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Preventing Medication Errors in Healthcare- Nursing Perspective

A Descriptive Literature Review

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This descriptive literature review was done to describe how to prevent medication errors in nursing. The study aimed to produce new knowledge regarding the prevention of medication errors in nursing that will facilitate the development of tools to prevent medication errors made by nurses.

Data was collected from Medline. Nine articles published between 2013 and 2023 were selected. They were screened for relevance using the JBI tool. Inductive content analysis was conducted to analyze the data.

According to the findings, organizational practices like the rights of medication administration prevent medication errors. Likewise, the knowledge of nurses and the ability to identify medication errors can prevent errors. Clearly written medication orders were also found to be crucial. Furthermore, the nurses must re-check the medication labels. Similarly, regularly reviewing the medication processes can prevent errors. Also, a culture where the nurses can accept their mistakes can prevent errors. The findings also showed that adequate staff in a shift, manageable workload and training can prevent errors. Finally, there must be resources for medication preparation. Tight schedules at work and lack of time for documentation were found in the study to be challenges in preventing medication errors. Other challenges were verbal handover, when nurses write orders in place of a physician and when physicians do not write orders legibly, in time and update them. The study also identified that the barriers to medication error reporting were challenges in preventing medication errors. Finally, the lack of a favorable physical environment for medication preparation was a challenge.

Nurses must be trained to improve their knowledge, skills and attitudes toward medication administration. They must be encouraged to follow the rights of medication administration, double-check with another nurse and follow standard procedures. They must report when an error or near-miss occurs. Adequate facilities and resources must be available for medication preparation without interruption.

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Keywords	medication errors, nursing perspective, error prevention

Contents

1 Introduction

Medication errors represent a prevalent cause of preventable harm to patients, often resulting in adverse health effects and financial burdens (Scott 2016: 61-62). A medication error can be defined as 'any preventable event that may cause or lead to inappropriate medication use or patient harm while the medication is in the control of the health care professional or patient'. This can manifest during prescription, order communication, product labeling, packaging, nomenclature, distribution, administration, education, monitoring and usage. (Payne 2016: 04.) the Institute of Medicine estimates that medication errors contribute to 1 in 131 outpatient deaths and 1 in 854 inpatient deaths, underscoring their significance in patient morbidity and mortality. Factors related to medication, patients and healthcare professionals can all contribute to medication errors, with consequences ranging from the loss of patient trust to criminal charges and medical board discipline. Approaches such as information technology, enhanced drug labeling and medication reconciliation albeit with varying success in preventing medication errors. A comprehensive understanding of how medication errors can be prevented is important for healthcare professionals to deliver safe care to their patients. (Wittich, Burkle and Lanier 2014: 1116-25.)

Safe medication administration is the responsibility of nurses, and it is a vital aspect of patient care and recovery. Medication errors, which can lead to unfavorable outcomes for patients may occur at any point of the medication procedure; in the doctor's orders, prescription, dispensing medication, administering and documentation. (Salar, Kiani and Rezaee 2020: 1.)

It is necessary to systemize the guidelines in order to prevent medication errors. This involves education and training programs, standardized procedures, adherence to the rights of medication administration, documentation, open communication, enhancing labeling and packaging, minimizing workload, preventing distractions, ensuring job security for nurses and cultivating a blame-free workplace. (Alrabadi, Shawagfeh, Haddad, Mukattash, Abuhammad, Al-rabadi, Farha, Alrabadi and Al-Faouri 2021: 79.)

The purpose of the study was to describe how to prevent medication errors in nursing. The study aimed to produce new knowledge regarding the prevention of medication errors in nursing and to facilitate the development of tools to prevent medication errors made by nurses.

2 Background

2.1 Medication errors

According to Merry and Wahr (2021), 5.3% of medication administrations result in errors, with 79% deemed preventable. Most medication errors occur during prescribing and administration stages (Merino, Martin, Alonso, Gutierrez, Alvarez and Becerril 2013: 395). Common types of medication administration errors include incorrect dose forms, incorrect frequencies, incorrect routes of administration and illegible handwriting. (Suclupe, Martinez-Zapata, Mancebo, Font-Vaquer, Castilla-Masa, Vinolas, Moran and Robleda 2019: 1196). The contributing factors to these errors include poor handwriting, confusing symbols, the use of abbreviations and translation issues (Tariq, Vashisht, Sinha and Scherbak 2023). Human factors such as stress and miscommunications also play a role in medication errors (Hayes, Jackson, Davidson and Power 2015: 3067).

Organizational factors, such as high workload and insufficient resources impact the nurses' workflow, hindering their ability to engage in safe medication administration practices (Banda, Simbota and Mula 2022: 2; Martyn, Paliadelis and Perry 2019: 109). Nurses are susceptible to making errors when they are interrupted (Prakash, Koczamara, Savage, Trip, Stewart, McCurdie, Cafazzo and Trbovich 2014: 891). A leading cause of medication errors was due to interruptions in the medication administration process. (Hayes et al. 2015: 3064). The primary source of interruptions is often phone calls (Suclupe et al. 2019: 1197), while other interruptions stem from conversations unrelated to the medication administration process, environmental distractions and unexplained loss of focus (Hayes et al. 2015: 3067), system failures, such as missing medications, environmental noise and sudden emergencies in the healthcare setting (Getnet and Bifftu 2017: 2). Interruptions during the medication administration process represented a significant contributor to medication errors, accounting for 43% of errors, with 89% having adverse effects on patient care. This process is identified as the most interrupted nursing activity, and it affects the nurses as they experience anxiety, stress and dissatisfaction. (Getnet and Bifftu 2017: 1.) Errors due to this cause can be reduced by double-checking the medications (Alteren, Hermstad, Nerdal and Jordan 2021: 7).

Physicians make prescribing errors which may be due to dosing errors; underdosing or overdosing, writing errors, lack of knowledge about patient allergies, unspecified

duration of treatment, drug interactions and unnecessary prescribing. (Seden, Kirkham, Kennedy, Lloyd, James, Mcmanus, Ritchings, Simpson, Thornton, Gill, Coleman, Thorpe and Khoo 2013: 4-6.)

Packaging designed for product safety during transport and storage can lead to confusion if they look alike or sound alike. The patient receives wrong medicines or wrong doses and this accounts for 33% of the medication errors. (Nayak, Katta, Thunga, Pai, Khan and Kulyadi 2022:101161.)

Consequently, medication errors result in adverse drug reactions, contributing to patient morbidity and mortality (Classen, Munier, Verzier, Eldridge, Hunt, Metersky, Richards, Wang, Brady, Helwig, Battles 2021: e234). Furthermore, medication errors result in prolonged hospitalization, increased readmission rates, post-discharge disability and emotional distress (Hayes et al. 2015: 3064).

2.2 Nursing Error Prevention

The primary objective of nursing is to protect patients and, ideally, prevent any harm (Cleary-Holdforth and Leufer 2013: 218). Nurses are responsible for delivering quality care and ensuring patient safety and hey have a major role in preventing medication errors (Hammoudi, Ismaile and Yahya 2018: 1038-1039).

