Medycyna Pracy 2023;74(2):85–92
http://medpr.imp.lodz.pl/en

https://doi.org/10.13075/mp.5893.01356

ORIGINAL PAPER

SELF-REPORTED MEDICATION ADMINISTRATION ERRORS IN CLINICAL PRACTICE OF NURSES: A DESCRIPTIVE CORRELATION STUDY

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Abstract

Background: Medication administration errors (MAE) are a worldwide issue affecting the safety of hospitalized patients. Through the early identification of potential causes, it is possible to increase the safety of medication administration (MA) in clinical nursing. The study aimed to identify potential risk factors affecting drug administration in inpatient wards in the Czech Republic. **Material and Methods:** A descriptive correlation study through a non-standardized questionnaire was used. Data were collected from September 29 to October 15, 2021, from nurses in the Czech Republic. For statistical analysis, the authors used SPSS vers. 28 (IBM Corp., Armonk, NY, USA). **Results:** The research sample consisted of 1205 nurses. The authors found that there was a statistically significant relationship between nurse education ($p = 0.05$), interruptions, preparation of medicines outside the patient rooms ($p < 0.001$), inadequate patient identification ($p < 0.01$), large numbers of patients assigned per nurse ($p < 0.001$), use of team nursing care and administration of generic substitution and an MAE. **Conclusions:** The results of the study point to the weaknesses of medication administration in selected clinical departments in hospitals. The authors found that several factors, such as high patient ratio per nurse, lack of patient identification, and interruption during medication preparation of nurses, can increase the prevalence of MAE. Nurses who have completed MSc and PhD education have a lower incidence of MAE. More research is needed to identify other causes of medication administration errors. Improving the safety culture is the most critical challenge for today's healthcare industry. Education for nurses can be an effective way to reduce MAEs by enhancing their knowledge and skills, mainly focusing on increasing adherence to safe medication preparation and administration and a better understanding of medication pharmacodynamics. Med Pr. 2023;74(2):85–92

Key words: nursing, patient safety, drug, safety management, errors, medication administration

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Received: February 22, 2023, accepted: May 4, 2023

INTRODUCTION

Maintaining the safety of patients in healthcare facilities is still a much-discussed topic that still challenges healthcare professionals [1]. Medication administration errors (MAE) is defined as any error in prescribing, preparing and administering medication to patients inconsistent with what the prescriber intended in the original order [2]. The MAEs in hospitals have a direct negative impact on patient health (under or over-dosing), increase patient mortality and morbidity (due to adverse medication effects or therapy failure) and increase financial costs (by causing longer hospitalization time, consumption of additional medication and diagnostic tests for resolving the patient's health condition) [3–5]. Ledlow et al. [6] reported that the United States of America reports approx. 400 000 medication errors and 98 000 MAE-related deaths annually. According to available data from the World Health Organization (WHO) [7], global costs related to medication administration errors amount to USD 42 billion per year. The European Collaborative Action on

Funding: this research was supported by Ministry of Health of the Czech Republic (grant No. NU20-09-00257 entitled "Safety of nurse medication administration at selected hospital wards," grant manager: Prof. PhDr. Valérie Tóthová, Ph.D.).

Medication Errors and Traceability (ECAMET) [8] involving hospitals from 13 European countries (Belgium, France, Germany, Hungary, Ireland, Italy, Netherlands, Poland, Portugal, Spain, Sweden, Switzerland, United Kingdom, European Union of Private Hospitals) noted that the most common medical errors occur (in decreasing order) during administration (29%), in the use of electronic prescriptions (21%), in manual prescriptions (17%), during dispensing 17%, and during preparation 16%. This report also notes that staffing or workflow problems are involved in 24% of MAEs. In 17%, this is due to the lack of trained workers, followed by miscommunication of drug orders (16%), issues involving drug names, drug labels, package control (10%), lack of clinical information (8%), and lack of an independent quality control system (6%).

To eliminate MAEs, the National Institute for Health and Care Excellence (NICE) recommends that the methods of a pharmacist-led information technology intervention for medication errors (PINCER) be used. It is a method that contains several principles:

1) use of technology support,
2) use of education to strengthen competence,
3) actively involving a multidisciplinary team in the process,
4) adding pharmacists support,
5) having a clear action plan,
6) providing regular feedback, and
7) providing concise, explicit, evidence-based knowledge [9].

The administration of medicines is designed to ensure the safe preparation, administration, and use of medicines. Nurses are responsible for this process in hospitalized patients [10,11]. The MAEs are failures that appear during the prescription, preparation, or administration of medications [12]. From the point of view of safety, 5 universal rules for safe medication administration (MA) [13] are:

1) the right patient,
2) the right drug,
3) the right dose,
4) the right way, and
5) the right time.

