

ISSN 2597– 6052DOI: <https://doi.org/10.56338/mppki.v7i7.5326>**MPPKI****Media Publikasi Promosi Kesehatan Indonesia**
*The Indonesian Journal of Health Promotion***Review Articles****Open Access**

Factors Affecting the Occurrence of Medication Error (ME) in Hospital Pediatrics Unit: Literature Review

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ABSTRACT

Introduction: Medication errors do not only occur in adult patients, but can also occur in pediatric patients. Systematic preventive measures are needed to prevent the occurrence of Medication errors in children. This is because pediatric patients have a weaker body than adult patients so that the negative impact of Medication errors will also have a greater effect on pediatric patients than on adult patients. Therefore, it is necessary to identify what factors can lead to the occurrence of Medication errors so that organizational leaders or related parties can determine what intervention actions can be taken to prevent the adverse effects of Medication errors for pediatric patients in hospitals.

Objective: The aim of this literature review is to analyze and determine what factors influence the occurrence of medication errors in hospitals, especially in the pediatrics unit.

Method: Article searches were conducted through several databases including PubMed, ScienceDirect, and Google Scholar using the keywords "Factor" AND "Medication errors" AND "Pediatrics" AND "Hospital". The total number of articles found was 259 articles, but only 14 articles were relevant to the topic raised.

Result: The study was conducted in 24 hospitals in thirteen countries where each of these hospital has several factors that can cause medication errors in pediatric services with the most common factor being the lack of adherence of health workers to procedures or guidelines for drug administration to patients.

Conclusion: Medication errors that occur in hospital pediatric services are influenced by 3 factors, namely health human resource factors, patient family factors, and environmental factors.

Keywords: Hospital; Medication Errors; Pediatric

INTRODUCTION

Medication errors (ME) can be defined as a failure that can arise during the course of treatment or care [1]. Medication errors can pose a serious problem to public health [2]. MEs not only harm patients, but can also jeopardise patient safety [3]. Often, medication errors are triggered by errors in the process of prescribing medication to patients [4]. Medication errors can occur at any stage or process of administering medication to patients, whether at the prescribing, dispensing or drug administration stage [5]. Errors that occur at one stage of drug prescription preparation can propagate and cause errors at the next stage of drug prescription preparation [6]. Medication errors can be in the form of prescription writing errors by doctors, pharmacist errors in interpreting drug prescriptions, and errors in preparing and administering drugs to patients [7].

Based on research that has been conducted by previous researchers, it can be seen that the administration of drugs to patients is a common cause of medication errors in about 3-7% of hospitalised patients [8]. The number of medication errors has not been recorded accurately and systematically in Indonesia, but ME often occurs when providing health services to patients in health care institutions [9]. Based on data from the Institute of Medicine USA, it can be seen that ME causes 7000 deaths in the USA per year. Another study also mentioned that there were 288 occurrences of ME out of 24,617 treatments performed at the University Hospital of Bern, Switzerland [10]. This shows that ME often occurs during health services and has a fatal impact on patients.

The incidence of ME is mostly found in paediatric patients. This is because children have a more susceptible reaction to the drugs given than adult patients. The incidence of ME in paediatric patients needs to be vigilant and requires special attention because the use of drugs in children can affect the rate of development of the body, metabolic enzymes, the child's body system, and can affect the excretion of the child's body which is still not perfect so that it can endanger the safety of the child if there is a medication error [11]. The incidence of medication errors in paediatric patients can worsen the disease suffered by the patient and can affect the work of his body organs because the enzyme system in drug metabolism in children has not been formed optimally [12].

The incidence of ME can have a fatal impact on the patient. Children's vulnerable bodies require attentive care to avoid the incidence of ME. The high incidence of ME in paediatric patients needs to be stopped and followed up to ensure the safety and security of children during treatment. To follow up on this, of course, it is necessary to know what factors influence the occurrence of ME in hospitals, especially in paediatric services.