The majority of medication errors tend to occur during the administration phase (Hayes et al. 2015: 3064; Ruano, Villamañán, Pérez, Herrero and Álvarez-Sala 2016: 32). Consequently, it is crucial to minimize errors during the administration of medications (Noguchi, Sakuma, Ohta, Bates, Morimoto 2016: 1133). The universally accepted framework for ensuring safe medication administration is based on the ‘rights’ of medication administration. This framework ensures that the correct patient receives the correct medication at the correct time, in the correct dosage and via the correct route. (Martyn, Paliadelis and Perry 2019: 109.)

The medication administration process involves the collaboration of multiple health professionals (Martyn, Paliadelis and Perry 2019: 109). During this process, the practice of double-checking is crucial, typically involving two or three individuals verifying the same information, thereby contributing to error reduction. Additionally, even when performed by a single individual, double-checking can minimize errors. (Koyama, Maddox, Li, Bucknail and Westbrook 2020: 596-600.)

Proper documentation is a vital aspect of the medication administration process, as incomplete or incorrect documentation can lead to incorrect clinical decision-making and adverse effects for patients. Timely documentation is essential, as delays can hinder the medication administration process and disrupt nursing practice. Furthermore, documentation may compromised when it requires additional effort, such as when nurses postpone documentation until the end of their shift rather than completing promptly it after administration. (Hammer, Wagner, Rieger and Manser 2019: 1-10.)

Factors such as a lack of access to knowledge on medications, nonadherence to medication administration guidelines, interruptions and burnout were identified as nursing factors contributing to medication errors (Hammoudi et al. 2018: 1043). It is essential for nurses to be self-aware and engage in continuous reflection on their practice (Scott 2016: 61). The level of knowledge of the nurses is influenced by their curriculum, training opportunities, availability of facilities and resources and their practical expertise. Negative attitudes leading to behaviors such as failure to follow guidelines are associated with medication errors. (Alandajani, Khalid, Ng and Banakhar 2022: 1024.) Conversely, knowing the patient's medical history is crucial to understand their health status. This includes information on the patient's illnesses, previous surgeries, family history, social history and allergies, all of which play a role in determining the appropriate choice of medications. Additionally, being aware of the patient's medical history and the drugs that the patient is already taking can help minimize potential drug interactions. (Nichol, Sundjaja and Nelson 2022: 1.)

Medication errors are often linked to nurses' negligence, which may stem from a lack of knowledge or a negative attitude (Abdel-Latif 2016: 88; Vaismoradi, Tella, Logan, Khakurel and Vizcaya-Moreno 2020: 2). Nearly 7 in 10 medication errors result from negligence and the failure to report these errors (Hammoudi et al. 2018: 1039). Communication plays a crucial role in preventing medication errors (Scott 2016: 61). Errors frequently occur when medication orders are communicated verbally (38.2%) and due to miscommunications (34.1%) (Hammoudi et al. 2018: 1043). This also includes the absence of communication after an error has occurred (Rogers, Griffin, Carnie, Melucci and Weber 2017: 308-309). Therefore, an effective strategy to prevent medication errors is to record and report errors and near-misses, which can help identify causes, strengthen the healthcare system and minimise risks. (Goedecke, Ord, Newbould, Brosch and Arlett 2016: 493; Tariq et al. 2023.) However, it was found that nurses were more inclined to report the errors to a physician (49.4%) than to use the reporting system (29%). Common reasons for not reporting errors include hesitancy to be seen as incompetent among peers, fear of punishment and unawareness that a mistake had

been made. (Dirik, Samur, Intepeler and Hewison 2019: 934.) Underreporting errors was also associated with cultural views on identifying when an error occurs (Alandajani et al. 2022: 1037). The lack of awareness among nurses regarding medication error reporting is also a significant issue (Abdel-Latif 2016: 89).

Concerning this, a study that utilized data from the European Public Assessment Report registry underscored the importance of managing and minimizing the risks associated with medication errors. Simultaneously, the study revealed that it is not possible to eliminate all medication errors with a single approach because the errors varied, and a clear pattern did not exist. Routine risk assessment was identified as a method to minimize medication errors due to this factor (Hoeve, Francisca, Zomerdijk, Sturkenboom and Straus 2020: 53.)

Furthermore, the significance of patient-centered approaches in achieving patient-centered outcomes has also been emphasized. Consequently, the timely and accurate handover of medications at all stages of the medication process is crucial for preventing medication errors. This necessitates coordinated efforts from healthcare professionals, focusing on the patient's needs. Patients and their carers may also play a role in these efforts. (Wheeler, Scahill, Hopcroft and Stapleton 2018: 74.)

The proficiency of the nurses in clinical practice can be significantly improved through training (Ortega, Cecagno, Llor, de Siqueira, Montesinos and Soler 2015: 408; Ragheb, El.Sayed, El.Sayed and Metwally 2016: 117). It is essential to create a conducive work environment that allows for the preparation and administration of medications, including double-checking procedures without interruptions (Vaismoradi et al. 2020: 8). Additionally, a focus on systemic changes and the identification of risk factors throughout the medication process may be necessary to prevent errors (Farzi, Irajpour, Saghaei and Ravaghi 2017: 162). For instance, re-designing medication packages and improving can help minimize medication errors by addressing confusion arising from similar appearances and names (Hammoudi et al. 2018: 1043).

3 Purpose, Aim and Study Questions

The purpose of the study was to describe how to prevent medication errors in nursing.

Similarly, the aim of the study was to produce new knowledge regarding the prevention of medication errors in nursing that will facilitate the development of tools to prevent medication errors made by nurses.

The study questions were:

1. How to prevent medication errors in nursing?
2. What are the challenges of preventing medication errors?

4 Methodology and Methods

4.1 Data Collection Method

The rapid increase in the generation of new knowledge through research in the healthcare field poses a significant challenge in staying updated and evaluating the existing body of evidence. Therefore, literature review as a research method is relevant as a systematic approach to collecting and synthesizing previous research studies without involving primary data. (Synder 2019: 333-339.) In line with this, a descriptive literature review was conducted to fulfill the aims of the study. The systematic procedure encompasses searching, screening and categorizing studies to develop new frameworks and theories (Kuziemsky and Lau 2017: 157-159). A descriptive literature review assesses the extent to which knowledge in a specific area reveals patterns or trends related to existing theories and findings. It uses structured methods to form a sample from the broader population of information. This identifies trends and draws conclusions with the available information related to the study area. (Paré and Kitsiou 2017:162.)

Initially, the justification for the review was established, the objectives were clarified and the key concepts were outlined. The research questions played a pivotal role in guiding the entire review process, determining the type of information needed, influencing the search and selection of literature and directing the subsequent analysis. Afterwards, articles were collected and their suitability for inclusion in the study was assessed. The applicability and relevance of each study were also evaluated based on the pre-defined inclusion and exclusion criteria. In addition, a quality assessment of the research designs and methods was conducted to further refine the selection by excluding studies that did not meet the required standards. Finally, relevant information from the remaining studies was gathered and extracted to address the study questions. The acquired information was then presented in a structured manner.