Self-reporting and drawing attention to the occurrence of MAEs by nurses can serve as a suitable preventive and protective tool against further occurrences, although self-reporting errors in some cases can cause nurses to feel frustrated and stigmatized for admitting an MAE [1,14]. Brabcová et al. [15] reported that MAEs were reported 777 times in the Czech healthcare system in 2020, and they found that the most common causes of MAE were name confusion (due to similar names but with different strengths of medication) and unclear medical prescription of medication in patients medical documentation. The authors also found that frequent changes in medication in medical documentation can conduce to MAEs. Ensuring patient safety is a critical priority in the Czech healthcare system. In safe medication administration, 41.6% of Czech patients trust nurses and physicians to administer medication [16]. The first step to increase safety is to improve MAE reporting by nurses and subsequent identification of risk factors.

MATERIAL AND METHODS

Objective

This study aimed to identify potential risk factors associated with administering medicines in inpatient wards in the Czech Republic.

Study design

This was quantitative descriptive correlation study.

Participant and data collection

A total of 1370 nurses were randomly asked for this study and out of these, 165 nurses (12.0%) declined to participate in it. The final research sample consisted of 1205 nurse who actively work in inpatient departments in the Czech Republic. Moreover, the parameters of the research sample, which were chosen based on the Institute of Health Information and Statistics data at the Ministry of Health of the Czech Republic, valid as of August 19, 2021 [17], were informed by the fact that there were 82 838 nurses in the Czech Republic as of 2021 [18].

Data collection and instrument description

The field investigation was carried out using the technique of a standardized, controlled interview (face-to-face) with respondents from September 29 to October 15, 2021. A non-standardized questionnaire was used to clarify problems associated with medication administration errors. A pilot study was carried out on 122 nurses to validate the overall questionnaire. The final version of the questionnaire was divided into 4 parts: Communication (A section), Preparation of medicinal products (B section), Administration of medicinal products during hospitalization (C section), and Errors in the administration of drugs (D section).

The 7-point Likert scale is usually used in surveys to measure participation attitudes, perceptions and opinions of study objects of interest [19]. Participants were asked to indicate their level of agreement or statement on a scale where 1 means "never" and 7 means "always."

Data analysis

For statistical data analysis, the authors used mathematical-statistical methods (percentages, means, median, standard deviation). As part of the statistical testing, the authors applied the χ^2 test, the test for independence, and the Pearson coefficient contingency and calculated Cramer, Wallis, and Spearman, correlation coefficients. The statistical significance was set at $p < 0.05$, $p < 0.01$, and $p < 0.001$. Data analysis was performed in the statistical program SASD 1.5.8 (Statistical Analysis of Social Data, SPIROX, s.r.o.) and IBM SPSS Statistics ver. 28 software (IBN Corp., Armonk, NY, USA).

Ethical consideration

The research was anonymous. Participation was voluntary, and the questionnaire contained no controversial ethical issues. The research was carried out by the recommendation of the Declaration of Helsinki. The research was approved by the ethics committee of the University of South Bohemia in České Budějovice, Faculty of Health and Social Sciences.

RESULTS

Demographics

A total of 1205 nurses completed the questionnaire. The research was representative relative to age, gender, and representation by region in the Czech Republic (see Table 1 for more complete demographic data).

The results in Table 2 – A section show that the fewest MAEs involved failure to document medications brought by patients. Statistically, significantly fewer MAEs were associated with 1) nurses working in teaching hospitals, 2) nurses who prepare medicines directly at the patient's bedside, and 3) surgical departments. Furthermore, the rate of MAEs was statistically significantly lower among nurses with an undergraduate degree but without a nursing specialization.

The most common MAEs occur in cases where nurses did not have the drug requested by the doctor available to them but instead had to use a generic substitute. Another common MAE was interruptions (such as a signaling device, a phone, or communication with another person). From a statistical point of view (Table 2 – B section), more MAEs were associated with the preparation of medicines in smaller district and private hospitals, when nurses cared for more patients (i.e., ≥31 patients), and when nurses used the team model of nursing care. Statistically, significantly greater MAEs occur when healthcare assistants or nurses without a specialization prepare medicines.

Table 2 – C section shows that MAEs are less likely to occur if the nurse can explain the implications of administering and taking medications to the patient.

