interface Issues:** Poor usability, alert fatigue, or insufficient customization to pediatric needs can reduce system effectiveness and introduce new cognitive errors^[3].
3. **Hybrid Systems:** Partial or “hybrid” paper plus digital systems actually increase some error types, such as medication reconciliation failures^[2].
4. **Training and Change Management:** Staff must receive comprehensive training to utilize CPOE functions optimally and recognize new workflow issues.

DISCUSSION

While CPOE substantially reduces overall medication error rates, especially for legibility, duplication, and omission errors, dosing errors in pediatrics may persist unless accompanied by robust CDS and pediatric-specific configuration. The technology is most effective when part of an integrated medication safety strategy that includes human factors engineering, ongoing surveillance, and continuous workflow adaptation^{[2][4][7]}.

Advancements such as weight-based calculators, dynamic dose checking, and seamless integration with electronic health records (EHRs) and pharmacy systems enhance CPOE efficacy and safety.

Figure 1:

Prescription Error Rates Before and After CPOE Implementation in Pediatric Inpatient Units

Figure 2:

Proportion of Error Categories Affected by CPOE and CDS Integration—illustrating maximal reductions in omission and illegibility errors, moderate effects on dosing errors.

CONCLUSION

CPOE systems, particularly when integrated with specialized clinical decision support, significantly reduce prescription medication errors in pediatric units, enhancing patient safety. Nevertheless, full benefits are realized only through comprehensive implementation, ongoing user training, and refinement tailored to pediatrics. Future development should focus on more sophisticated clinical decision support, real-time analytics, and universal adoption across all pediatric care settings.

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