4.2 Data Search and Selection

The data search was done on CINAHL and Medline. Advanced searches were conducted with search terms ‘medication error*’, ‘drug use error*’, ‘drug error*’, ‘nurs*’, ‘prevent*’ and ‘avoid’, along with Boolean operators ‘AND’ and ‘OR’ to combine these keywords.

The basis for including and excluding studies was based on a predetermined set of criteria. This determined the applicability and relevance of the material that was obtained through the searches (Table 4.1)

Table 4.1 Inclusion and exclusion criteria

Inclusion Criteria	**Exclusion Criteria**
Articles published between 2013 and 2023	Articles published before 2013
Articles written in the English language	Languages other than English
Peer-reviewed, with abstract available	Non-peer-reviewed articles, articles with no abstract available
Original articles	Reviews
Focusing on medication errors made by registered nurses	Pertaining to medication errors by other healthcare professionals, including students

The studies that were extracted based on the inclusion and exclusion criteria are illustrated in the PRISMA flowchart (Figure 4.1). Initially, 308 studies from Medline and 9 from Cinahl were obtained. The advanced search on the databases aimed to obtain studies published between 2013 to 2023, in the English language. The screening process began with individual screening based on titles, where studies containing two or more search words from the advanced search were included. Subsequently, 272 studies from Medline and all the studies from Cinahl were excluded, resulting in 36 studies. The screening process continued with an individualized evaluation of abstracts for relevance to this study, leading to the exclusion of 20 studies. This left 16 studies, and their full texts were further examined for alignment with the study objectives. By the end of this phase, 7 studies were excluded, leaving 9 studies. These studies were screened for their relevance using the JBI tool.

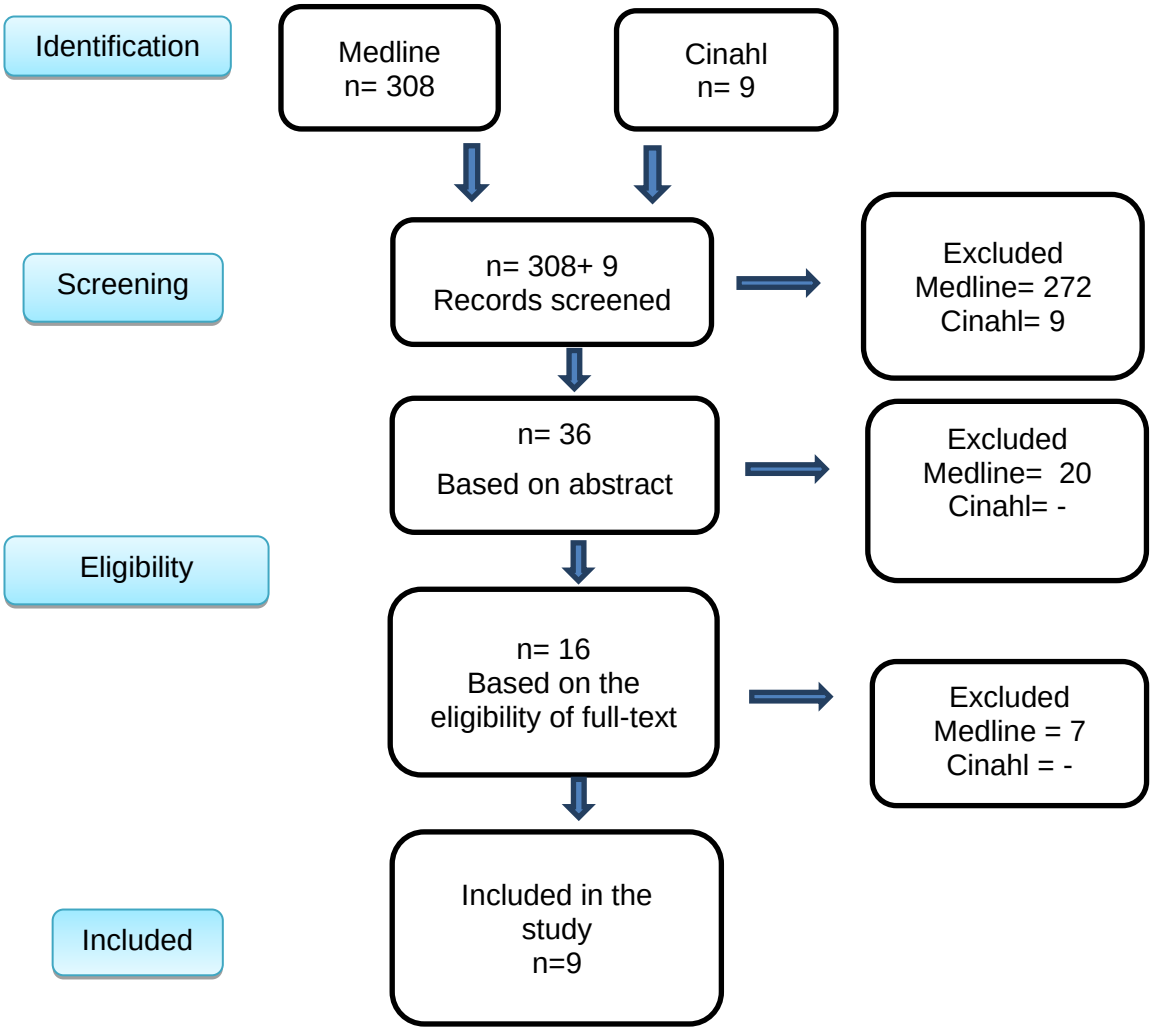

Figure 4.1 PRISMA Flowchart

4.3 Data Analysis Method

Inductive content analysis was employed to analyze the data. This method involves the reduction and grouping of information to address research questions using concepts, categories or themes. The results of the content analysis are reported under themes. (Kyngas 2020: 13-21.) Inductive content analysis is similar to thematic analysis, a widely used qualitative analysis method, which entails coding, labeling and grouping information to align with the study objectives and answer research questions. (Vears and Gillam 2022: 113). To effectively analyze and synthesize the data, the studies must be collated, summarized, aggregated, organized and compared to present the data in a meaningful way (Kuziemsky and Lau 2017: 160). The coding must be fol-

lowed by comparing, grouping and subdividing groups of codes which lead to categories and sub-categories (Vears and Gillam 2022: 114).

The analysis process commenced with screening the studies against the inclusion criteria, followed by a quality appraisal using the JBI tool (Appendix 1). The screening involved thoroughly reading through all the data for familiarization. The coding was done by organizing the data, by identifying and labelling sections of data based on the main concepts concerning the study. Subsequently, sections from the texts were individually labelled, ensuring alignment with the research questions. In doing this, it was vital to ensure that the analysis aimed to answer the research questions and to obtain a productive outcome upon completion of the study.