Table 1. Demographic characteristics and reported factors contributing to medication administration errors among nurses in Czech clinical practice in 2021

Variable	Participants (N = 1205) [n (%)]
Gender	
male	44 (3.7)
female	1161 (96.3)
Age	
≤34 years	294 (24.4)
35–44 years	306 (25.4)
45–54 years	363 (30.1)
55–64 years	201 (16.7)
≥65 years	41 (3.4)
Education level	
secondary school of nursing	447 (37.1)
nursing diploma	352 (29.2)
BSc degree	335 (27.8)
MSc degree or higher	71 (5.9)
Specialization in clinical nursing	
yes	209 (17.3)
no	996 (82.7)
Type of hospital	
faculty	244 (20.2)
regional	348 (28.9)
county	466 (38.7)
other local	147 (12.2)
Length in clinical nursing practice	
≤5 years	498 (41.3)
6–10 years	307 (25.5)
11–15 years	173 (14.4)
16–20 years	100 (8.3)
≥21 years	127 (10.5)

Table 2. Nurses' reports of factors contributing to medication administration errors in the Czech Republic, 2021

Factor	Mo	M±SD	s^2	χ^2	df	p
A section: Control of medicinal products in the hospital						
checking medicines brought by patients	7	6.437±1.249	1.561			
checking the amount of drugs brought by patients	7	5.883±1.664	2.771			
recording the number of medicines brought by patients	5	4.547±2.357	5.556			
informing the patient about the use of the medicines they brought	7	6.089±1.608	2.587			
type of hospital				12.594	6	<0.05*
number of patients per nurse				1.120	4	0.891
model of nursing care				3.206	4	0.524
medicine administration system used in the department				48.816	6	<0.001***
department type				16.426	4	<0.01**
gender				1.756	2	0.416
nurses' age				6.306	8	0.613
job position of the nurse				7.489	6	<0.01**
the highest level of education in nursing				14.127	6	<0.05*
specialization education in clinical nursing				6.274	2	<0.05*
number of hours typically worked per week				5.381	2	0.068
years of experience as a nurse				5.986	8	0.649
B section: Medication administration errors during the preparation process						
communicating with another person while preparing medications	6	4.566±1.658	2.750			
interruption of medication preparation for any reason	6	4.384±1.582	2.502			
preparation of medicines just before administration	7	5.601±1.651	2.726			
administering medications prepared by another nurse	6	4.932±1.745	3.046			
preparation of medicines during the previous shift	7	5.008±1.825	3.331			
carrying out a triple control during the preparation of medicines	7	6.241±1.154	1.332			
checking the number of prepared medicines with the number in the medical documentation	7	6.055±1.338	1.791			
replacing prescription drugs with generics	1	3.279±1.933	3.738			
storing used medicines back in the original packaging	7	6.035±1.667	2.781			
administering medicines from blister packs directly to patients	7	4.858±2.022	4.089			
type of hospital				40.821	6	<0.001***
number of patients per nurse				25.148	4	<0.001***
model of nursing care				8.595	4	0.072
medicine administration system used in the department				91.495	6	<0.001***
department type				32.272	4	<0.001***
gender				2.534	2	0.282
nurses' age				14.795	8	0.063
job position of the nurse				22.464	6	<0.001***
the highest level of education in nursing				10.140	6	0.119
specialization education in clinical nursing				13.010	2	<0.01**
number of hours typically worked per week				3.312	2	0.191
years of experience as a nurse				14.411	8	0.072

Table 2. Nurses' reports of factors contributing to medication administration errors in the Czech Republic, 2021 – cont.

Factor	Mo	M±SD	s^2	χ^2	df	p
C section: Medication administration errors during hospitalization						
knowledge of the reasons for changes in medication with what the patient takes at home	6	5.136±1.498	2.245			
information before the administration of drugs due to a change in therapy	7	5.389±1.463	2.140			
ability to explain served by medication	7	6.067±1.053	1.108			
justification of the importance of administered drugs in case of their refusal	7	6.067±1.102	1.214			
calling the doctor if the patient refuses the medication	7	5.720±1.555	2.419			
waiting in the patient until the medicine does not ingest	7	5.448±1.509	2.277			
leaving medicines on the table in the absence of the patient	7	4.762±1.877	3.524			
inquiring about the patient's name before administering medication	7	5.359±1.706	2.911			
checking the patient's identification bracelet before each medication administration	7	4.800±1.903	3.622			
communicating with another person during drug administration	6	5.237±1.290	1.663			
carrying out other activities during the administration of drugs	6	5.611±1.280	1.640			
type of hospital				12.344	6	0.055
number of patients per nurse				21.169	4	<0.001***
model of nursing care				7.645	4	0.106
medicine administration system used in the department				20.844	6	<0.01**
department type				22.340	4	<0.001***
gender				6.666	2	<0.05*
nurses' age				8.221	8	0.412
job position of the nurse				7.969	6	0.240
the highest level of education in nursing				12.599	6	<0.05*
specialization education in clinical nursing				4.017	2	0.134
number of hours typically worked per week				0.806	2	0.668
years of experience as a nurse				11.730	8	0.164
D section: Overall medication administration errors during patient hospitalization						
overall assessment of medication errors	6	6.072±0.838	0.703			
type of hospital				9.321	6	0.156
number of patients per nurse				29.803	4	<0.001***
model of nursing care				0.821	4	0.936
medicine administration system used in the department				7.112	6	0.311
department type				12.616	4	<0.05*
gender				1.186	2	0.553
nurses' age				6.099	8	0.636
job position of the nurse				1.141	6	0.980
the highest level of education in nursing				3.112	6	0.795
specialization education in clinical nursing				3.953	2	0.139
number of hours typically worked per week				2.831	2	0.243
years of experience as a nurse				3.200	8	0.921

Mo – modus, s^2 – variance.
Correlation is significant at: * p = 0.05, ** p = 0.01, *** p = 0.001.