Therefore, researchers are interested in knowing what factors influence the occurrence of medication errors in hospitals, especially in paediatric care. By knowing these factors, it is hoped that it can help hospital leaders to evaluate the health services provided to patients and can help stakeholders to set policies by providing an overview of the factors that influence the occurrence of medication errors. With this literature review, it is hoped that cases of medication errors can be prevented while providing services to paediatric patients.

METHOD

The research method used in writing the article is literature review, where the author analyses several articles and puts the results into the article. In searching for articles, the authors used 3 databases including PubMed, Science direct, and google scholar with keywords "Factor" AND "Medication errors" AND "Pediatrics" AND "Hospital". There are several criteria used by the author in selecting articles to be used, including 1) Articles published in the last 5 years, namely in the 2019-2023 range, 2) Articles published by national and international journals, 3) Articles in the form of original articles, free full text and open access. The articles were selected based on the purpose of writing the article, namely to find out what factors influence the occurrence of Medication Errors in paediatric services in hospitals.

From the various literature found, researchers found a total of 66 articles on Pubmed, 143 articles on Science Direct and 2590 articles on Google Scholar. Article searches are limited to slide 5 on Google scholar. So, the total number of articles found by researchers is 259 articles. The article search was continued by selecting articles that have titles and discussions that are relevant to the topic of discussion. From the search that has been done, researchers found 14 articles that are considered relevant and meet the criteria.

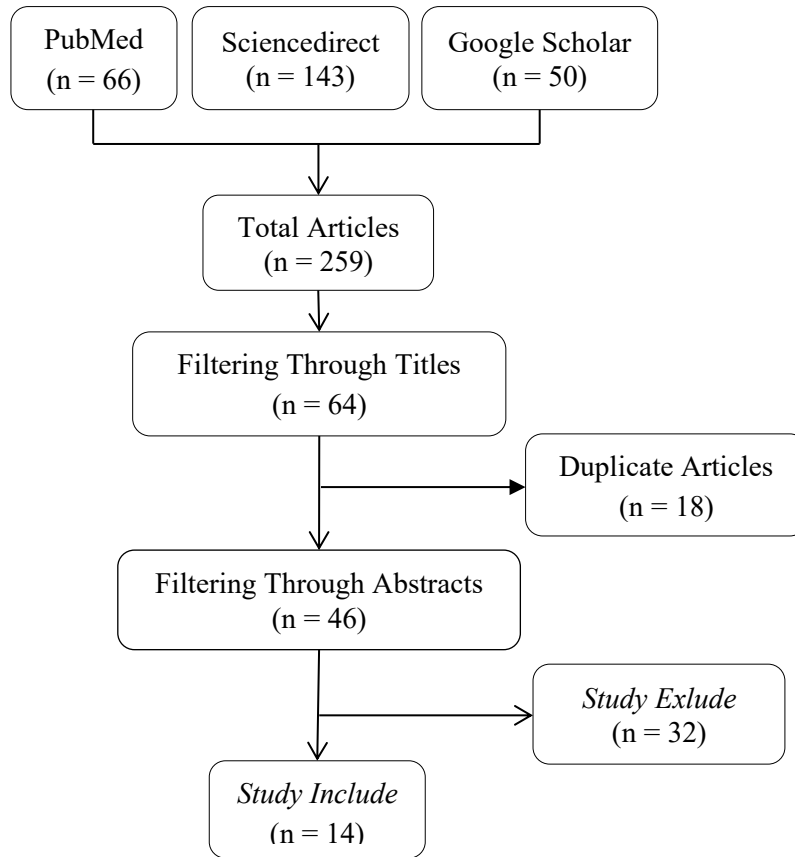


Figure 1. PRISMA diagram

RESULTS

A total of 14 articles were found that were conducted in 24 hospitals located in 13 countries, including: Ethiopia (n = 3), Spain (n = 8), Australia (n = 1), Thailand (n = 1), Saudi Arabia (n = 1), Sudan (n = 1), Malaysia (n = 1), USA (n = 1), India (n = 1), China (n = 1), UK (n = 2), Iran (n = 2), and also France (n = 1). There were three articles published in 2023, two articles published in 2022, one article published in 2021, three articles published in 2020, and five articles published in 2019. Most of the articles found by researchers were found in PubMed and Science Direct.