The initial coding was followed by iterative coding while grouping, comparing and adjusting the codes by focusing on the main data to identify newer codes. Categories and sub-categories were formed and they were compared and refined. Similar sub-categories were consolidated. At the same time, subcategories that required narrowing, more meaning, or further specification were modified and they were grouped or ungrouped accordingly to produce and interpret the most suitable data. The crucial aspect of the analysis was the interpretation in accordance with the research questions, presenting categorised data under the research questions.

Table 4.2 exemplifies the coding process for a generic category addressing the first research question: ”How to prevent medication errors in nursing?”

Table 4.2 An example of data analysis - coding, grouping and abstraction

Main category - Preventing medication errors in nursing			
Meaning Unit	**Codes**	**Sub-category**	**Generic category**
Nurses comply with five rights of medication administration: right drug, right dose, right time, right route, right patient (Alomari et al., 2017: 101)	Following the rights of medication administration	Following standards for medication administration	Adhering to standard organizational procedures
Implementation and adherence to the medication and handling policy implemented by the hospital covers all the steps in the	Adhering to organizational policies in the medication		

medication process, which requires two registered nurses to double-check the medication administration process could minimize or rather prevent errors (Alomari et al., 2017: 101)	administration process		
Following safe medication administration procedures in the organization (Güneş et al., 2014: 298).	Following organizational procedures for medication administration	Following policies in dealing with medication errors	
Utilizing risk management strategies to confront unsafe situations and adopting a multi-dimensional perspective to prevent medication errors and enhance patient safety (Pazokian et al., 2014: 249).	Risk management strategies		
Reporting of medication errors (Güneş et al., 2014: 298)	Reporting medication errors		

5 Results

The articles were gathered from two databases: Cinahl and Medline. No articles from Cinahl met the inclusion criteria and other specified requirements (Figure 4.1). The search strategy applied to Medline derived nine research studies for this descriptive literature review. These studies underwent critical appraisal to validate their significance and relevance within the research context (Appendix 1). The identified studies included three qualitative studies, one quantitative study, four descriptive studies and a study with a mixed method approach. Geographically, two studies were from Jordan, another two from Turkey and the remaining ones from Australia, the United Kingdom, Ethiopia, Iran and the United States. All the articles focused on medication errors in healthcare and nursing perspectives, as well as strategies for medication error prevention. A comprehensive summary of these nine articles is found in Appendix 2.

The main results are summarised in the figure below,

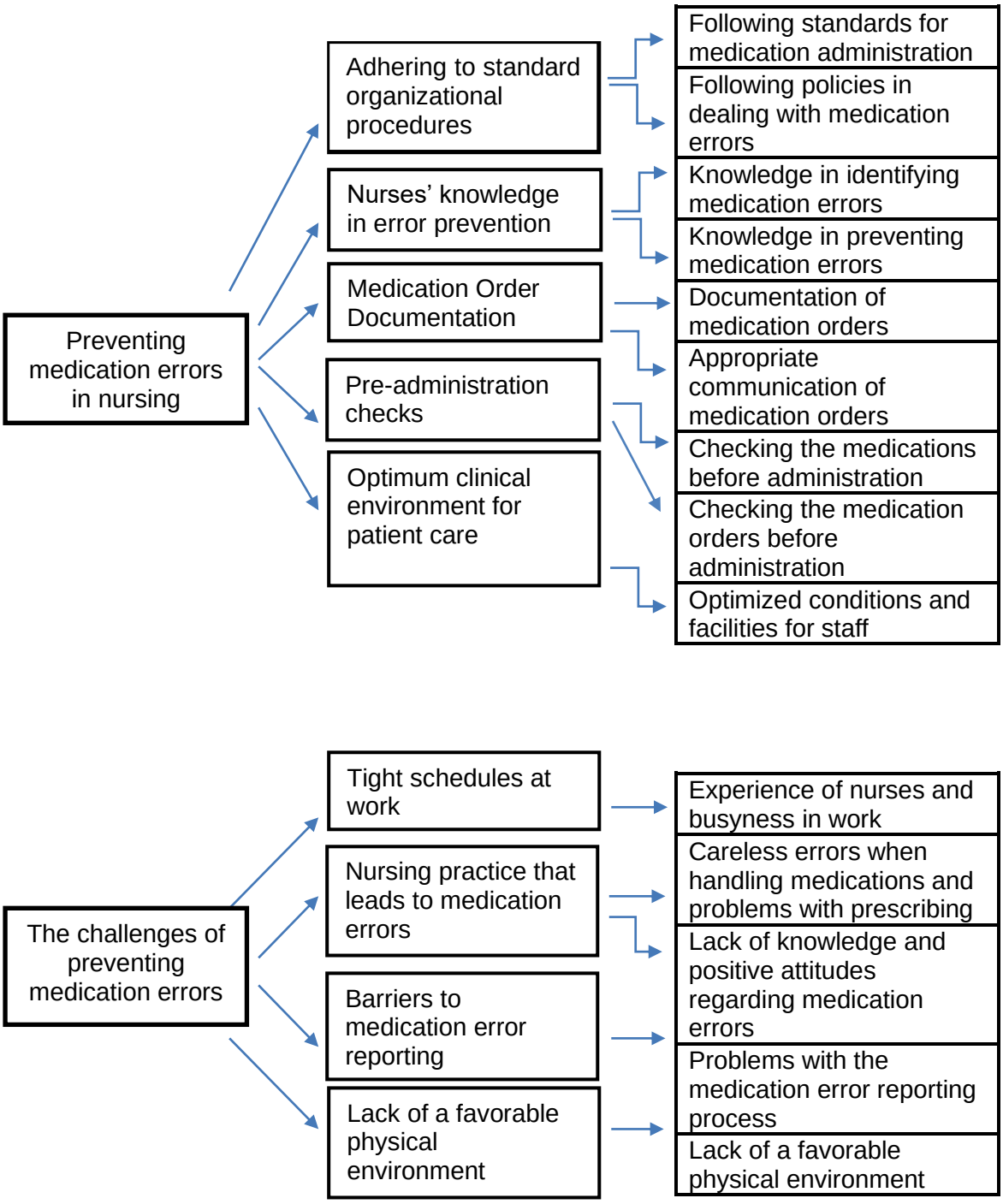

Figure 5.1 Summary of the results for the two research questions

5.1 Preventing medication errors in nursing

5.1.1 Adhering to standard organizational procedures

Adhering to the rights of medication administration is crucial for preventing errors among nurses. Nevertheless, a significant portion failed to perform a 'double-check' of the dose (nearly one-third) and verify patient identity (over 50%). However, all nurses ensured checking the medication and route of administration, with only a small percentage (7.7%) neglecting to verify the time. (Alomari, Wilson, Solman, Bajorek and Tinsley 2017: 101.)

