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 monitoring.
- Preventable adverse drug reactions (ADR) are medication-related injuries that arise as a result of an error.
- MEs and preventable ADRs are avoidable events that can result in significant patient harm.
- Clinical pharmacists play an integral role in preventing MEs and preventable ADRs in adults.
- Pediatric patients are more prone to MEs which have three times the potential to cause harm as compared to adults.

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 |
| Eligibility Criteria | Inclusion: Hospital settings, Pediatrics (birth-18 years), Medication error rate; Exclusion: Intervention not solely made by pharmacist |
| Selection and Data Extraction | Two reviewers (independently) |

Data Items Extracted
- 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: Forest plot, Random effect model, Odds ratio, Heterogeneity (I²)

Quality Assessment
- 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
- 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, Wrong drug, Wrong formulation, Drug interaction, Wrong administration rate
- Quality assessment: The overall quality of included studies is considered low to moderate (27.9/40) with high similarity between raters (ICC range, 0.948 to 0.997)

Figure 1. PRISMA flow diagram of the study selection process

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

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.