There are various factors that influence the occurrence of medication errors in paediatric patients. Based on Table 1, it can be seen that the lack of adherence to procedures and guidelines for administering drugs to patients is the most common factor.

Table 1. Summary of research results

No.	Name of author (year)	Title	Research method	Sample / research population	Research location	Results
1.	Bante et al,2023 [13]	Medication errors and associated factors among pediatric inpatients in public hospitals of gamo zone, southern Ethiopia	Mixed methods (quantitative and qualitative) withcross-sectional study	421 paediatric patients admitted to <i>Arba Minch general hospital</i> (AMGH) and <i>Chencha primary hospital</i> (CPH) with the criteria of taking at least one medication and staying in the hospital for at least 24 hours.	Arba Minch General Hospital (AMGH) and Chencha Main Hospital (CPH), Southern Ethiopia	Factors that influence the occurrence of <i>medication errors</i> in paediatric health care include: 1. Inadequate knowledge and skills of health workers 2. Inappropriate drug reconstitution environment 3. Lack of medication compliance in patients 4. Lack of parental involvement in the medication administration process

5. Length of stay of the patient

2.	Beatriz et al., 2023 [14]	Medication errors in children visiting pediatric emergency departments	Qualitative method with multicentre prospective observational study	All patients visiting the paediatric ED with the criteria of being under 16 years of age	8 public hospitals in Spain over a 4-month period	Factors that influence the occurrence of medication errors are: <ol style="list-style-type: none"> 1. Lack of knowledge of the patient's parents and family regarding the medication to be given to the patient. 2. Non-compliance with procedures or guidelines for administering medication to patients 3. Inadequate communication between health workers and patients' families
3.	Khayrallah et al., 2022 [15]	Prescribing in a pediatric hospital setting – Lost in translation?	Qualitative method using semi-structured interviews	20 Parents with the criteria of having a child undergoing anaesthesia at <i>Perth Children's Hospital</i>	Perth Children's Hospital	Factors that influence the occurrence of wrong medication administration in children are: <ol style="list-style-type: none"> 1. Lack of specific description of drug use on drug labels 2. Parents' lack of ability to interpret how to use the medicine on the medicine label.
4.	Tansuwannarat et al., 2022 [16]	Characteristics and Consequences of Medication Errors in Pediatric Patients Reported to Ramathibodi Poison Center: A 10-Year Retrospective Study	Quantitative method with retrospective study for 10 years	121 Patients with criteria less than equal to 15 years old and experiencing therapeutic errors	Ramathibodi Poison Centre (RPC), the poison centre of one of Thailand's teaching hospitals	Factors that influence the occurrence of medication errors in patients, especially paediatric patients, are: <ol style="list-style-type: none"> 1. Health worker work shifts 2. Lack of accuracy of health workers in giving drug doses to patients