Simultaneously, a noteworthy of 84.5% of nurses did not comply with the practice of 'checking one medication at a time for one patient,' although they expressed knowledge of the main aspects of medication policy. Double-checking of medications at the bedside was uncommon; almost 70% of nurses did not engage in this practice. Findings also revealed that a majority of nurses (77%) signed before witnessing the administration. (Alomari et al., 2017: 101.)

Following the organizational procedures for safe medication administration is considered a preventive measure against errors. However, 52.3% of the nurses reported the existence of such procedures in the hospital, while 41.6% asserted the absence of such protocols. Reporting medication errors is emphasized as a means to prevent their repetition. (Güneş, Gürlek and Sönmez 2014: 298.)

Strategies to manage medication errors can enhance a multi-dimensional perspective to prevent errors and improve patient safety. Risk management provides a logical approach to handling unsafe situations and proves to be an effective method for reducing medication errors. (Pazokian, Zagheri Tafreshi and Rassouli 2014: 249.)

5.1.2 Nurses' knowledge in error prevention

In general, nurses demonstrated a lack of knowledge regarding what constitutes an error and a near-miss which led to a limited understanding of the overall situation (Haw, Stubbs and Dickens 2014: 802). The nurses recognized that missing a dose was an error, but they perceived it as less severe than administering the wrong dose. Nurses ignored when medication errors resulted in minimal side effects. The nurses were not aware of what exactly an error is and what should and should not be reported. They considered errors as part of their practice and failed to admit them, which led to repetition. (Alomari et al., 2017:102.)

Errors in drug administration occurred when nurses lacked knowledge of drug administration. For instance, medication errors were the result of incorrectly set or adjusted infusion devices and when the nurses were confused by the different types and functions (Mrayyan, Al-Atiyyat, Al-Rawashdeh, Sawalha and Awwad 2020: 566.)

5.1.3 Medication Order Documentation

The use of verbal orders instead of written instructions from doctors contributed to medication errors (Çetin and Cebeci, 2021: 59; Güneş et al., 2014: 298). Unclear instructions for nurses to administer drugs were causes of error (Güneş et al., 2014: 298).

Unclear handwriting of doctors can also cause medication errors (Çetin and Cebeci, 2021: 59). Doctors must ensure clear documentation of medication orders on patient reports and medication charts. This would prevent the nurses from repetitively requesting them to do so (Alomari et al., 2017: 103).

5.1.4 Pre-administration Checks

Considering the patient's medical history is crucial in preventing medication errors, as it is required to make accurate decisions about medications, especially for patients with specific health conditions. (Pazokian et al., 2014: 248-249.)

Medication errors resulting from confusion due to different medications with similar appearance can be eliminated by re-checking the medications at all times (Çetin and Cebeci, 2021: 59). Additionally, the nurses stated that medication errors occurred due to low-quality or damaged medication labels or packaging as it affected the ability to read them (Mrayyan et al., 2020: 566).

Re-checking written orders before administration can minimize errors caused by interruptions, such as phone calls or questions during medication preparation (Güneş et al., 2014: 298).

Reviewing orders can reduce the need for frequent drug substitutions (Çetin and Cebeci, 2021: 59), writing the medication orders on time, updating them when necessary and writing them legibly (Güneş et al., 2014: 298). Similarly, constantly reviewing the system and employees can identify and prevent problems, which will prevent repetitions to ensure an effective medication administration process (Ali, Saifan, Alrimawi, Atout and Salameh, 2021: 3).

5.1.5 Optimum clinical environment for patient care

Nurses admitted that they were reluctant to accept their mistakes as their attitudes were affected by their culture (Ali et al., 2021: 4). A climate where the nurses can be honest and accept their shortcomings without the fear of consequences is an optimal environment for learning and this must be created a suitable climate in the clinical setting (Pazokian et al., 2014: 249).

Furthermore, Çetin and Cebeci (2021) identified inadequate staff in a shift, heavy workloads and insufficient in-service training on new medicines for nurses as causes of medication errors (Çetin and Cebeci, 2021: 59). Adequate resources in the medication room for medication preparation increased the efficiency of the medication administration process (Alomari et al., 2017: 103-104). Thus, the elimination of gaps in these aspects can minimize medication errors (Çetin and Cebeci, 2021: 59).

5.2 The challenges of preventing medication errors

5.2.1 Tight schedules at work

The administration of medication has led to increased activity during peak hours on the ward. The requirement mandating two nurses to verify each drug by double-checking has led to overcrowding in the medication room. (Alomari et al. 2017: 41.)

At the same time, the documentation process created additional pressure and necessitated extra time. Even though the nurses acknowledged the importance of documenting medication administration in preventing errors, it is recognized that this adds to the workload. (Haw et al., 2014: 802.)

5.2.2 Nursing Practices that lead to medication errors

In many healthcare settings, updates on patient medication management are typically conveyed verbally during shift changes. However, a written handover goes beyond, offering details on significant medication issues and other crucial clinical information. (Alomari et al. 2017: 41.)

The main factor contributing to medication errors was the necessity to write an order instead of having a physician do so. The second most common factor was the issuance of an oral order in non-emergency situations. Subsequent factors included physicians not timely writing medication orders, not writing them at all, failing to update orders, and

many physicians writing medication orders in an illegible manner. (Güneş et al. 2014: 298.)

5.2.3 Barriers to Medication Error Reporting

The potential obstacle of additional time to error reporting is significant. Barriers to reporting include user-unfriendly reporting processes, insufficient training in these procedures, and a lack of prompt feedback on the outcomes of reporting medication errors. (Rutelge, Retrosi and Ostrowski 2017: 1950; Jember, Hailu, Messele, Demeke and Hassen 2018: 1-8.)

Concurrently, the lack of an easily accessible reporting form, a lack of understanding of reporting or who is liable and the perception that reporting does not improve the quality of patient care act as barriers to error reporting, which could reduce or eliminate the possibility of error recurring (Rutledge et al. 2017: 1951).

5.2.4 Lack of a favorable physical environment

The time required for medication preparation and frequent disruptions during the medication administration process are directly influenced by the physical environment (Alomari et al., 2017: 9).

The physical setting of the ward significantly affected both the preparation of medication and overall safety This was particularly evident in instances where the limited space accommodated "Seven nurses and students," contributing to a crowded environment. The predominant challenges were mainly associated with the medication room, where space constraints were notable, resources such as calculators and reference books were lacking, and essential supplies like computers were stored outside the medication room. (Alomari et al., 2017: 9.)

6 Discussion

6.1 Discussion of Results

The findings of this thesis reveal insights into the prevention of medication errors in nursing and the challenges of preventing medication errors. These results are summarized and compared with the background and presented in this chapter.

This review emphasizes the significance of adhering to the rights of medication administration. A study conducted in Australia supports the notion that following these rights can effectively minimize medication errors. However, it is emphasized that safe medication administration goes beyond merely following the rights of administration, as nursing care is inherently patient-centered (Martyn, Paliadelis and Perry 2019: 109). Additionally, the practice of double-checking before medication administration has been identified as effective in reducing errors (Koyama et al. 2020: 596). Similarly, re-checking in instances of interruptions during the medication process is highlighted as a preventive measure against subsequent errors. (Alteren et al., 2021).