The MAEs are likely to occur when nurses leave medications unattended on the patient's table and when nurses fail to confirm the patient's identification data before each administration of medications. Fewer MAEs occur when nurses care for fewer (≤20) patients and when medicines are prepared at the patient's bedside. Almost no MAEs were seen in nurses with a master's degree or higher. In contrast, most MAEs occurs: 1) when nurses care for more (≥31) patients, 2) when medications are prepared in the nursing station or hallways, and 3) in long-term care departments. When comparing MAEs from a demographic point of view, more MAEs were associated with females than males.

Table 2 – D section presents the results of the overall statistical evaluation of MAEs. The results show that nurses caring for fewer patients (≤20) have significantly fewer MAEs than nurses caring for ≥31 patients. Significantly fewer MAEs occurs in surgical departments.

DISCUSSION

The safety of the hospitalized patient should be the primary concern in every medical institution. Early detection of the causes of MAEs can increase patient safety, and the quality of healthcare provided since the potential for MAEs in hospitalized patients is considerable [20].

Medication administration errors reported by nurses

The results of this study show that errors most often occur when: 1) nurses care for ≥31 patients, 2) use team nursing model, 3) medications are not adequately prescribed, 4) medicines are prepared by healthcare assistants, and especially 5) patient identification data is not checked. Team nursing is a model of care where care staff (registered nurses and other support staff) care for many patients during one shift. It has found no consistent impact of the team nursing model on patient outcomes, nursing, and organizational results in terms of its effectiveness [21]. Another study carried out in the Czech Republic confirms this study findings [15]. The results of this study also point to MAEs related to the administration of generic substitutions. According to Tóthová et al. [22] more than one-third of nurses have experience with generic drug substitution. However, the authors point out that according to legal regulations, Czech nurses do not have the legal competence to substitute a generic drug despite receiving training in pharmacology.

The findings of this study suggest that medication administration errors can be reduced if nurses can explain the effects of individual medications to their patients. This is consistent with other research in the field [23]. Rohde and Domm [24] draw attention to the clinical thinking of nurses regarding drug effects, a topic that is not well-researched. Kelly et al. [25] noted that nurses with limited knowledge of pharmacology often experience more MAEs.

The number of patients on the ward and nursing staff shortages are other factors that significantly increase medication administration errors. Other authors also came to this conclusion [26,27]. Adequate shift staffing was found to be instrumental in preventing medication administration errors [28,29].

Strategies to reduce MAEs

Increasing education is an appropriate means of preventing medication administration errors. Our results showed that nurses with master's degree or higher were the least likely to have an MAE in clinical practice. An international study by Aiken et al. [30] found that for every 10% increase in the number of nurses with a bachelor's degree, there was a 7% reduction in hospital patient mortality. College-educated nurses have more knowledge regarding the safe administration of drugs and can recognize existing MAEs in clinical practice [29]. Another good strategy to eliminate medication administration errors could be simulation training or nurse training. Kuo et al. [31] based on a quasi-experimental study, points to the critical fact that only 2 h of simulation training (pre-test: 2.05±1.12 and post-test 6.14±1.25, $t = 22.85$, $p < 0.001$) had the potential to reduce MAEs. Mardani et al. [32], based on a systematic review, also support simulation training. However, Prokešová et al. [33], based on a SWOT analysis of risk factors determining MAEs, recommends that hospitals increase the number of staff. Appropriate staffing may reduce the incidence of MAEs [26].

Limitations

The study has several limitations. The first limitation is that anon-standardized questionnaire was used, which dealt with the subjective opinions of nurses in clinical practice in the Czech Republic. A second issue is that there may be other, more complex MAE situations that were not covered by the questionnaire. On the plus side, the study assesses many essential and unique factors linked to MAEs in the Czech Republic. Another strength is the representativeness of the research sample.

CONCLUSIONS

The results of this study point to factors that can positively impact safe medication administration in hospitalized patients. The most common reasons for MAEs are too many patients per nurse, interruptions during MA, and failure to confirm patient identification with ID bracelets. The authors further conclude that less education is linked to a greater likelihood of an MAE. After resolving these identified problems, it will be possible to increase the safety of patients during hospitalization.

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Publisher: Nofer Institute of Occupational Medicine, Łódź, Poland