5.	Alolayan et al., 2021 [17]	The Prevalence, Severity and Potential Causes of Prescribing and Transcribing Errors among Hospitalized Pediatrics and Pregnant Women in Al-Madinah Al-Munawarah, Saudi Arabia	Quantitative method with <i>cross-sectional</i> study	379 patients whowere pregnant women and paediatrics	500-bed NHS hospital in Al-Madinah Al-Munawarah, Saudi Arabia	Factors that influence the occurrence of drug prescribing errors are: 1. Use of brand names on patient prescriptions 2. Use of drug name abbreviations or non-standardised nomenclature 3. Incomplete drug description 4. Ineffective communication between health workers and patients' families
6.	Abdalla et al., 2020 [18]	Perception of medication errors' causes and reporting among Sudanese nurses in teaching hospitals	Quantitative method with descriptive cross-sectional	196 nurses working in Wad-medani teaching hospital for a minimum period of 6 months	Wad-medani teaching hospital in Wad-medani town, Gazera state, Sudan	Factors that influence the occurrence of medication errors are: 1. Lack of nurses' ability to interpret drugs that have similar names to other drugs 2. Lack of accuracy of health workers in administering drugs to patients
7.	Yao Chen et al., 2019 [19]	Evaluation of a medication error monitoring system to reduce the incidence of medication errors in a clinical setting	Quantitative method by analysing medication error data	Patients and healthcare workers at Xiamen maternity and paediatric hospital	Xiamen maternity and paediatric care hospital	Factors that influence the occurrence of medication errors are: 1. Incomplete diagnosis included in the prescription 2. Lack of accuracy of staff and health workers in drug distribution
8.	Glick et al., 2019 [20]	Discharge Instruction Comprehension and Adherence Errors: Interrelationship Between Plan Complexity and Parent Health Literacy	Quantitative method with prospective cohort study	165 parents of paediatric inpatients with the criteria of being able to speak English and having children under 12 years old	Bellevue Hospital Centre, New York City	Factors that influence the occurrence of medication errors are Lack of understanding and compliance of parents in administering drugs to children
9.	Bharathi et al., 2020 [21]	Medication errors in neonatal intensive care unit of a tertiary care hospital in South India: A prospective observational study	Qualitative method using interviews and semi-structured pretested questionnaires	263 Neonate patients admitted to the NICU	Tertiary care hospitals in South India	Factors that influence the occurrence of medication errors are: 1. Inadequate communication between staff and patients' families 2. High staff workload
10.	Yang et al., 2019 [22]	Prescribing errors in electronic prescriptions for outpatients intercepted by pharmacists and the impact of prescribing workload on error rate in a Chinese tertiary-care women and children's hospital	Quantitative method with cross-sectional study	65,407 female and paediatric patients	Tertiary care women and children's hospital, China	Factors that influence the occurrence of medication errors are: 1. Inadequate communication skills of doctors 2. Incorrect typing of prescription details 3. Inappropriate drug prescription by the doctor 4. Use of abbreviated terms in prescription drugs that are less commonly

recognised

11.	Feyissa et al., 2020 [23]	Medication Error and Its Contributing Factors Among Pediatric Patients Diagnosed with Infectious Diseases Admitted to Jimma University Medical Center, Southwest Ethiopia: Prospective Observational Study	Qualitative method with prospective observational study	325 paediatric patients under the age of 16 who were admitted to JUMC and diagnosed with infectious diseases	Jimma University Medical Centre (JUMC) paediatric ward, Jimma City, Ethiopia	Factors that trigger the occurrence of medication errors are the lack of accuracy of health workers in giving the right dose of medicine to patients.
12.	Sutherland et al., 2019 [24]	Exploring the human factors of prescribing errors in paediatric intensive care units	Qualitative method with semi-structured interviews	22 junior medical staff (paediatricians, anaesthetists, emergency medicine trainees and PICU trainees); 22 consultants; and 8 advanced nurse practitioners (ANPs)	In two PICUs in the north of England	Some factors that cause medication errors are : <ol style="list-style-type: none"> 1. Heavy cognitive load of health workers 2. Heavy workload of health workers 3. Lack of adequate communication 4. Lack of access to adequate information 5. Lack of understanding and skills of health workers in drug utilisation
13.	Eslami et al., 2019 [25]	Identifying medication errors in neonatal intensive care units: a two-center study	Quantitative method with descriptive cross-sectional	Infants admitted to a NICU room for 24 hours or more and receiving at least one therapeutic medication	In the NICU room of Abuzar and Imam Khomeini hospitals in Ahvaz, southwest Iran	Some of the factors that lead to medication errors are: <ol style="list-style-type: none"> 1. Inadequate experience of health workers 2. Densely populated inpatient wards 3. Heavy workload of health workers 4. Manual recipe writing 5. Length of hospitalisation
14.	Charles et al., 2023 [26]	Evaluation of the impact of pharmaceutical trainings and tools on the proper use of medicines in pediatrics	Mixed methods (quantitative and qualitative) with prospective, descriptive, and monocentric studies	Children admitted to the paediatrics unit on 5 November 2020 and 8 March to 19 April 2021	French University Hospital paediatrics unit	Some of the factors that lead to medication errors are: <ol style="list-style-type: none"> 1. Health worker workload increases 2. Inadequate nursing skills 3. Inappropriate drug dosage

DISCUSSION

When viewed from the source of occurrence, factors that influence the occurrence of medication errors in hospital paediatric units can be divided into 3, including factors originating from health human resources, factors originating from the patient's family, and factors originating from the environment.