In addition, adherence to organizational procedures for medication administration is crucial for enhancing error prevention. Implementing risk management strategies can effectively minimize or prevent errors, as supported by a study conducted in the Netherlands (Hoeve et al. 2020: 53).

The research identified that maintaining adequate staffing levels during a shift, managing a feasible workload and providing training on new medications contribute to error minimization. High nurse workloads of nurses resulting from low levels of staffing can significantly impact patient care (Martyn et al. 2019: 109), potentially leading to missed or improper care, or care may be given in the wrong manner (Banda et al. 2022: 2). Training programs not only enhance nurses' knowledge but also improve efficiency, reduce mistakes, enhance job satisfaction and mitigate turnover (Ragheb et al. 2016: 117). Consequently, ensuring resources are available for medication preparation is crucial (Martyn et al. 2019: 109; Banda et al. 2022: 2).

The knowledge of the nurses plays a pivotal role in preventing errors. Their understanding of medication administration and the ability to identify and acknowledge errors is essential. Therefore, knowledge emerges as a critical factor in preventing medication errors (Vaismoradi et al. 2020: 2028). Similarly, fostering a positive attitude toward patient safety and safe practice is vital (Alandajani et al. 2022: 1024).

Moreover, effective documentation emerged as a key factor in preventing errors. The study findings underscored the importance of detailed and clearly written documentation for optimal flow of patient care information (Hammer et al. 2019: 1-10). Reviewing the patient's medical history before medication administration can minimize errors related to drug interactions by uncovering potential under-treated illnesses or health effects (Nichol, Sundjaja and Nelson 2022: 1).

Nurses must check the medication labels and packaging to avoid confusion that can lead to errors, which is a factor identified by Nayak et al. (2022) and Hammoudi et al. (2018) as contributing to medication errors.

Further, the study emphasized the importance of reviewing, timely writing, updating orders and maintaining legible writing to prevent errors. The link between illegible writing and medication errors was noted in a recently published American book (Tariq et al. 2023). Similarly, conducting systemic reviews of the healthcare system and protocols and identifying gaps in processes can prevent the recurrence of medication errors (Goedecke et al. 2016: 493; Tariq et al. 2023). Creating an optimal clinical environment is crucial, including fostering a culture where the nurses can openly admit their mistakes and communicate to report and disclose errors (Rogers et al. 2017: 309).

On the other hand, this review delves into the challenges associated with preventing medication errors. It was revealed that medication errors in healthcare settings are caused by tight schedules (Koyama et al. 2020: 596). The requirement for two nurses to double-check led to overcrowding in the medication room and distractions during this process (Hayes et al. 2015: 3067).

Effective documentation following medication administration, crucial for preventing medication errors, faces challenges as it was identified in the study to demand additional time. Despite the extra effort involved, proper documentation is essential for preventing erroneous decision-making and potential adverse effects for patients (Hammer et al. 2019: 1-10).

The findings uncovered that medication errors resulted from physician malpractices of physicians, including situations where nurses had to write orders on behalf of physicians, when oral medication orders were given by physicians during non-emergencies, when orders were not written on time, not written at all, not updated or were illegibly written. Consequently, prescribing errors by physicians were identified as a contributing factor to medication errors, as indicated in a study conducted in England (Seden et al. 2013: 4-6.)

Verbal communication of medication errors during handover, instead of formal error reporting, was found to be less effective in minimizing errors. Alandajani et al. (2022) emphasized the prevalence of verbal reporting. While reporting medication errors can reduce the likelihood of their repetition (Tariq et al. 2023), the requirement for additional time serves as a barrier. (Hammer et al. 2019: 1-10). Errors stemming from human factors such as stress and miscommunications were also identified as contributors to

medication errors (Hayes et al. 2015: 3067). moreover, the reporting process was characterized as unfriendly and the results of the study indicated that nurses training in this aspect. Simultaneously, the results stated that nurses were unaware of the benefits of error reporting, a finding echoed by Abdel-Latif (2016), who highlights the association between under-reporting and knowledge gaps. The review also brought to light factors such as the absence of reporting forms, nurses' insufficient knowledge of reporting procedures and the belief that reporting cannot enhance patient care, all of which discouraged nurses from reporting medication errors.

In terms of the physical environment in the clinical setting, the review highlighted a general inadequacy of space in the medication room and a shortage of resources for medication preparation. Nurses frequently experienced interruptions and faced challenges in complying with the medication policy due to issues in the physical environment. There is a necessity for nurses to work in an environment that allows them to prepare and administer medications without interruptions (Vaismoradi et al. 2020: 8).

6.2 Validity and Ethics

This descriptive literature review focused on describing the prevention of medication errors in healthcare from a nursing perspective.

The validity of the sources used to address the research questions was checked by using the JBI tool. It is a critical appraisal tool that assesses the trustworthiness and relevance of studies (Appendix 1) (Critical Appraisal Tools 2023). However, the main criteria that ensured the validity was the use of articles from Medline, which is a popular scientific database. Validity can be defined as the efficiency of the research findings to predict actual outcomes among the study population in a general context (Patino and Ferreira 2018: 183). Validity in a descriptive literature review also requires considering any biases in the literature and being open about any restrictions or gaps in the research (Chetwynd 2022: 392-396). The systematic search strategies along with subheadings, keywords and phrases helped to minimize bias. A systematic approach was used to uncover and choose pertinent studies, assess the caliber of the studies included and concisely present the methods and conclusions in order to increase the validity of a literature review (Burke 2017: 48-49).

In addition to avoiding bias and ensuring validity, ethical considerations in literature reviews include avoiding plagiarism (Resnik 2020).

Plagiarism can be defined as the inappropriate and unauthorised use of ideas from others and using them as one's own (Kumar, Priya, Musalaiah and Nagasree 2014: 194). The data from the studies included in this literature review was used appropriately to avoid plagiarism. The findings and ideas of those studies were summarized and paraphrased. The sources that were used throughout the review were cited, acknowledged in-text and listed under references. All of this complied with the guidelines of Metropolia University of Applied Sciences.

6.3 Conclusion and utilization of the results

This study discussed preventing medication errors and the associated challenges. Minimizing errors in the medication administration process involves adhering to the rights of medication administration, implementing double-checking procedures, examination of packages and labels properly, following organizational protocols and employing risk management strategies. Strategies such as double-checking are effective in reducing errors caused by interruptions during the medication process. Enhancing nurses' knowledge through training contributes to a reduction in medication errors, emphasizing the importance of fostering a positive attitude toward patient safety. Regular evaluation of systems and employees helps identify and address gaps that may lead to repetitive errors. The clinical environment should promote a culture where nurses feel encouraged to admit and report mistakes.

