

The Impact of Pharmacist Interventions on Reducing Medication Errors in Pediatric Patients: A Systematic Review and Meta-analysis

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Background

- Medication errors (MEs) are events that can occur at any stage of the medication use process including prescribing, transcription, dispensing, administration and monitoring¹
- Preventable adverse drug reactions (ADRs) are medication-related injuries that arises as a result of an error¹
- MEs and preventable ADRs are avoidable events that can result in significant patient harm¹
- Clinical pharmacists play an integral role in preventing MEs and preventable ADRs in adults²
- Pediatric patients are more prone to MEs which have three times the potential to cause harm as compared to adults³

Objectives

- To qualitatively and quantitatively assess the effectiveness of pharmacist interventions on reducing medication errors for pediatric patients in hospital settings
- To explore types of MEs that prompted pharmacist interventions in hospitalized pediatric patients

Methods

Table 1. Study Methodology

Study Design	Systematic review and meta-analysis following the PRISMA checklist
Protocol Registration	PROSPERO registration number: CRD42019126541
Search Engines	PubMed, Embase, Cochrane, Google Scholar
Search Terms	Search categories: <ul style="list-style-type: none"> Population: "pediatrics"[MeSH] Intervention: "pharmacists"[MeSH] Outcome: "medication errors"[MeSH]
Eligibility Criteria	Inclusion: <ul style="list-style-type: none"> Hospital settings Pediatrics (birth-18 years) Medication error rate Exclusion: <ul style="list-style-type: none"> Intervention not solely made by pharmacist
Selection and Data Extraction	Two reviewers (independently)
Data Items Extracted	<ul style="list-style-type: none"> Author(s) Year of publication Country of the study Study design Study site(s) Population characteristics Description of pharmacist intervention Medication error rate
Meta-analysis	Review Manager <ul style="list-style-type: none"> Forest plot Random effect model Odds ratio Heterogeneity (I²)
Quality Assessment	<ul style="list-style-type: none"> Crowe Critical Appraisal Tool (CCAT) Intraclass correlation coefficient (ICC) via SPSS software

Results

- Out of 606 citations, 19 were included in the qualitative synthesis and 6 in the meta-analysis (**Figure 1**)
- Studies design:**
 - Retrospective or prospective cohort studies (n = 11)
 - Before-after studies (n = 6)
 - Cross-sectional studies (n = 2)
- Departments included:**
 - Various departments within the hospital (n = 8)
 - Neonatal intensive care unit (n = 3)
 - General medical ward (n = 3)
 - Pediatric intensive care unit (n = 2)
 - Surgery department (n = 1)
 - Unspecified (n = 2)
- Clinical pharmacist intervention:**
 - Educational sessions (n = 5)
 - Review or order validation (n = 5)
 - Various unit-based activities (n = 4)
 - Multiple pharmacist interventions (n = 3)
 - Attending rounds (n = 2)
- Main types of MEs provoking clinical pharmacist interventions:**
 - Wrong dose
 - Wrong frequency
 - Drug interaction
 - Wrong drug
 - Wrong formulation
 - Wrong administration rate
- Quality assessment:** the overall quality of included studies is moderate (27.9/40) with high similarity between raters (ICC range, 0.948 to 0.997)
- Meta-analysis:**
 - The pooled odds ratio across 6 studies was 0.27 (95% CI 0.15 to 0.49), favouring the pharmacist intervention
 - Results of these studies are substantially heterogeneous (**Figure 2**)