Table 2. Factors influencing the occurrence of medication errors in the hospital paediatrics service unit

Health Human Resources	Patient's Family	Environment
1. Inadequate knowledge and skills of health workers	1. Lack of knowledge and skills of parents and family members regarding the administration of medication to patients	1. Inappropriate drug reconstitution environment
2. Lack of adherence to patient administration procedures and guidelines	2. Lack of parental involvement in the medication administration process	2. Heavy workload of healthworkers
3. Ineffective communication	3. Lack of adherence to patient medication administration	3. Unqualified health workers' work shifts
4. Lack of accuracy of healthworkers in prescribing drugs to patients	4. Inadequate access to information	

Factors originating from Human Health Resources are all factors that can influence the occurrence of medication errors originating from health workers who are in charge of providing services to patients. HRK is someone who works actively in the health sector, whether or not they have formal health education, and requires authority in carrying out health efforts. SDM can consist of various types of health workers, both clinical and non-clinical health workers [27]. Health workers have an important role in providing optimal service to patients. Health workers take a significant role in the occurrence of medication errors in patients.

Adequate knowledge needs to be possessed by health workers in providing treatment to patients to prevent the administration of treatment that is not in accordance with standards. However, knowledge alone is not enough to ensure the safe administration of patient medication. Health workers must also have adequate skills to support their knowledge in providing safe and optimal treatment to patients [13]. One of the causes of medication errors is the lack of knowledge and skills of health workers in providing treatment to patients.

Based on research conducted by Abdalla et al (2020), there are several nurses who still experience confusion in determining which drugs need to be given to patients because the name of the drug prescribed by the doctor has the same name as other drugs. This indicates that nurses still do not have adequate knowledge about the drugs that will be given to patients. This can certainly pose a danger to patients, especially paediatric patients who have a weak body metabolism. There is a need for continuous education in order to improve health care and increase the effectiveness of the performance of health workers in an effort to reduce ME in patients [28].

Another factor that can influence the occurrence of medication errors is the lack of compliance of health workers with procedures and guidelines for administering drugs to patients. Lack of compliance of health workers with procedures and guidelines for drug administration can be characterised by doctors who provide less specific drug descriptions to patients, use drug name abbreviations and nomenclature that are not in accordance with standards, or diagnoses that are less accurate [13,14,15,17,19,22]. So that it can cause miss-information of nurses, pharmacists or the patient's family when giving prescribed drugs to patients. This is in accordance with research conducted by Alolayan et al (2021) which states that incomplete writing of drug prescriptions can lead to misinterpretation of prescriptions and consequently cause patients to receive inappropriate drugs.

Ineffective communication is also a factor that triggers the occurrence of ME. Communication between nurses and doctors is a major factor in the high rate of medication errors [13]. This is because poor communication can lead to misinterpretation of both the nurse in charge of delivering the medicine to the patient or the patient's family in giving the medicine to the patient. Misinterpretation can make nurses give patients inappropriate drugs which of course have the potential to harm the patient's condition. It is necessary to improve communication between patients, nurses and doctors regarding the prescription of drugs written so that there is no misinterpretation both in the patient's family and the nurse in charge of giving the drug to the patient.

Another factor originating from SDM that can lead to the occurrence of ME is the lack of accuracy of health workers in administering drugs to patients. In a study conducted by Tansuwannarat et al (2022), there were about 3 children who died out of 4 children studied due to drug dosing errors. This can occur because determining the dose of drugs in children is quite complicated because it must adjust to the patient's age, weight, or body surface area as well as drug dilution or small drug volumes given which can cause confusion among medical personnel [16]. Health workers need to have high accuracy before giving drugs to patients to avoid drug dosing errors. Health workers also need to double-check the patient to ensure the accuracy of the patient so that there is no drug administration to the wrong

patient. Nurses can reduce the occurrence of medication errors if nurses are more careful by paying attention to factors that can cause ME in giving drugs to patients [29].