However, challenges in preventing medication errors include tight schedules, overcrowding in the medication room necessitated by the requirement for two nurses to double-check, shortage of resources, delayed documentation, prescription errors by physicians, verbal reporting and under-reporting of medication errors. Under-reporting is influenced by unfriendly reporting processes, lack of training, insufficient awareness and knowledge of the benefits, absence of a reporting form and negative attitudes discouraging the nurses from reporting.

The responsibility lies with healthcare organizations and governing bodies to optimise medication-related facilities and provide training for nurses to enhance their knowledge, skills and attitudes toward safe medication administration. Nurses should work in optimised conditions and be educated on the significance of following the rights of medication administration, conducting double-checks, and reporting errors or near-misses. Compliance with organizational standard practices is crucial. Adequate staffing in shifts is essential to manage workload, and physicians should be encouraged to prioritize accurate documentation and order communication. Researchers can

contribute to preventing medication errors in healthcare by conducting studies to introduce additional methods.

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Appendix

Appendix 1: Critical Appraisal of the Research Articles

Barriers to Medication Error Reporting among Hospital Nurses (Rutledge et al., 2018)				
	Yes	No	Unclear	Not applicable
Were the criteria for inclusion in the sample clearly defined?	X			
Were the study subjects and the setting described in detail?	X			
Was the exposure measured in a valid and reliable way?	X			
Were objective, standard criteria used for measurement of the condition?	X			
Were confounding factors identified?	X			
Were strategies to deal with confounding factors stated?			X	
Were the outcomes measured in a valid and reliable way?	X			
Was appropriate statistical analysis used?	X			

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Pediatric Nurses' Perceptions of Medication Safety and Medication Error: A Mixed Methods Study (Alomari et al., 2017)				
	Yes	No	Unclear	Not applicable
Were the criteria for inclusion in the sample clearly defined?			X	
Were the study subjects and the setting described in detail?	X			
Was the exposure measured in a valid and reliable way?			X	
Were objective, standard criteria used for measurement of the condition?	X			

Were confounding factors identified?	X			
Were strategies to deal with confounding factors stated?	X			
Were the outcomes measured in a valid and reliable way?	X			
Was appropriate statistical analysis used?	X			

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Proportion of medication error reporting and associated factors among nurses: a cross sectional study (Jember et al., 2018)				
	Yes	No	Unclear	Not applicable
Were the criteria for inclusion in the sample clearly defined?	X			
Were the study subjects and the setting described in detail?	X			
Was the exposure measured in a valid and reliable way?	X			
Were objective, standard criteria used for measurement of the condition?	X			
Were confounding factors identified?			X	
Were strategies to deal with confounding factors stated?				X
Were the outcomes measured in a valid and reliable way?	X			
Was appropriate statistical analysis used?	X			

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Comparing rates and causes of and views on reporting of medication errors among nurses working in different-sized hospitals (Mrayyan et al., 2020)				
	Yes	No	Unclear	Not applicable
Were the criteria for inclusion in the sample clearly defined?	X			
Were the study subjects and the setting described in detail?	X			

Was the exposure measured in a valid and reliable way?	X			
Were objective, standard criteria used for measurement of the condition?	X			
Were confounding factors identified?	X			
Were strategies to deal with confounding factors stated?	X			
Were the outcomes measured in a valid and reliable way?	X			
Was appropriate statistical analysis used?	X			

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Perceptions of Clinical Nurses About the Causes of Medication Administration Errors: A Cross-Sectional Study (Çetin and Cebeci, 2021)				
	Yes	No	Unclear	Not applicable
Were the criteria for inclusion in the sample clearly defined?	X			
Were the study subjects and the setting described in detail?	X			
Was the exposure measured in a valid and reliable way?	X			
Were objective, standard criteria used for measurement of the condition?	X			
Were confounding factors identified?	X			
Were strategies to deal with confounding factors stated?	X			
Were the outcomes measured in a valid and reliable way?	X			
Was appropriate statistical analysis used?	X			

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Iranian nurses' perspectives on factors influencing medication errors (Pazokian et al., 2014)				
	Yes	No	Unclear	Not applicable
Were the criteria for inclusion in the sample clearly	X			

defined?				
Were the study subjects and the setting described in detail?	X			
Was the exposure measured in a valid and reliable way?	X			
Were objective, standard criteria used for measurement of the condition?	X			
Were confounding factors identified?	X			
Were strategies to deal with confounding factors stated?	X			
Were the outcomes measured in a valid and reliable way?	X			
Was appropriate statistical analysis used?	X			

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Factors contributing to medication errors in Turkey: nurses' Perspectives (Güneş et al., 2014)				
	Yes	No	Unclear	Not applicable
Were the criteria for inclusion in the sample clearly defined?	X			
Were the study subjects and the setting described in detail?	X			
Was the exposure measured in a valid and reliable way?	X			
Were objective, standard criteria used for measurement of the condition?	X			
Were confounding factors identified?	X			
Were strategies to deal with confounding factors stated?	X			
Were the outcomes measured in a valid and reliable way?	X			
Was appropriate statistical analysis used?	X			

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Barriers to the reporting of medication administration errors and near misses: an interview study of nurses at a psychiatric hospital (Haw et al., 2014)

	Yes	No	Unclear	Not applicable
Were the criteria for inclusion in the sample clearly defined?		X		
Were the study subjects and the setting described in detail?	X			
Was the exposure measured in a valid and reliable way?		X		
Were objective, standard criteria used for measurement of the condition?	X			
Were confounding factors identified?	X			
Were strategies to deal with confounding factors stated?	X			
Were the outcomes measured in a valid and reliable way?	X			
Was appropriate statistical analysis used?	X			

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Perceptions of nurses about reporting medication administration errors in Jordanian hospitals: A qualitative study (Ali et al., 2021)				
	Yes	No	Unclear	Not applicable
Were the criteria for inclusion in the sample clearly defined?	X			
Were the study subjects and the setting described in detail?	X			
Was the exposure measured in a valid and reliable way?		X		
Were objective, standard criteria used for measurement of the condition?	X			
Were confounding factors identified?	X			
Were strategies to deal with confounding factors stated?	X			
Were the outcomes measured in a valid and reliable way?	X			
Was appropriate statistical analysis used?	X			

Appendix 2: Results of the nine articles

Author(s), year, country	**Aim of the research**	**Study design and data analysis**	**Participants**	**Results**
1. Ali et al., 2021, Jordan	To explore the perceptions of Jordanian nurses around reporting medication errors and to identify potential barriers to reportage in their context	Qualitative descriptive approach with interviews analyzed using thematic analysis	Jordanian registered nurses with experience over three months (n= 24)	Identifying shortcomings in systems and individual mistakes through medication errors helps prevent their recurrence. However, reporting these errors does not always effectively prevent them. The primary obstacle to reporting medication errors is the fear of consequences, including punishment, blame, potential physical harm from patient families, and legal actions. Administrative responses, which tend to focus on individual factors rather than system defects, serve as barriers to reporting medication errors. Lack of uniformity in error reporting procedures, even within the same hospital, coupled with complex processes, discourages nurses from submitting written reports, with many believing verbal reports are sufficient. Additionally, the stigma associated with feeling ashamed acts as another barrier. This stigma, rooted in cultural beliefs about right and wrong, may hinder nurses from distinguishing individual errors from system errors.
2. Alomari et al., 2017,	To outline the current workplace	Mixed method with	Nursing staff (n=36); 33 registered	Errors of lesser significance were viewed as a normal part of daily practice, evoking a sense of vulnerability and defensive reactions when they did occur. Most nurses recognized that missed doses were the most frequent type of