Figure 1. PRISMA flow diagram of the study selection process

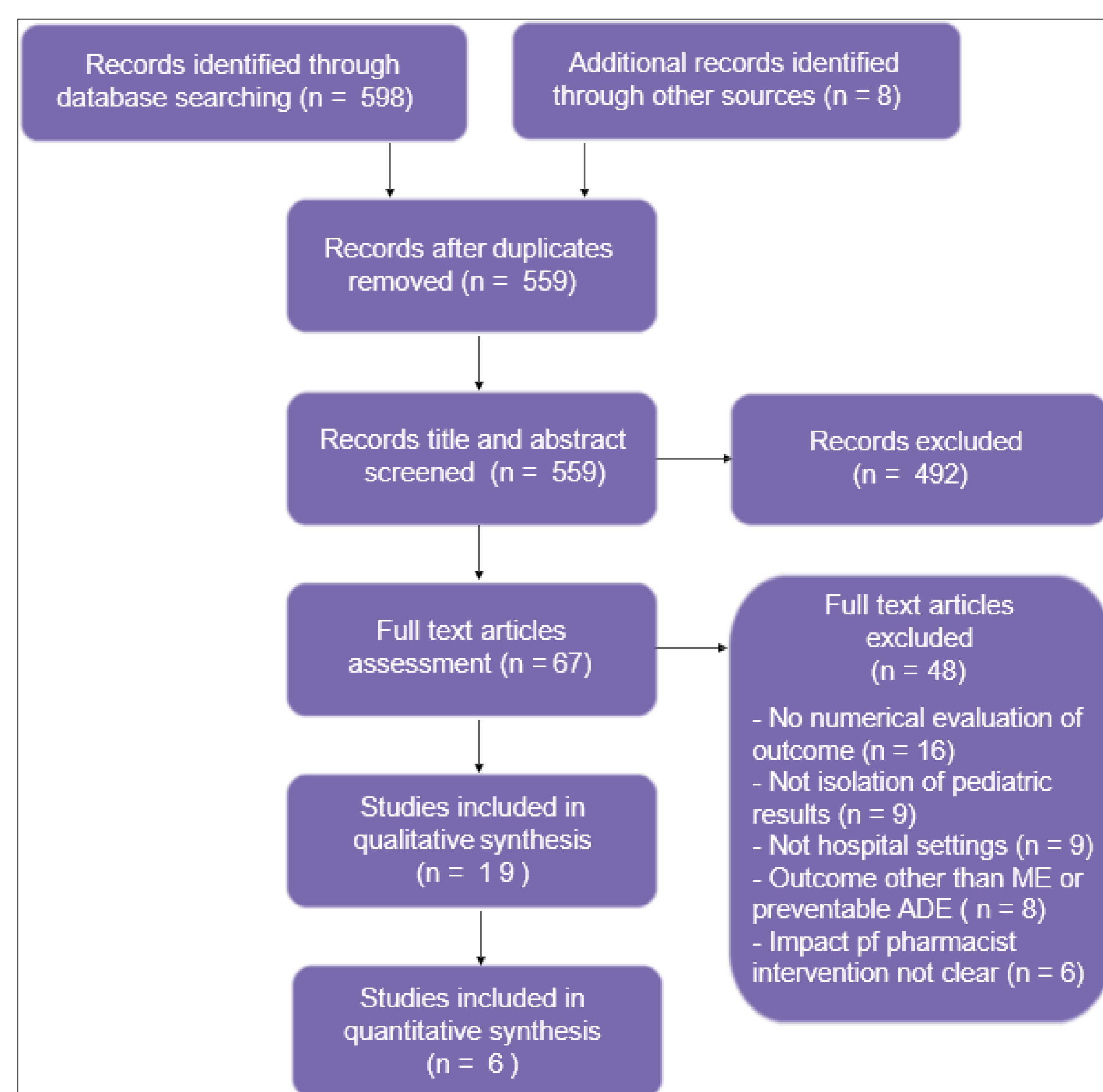
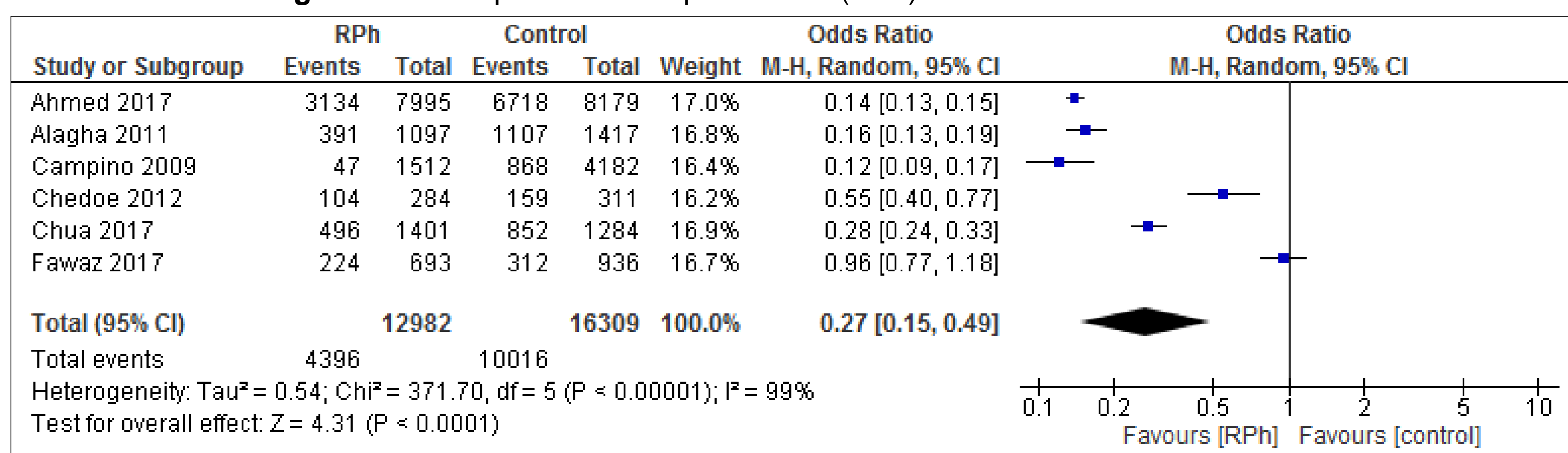


Figure 2. Forest plot of clinical pharmacist (RPh) effect on medication errors



Limitations

- The overall quality of included studies is considered low to moderate
- There is a high heterogeneity amongst studies as a result of the variations in settings (departments within the hospital) and types of pharmacist intervention (e.g. educational sessions, attending rounds, etc.)

Future studies

- Conduct a subgroup analysis on the outcomes of the current study to evaluate the impact of pharmacist on particular MEs (e.g. administration errors)
- Assess the impact of clinical pharmacist interventions in primary healthcare clinics and community pharmacy settings
- Evaluate clinical pharmacist impact on other health outcomes (e.g. mortality, length of stay, emergency department visit) related to MEs

Conclusions

- Dosing errors are the most common type of ME in pediatric patients
- Pharmacist involvement through different types of interventions decreases the rate of ME occurrence, as compared to no pharmacist interventions for pediatric patients admitted to hospital

References

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