Another factor that can lead to medication errors is family factors. The family is the most important party in the recovery of paediatric patients. Families, especially parents, are the main parties that bridge between health workers and patients. Based on research conducted by Beatriz et al (2023) it was stated that health workers need to involve the patient's family in the patient's treatment.

Health workers should establish adequate communication regarding prescription decisions with parents and/or caregivers. Health workers also need to equip parents/families with adequate knowledge and make them participants in the treatment to avoid errors in administering drugs to patients. Inadequate access to information about the patient's treatment is also one of the triggers for miscommunication between parents and health workers. Parents of patients tend to follow individual understanding and existing instructions without confirming the truth with health workers. Parents' understanding may differ from the prescription instructions, which can trigger ME and jeopardise the patient's condition. Therefore, health workers need to improve effective communication with the patient's family. In addition, long treatment times can also trigger ME in patients. This is because the patient's treatment time can reduce the level of parental compliance in giving medication to the patient. This phenomenon was explained in a study conducted by Bante et al (2023) where the parents' ability to cover medical costs decreased due to the increasing number of hospitalisations. As a result, parents often ignore some prescribed medications and leave the hospital without high medical approval.

Environmental factors that can trigger the occurrence of ME can come from the work environment. Factors caused by the work environment are the high workload of health workers. This high workload can reduce employee performance in completing their duties. The high workload of health workers can affect the ability of health workers to cope with the demands of their work [30]. This is in line with research by Sutherland (2019) where it was stated that health workers need full concentration in managing and prioritising workloads so that it can cause fatigue in health workers. Work fatigue is often identified as a contributing factor to prescribing errors in patients. This is because fatigue can reduce the morale of health workers and the concentration of health workers so that it can trigger the occurrence of ME where nurses can give the wrong medicine to patients.

The shift schedule of health workers also affects the quality of work of health workers. In research conducted by Yang et al., (2019) mentioned that the level of fatigue of health workers will increase at the end of each work shift. This is because the workload at the end of each work shift tends to continue to increase compared to the workload at the beginning of the work shift. This is because health workers still do not feel tired and have a workload that is not too heavy.

Another environmental factor that can trigger the occurrence of ME is an inadequate drug reconstitution environment. According to Bante et al (2023), the incidence of ME may increase in facilities that lack a medication preparation room and respective medication administration guidelines. This is because qualified healthcare providers alone can not ensure medication safety without minimal hospital infrastructure. There is a need for adequate hospital infrastructure in the preparation of patient medication to ensure the safety of drug supply.

CONCLUSION

From the results of the literature review that has been carried out, it can be seen that the factors that can affect medication errors can be divided into 3 groups based on their sources, namely health human resource factors, patient family factors, and environmental factors. HRK factors include inadequate knowledge and skills of health workers, lack of compliance with procedures and guidelines for administering drugs to patients, inadequate communication between staff, and lack of accuracy of health workers in prescribing drugs to patients. Meanwhile, the patient's family factors include the lack of knowledge and abilities of parents and family of patients regarding the administration of drugs to patients, lack of involvement of the patient's parents in the drug administration process, lack of compliance with patient drug administration and inadequate access to information. And finally in environmental factors, including an inappropriate drug reconstitution environment, heavy workload of health workers, inappropriate work shifts of health workers. Interventions are needed to prevent the risk of medication errors.

SUGGESTION

Patient safety is one of the important things that must be considered in providing health services to patients. Not only for adult patients, patient safety also needs to be considered when providing services to pediatric patients. From the results of this literature review, it is known that there are several factors that affect patient safety in hospitals. It is hoped that the classification of these factors can help policy makers in determining what efforts can be made to prevent medication errors in hospitals. Based on the results of the literature review, there are several things that can be done by hospitals to prevent medication errors, including conducting training for hospital medical personnel to improve service quality, enforcing compliance with SOPs and SPMs that apply in hospitals, especially those related

to medical services to patients, improving good communication with patients and their families, paying attention to the safety of hospital building reconstruction, and conducting periodic checks on the safety and feasibility of medical devices used in patient medical services.

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