Australia	culture of medication practice in a pediatric medical ward and to highlight the perception of factors affecting work practices of nurses during preparation and administration of medications and identify potential barriers to safe medication practice	descriptive statistics and thematic analysis	nurses (RNs), 2 enrolled nurses (ENs) and one assistant in nursing (AIN)	medication error but only deemed them reportable if the outcomes were severe. Minor errors were considered less significant and were not routinely reported. There was a lack of clarity among nurses regarding what constituted an error and what should be reported. The absence of a second nurse for double-checking medications, interruptions during the medication process, and doctors' unclear handwriting leading to errors necessitating nurses to cross-check orders all contributed to increased time spent on medication preparation. Challenges related to the physical environment, such as insufficient space and resources in the medication room, were obstacles faced by nurses in the medication process. Additionally, nurses were observed to be non-compliant with the medication policy due to a lack of clear understanding of what constitutes a medication error.
3. Çetin and Cebeci, 2021, Turkey	To determine the perceptions of nurses about the causes of medication	Descriptive and cross-sectional study	Nursing staff (n=590) from 4 hospitals with work experience over one year	Common causes of medication errors include a shortage of nurses, demanding workloads, unclear prescription orders from physicians, frequent drug substitutions, ambiguous medication instructions, verbal orders, similar appearances of different drugs, inadequate training on new medications, and comparable packaging. The frequency of witnessing medication errors

	administration errors and the rates of reporting errors made or witnessed by them.	with hypothesis analysis		surpasses the frequency of reporting them. Nurses with a bachelor's degree or higher are more likely to report errors compared to those with a high school education.
4. Güneş et al., 2014, Turkey	To determine the experience of nurses concerning medication errors and to establish why these errors might have occurred, what the factors contributing to medication errors were and how often	Descriptive cross-sectional study with descriptive statistics	Nurses (n= 243) of experience over 6 months with experience in making errors during medication administration	Nurses sometimes administer medications without a doctor's order when they cannot reach the doctor. Writing medication orders for physicians and receiving verbal orders contribute to medication errors. Other causes include doctors taking a long time to write prescriptions, not writing them at all, failing to update and not specifying how or when the medication should be taken. Disturbances during medication preparation also lead to errors. Reporting errors depends on staff awareness of the procedures. Following proper medication administration procedures can reduce and prevent errors.

	nurses came across these factors			
5. Haw et al., 2014, United Kingdom	To explore the reported reasons given by inpatient psychiatric nurses for not reporting a medication error made by a colleague and to determine the perceived barriers to near-miss reporting	Qualitative approach; interviews and thematic analysis	Psychiatric nurses (n=50)	Nurses cited several reasons for not reporting medication errors or near-misses, including the belief that mistakes do not happen repeatedly, fear and a lack of understanding (being able to recognize if an error occurred), as well as complex reporting procedures and time constraints. Barriers to reporting, whether the error was made by oneself or a colleague, included work pressure, a complex reporting system, the fear of facing disapproval from peers, and apprehension about potential consequences. The fact that the patient was unharmed by the medication error was also a factor in not reporting, along with the perception among nurses that reporting errors is not beneficial.
6. Jember et al., 2018, Ethiopia	To assess the proportion of medication error reporting and to explore the	Quantitative cross-sectional study	Nurses (n=397) from Federal Ministry of Health level government	The study revealed that reporting medication errors is linked to factors such as gender, marital status, previous experience of making a medication error, and the work area. Female nurses (72.7%) and those who were married (54.6%) were more inclined to report medication errors. Having prior experience with medication errors also played a significant role in reporting. It is suggested that

	relationships among the barriers; socio-demographic factors, organizational factors, social factors and attitudes of nurses	with descriptive statistics	hospitals	hospitals should identify and rectify any shortcomings in the reporting of medication errors by nurses, aiming to establish an environment that encourages effective reporting systems.
7. Mrayyan et al., 2020, Jordan	To examine the difference between medication error rates based on the hospital size (small, medium and large) and to find the differences among hospitals in Jordan with	Cross-sectional comparative study with descriptive statistics	Registered nurses (n= 229)	Nurses frequently avoid reporting errors. The primary causes of medication errors included issues like damaged medication labels or packaging, incorrect setup or adjustment of infusion devices, and nurses' confusion regarding the types and functions of infusion devices. While a significant percentage of nurses understood what constitutes a medication error (52.8%) and when they should be reported (51.1%), the reluctance to report was attributed to concerns about disciplinary actions and job loss (60.3%), fear of co-workers' reactions (59.8%), and fear of nurse managers (57.6%). The study suggested that implementing standardized infusion pumps could be beneficial in preventing errors.

	respect to the rate of medication errors reported to nurse managers using incident reports and to find the differences among hospitals in Jordan in the causes of medication errors, as perceived by registered nurses (RNs) and to find the differences among hospitals in Jordan on RNs' views on			

	reporting medication errors			
8. Pazokian et al., 2014, Iran	To explore and obtain deep insight into the factors affecting medication errors based on nurses' perspectives and their perception of medication errors	Qualitative study with deductive content analysis	Nursing staff (n=20) with at least 2 years of experience	One factor contributing to medication errors is the patient's history, as having all relevant patient information is crucial for making accurate prescribing decisions. Errors made by physicians can also impact mistakes made by nurses. The conditions in hospital wards may hinder adherence to standard medication administration protocols. It is important to establish a learning environment where nurses feel comfortable admitting mistakes without fearing punishment. Implementing effective risk management strategies has proven to be successful in reducing medication errors. Another factor is the insufficient pharmacological knowledge and skills of nurses, leading to errors related to similarities in medicine appearance, packaging, commercial names, and miscalculations of doses. Additionally, medication errors can sometimes occur due to unavoidable mistakes by nurses. Medication errors can even be the result of inevitable nursing errors.
9. Rutledge et al., 2018, United States	To report medication error reporting barriers (MERB) among hospital nurses and to	Descriptive study, factor analysis and extractio	Nursing staff (n=359) with three months of employment	The primary obstacles to hospital nurses reporting medication errors were the time-consuming reporting process and concerns about facing consequences. Additional barriers included a shortage of easily accessible forms, a lack of awareness about reporting procedures and responsibilities, and the belief that reporting cannot enhance the patient's quality of life. Significant variations in barriers were noted among different groups, with advanced practice nurses

	describe reliability and validity of a MERB questionnaire	n		exhibiting higher scores for lack of knowledge, and non-certified nurses showing greater fear, cultural barriers, and lack of knowledge scores.