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Reporting Adverse Drug Events in Drug Administration Process among Nursing Personnel

Występowanie zdarzeń niepożądanych w obszarze administrowania lekami w praktyce pielęgniarskiej

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Abstract

Introduction. Adverse events (AE) in the process of pharmacotherapy can have direct consequences on the health and life of a patient. Factors leading to AE are categorized in human and systematic ones. Among the latter ones, the most important are significant shortages of nursing staff as well as stress, fatigue and the Occupational Burnout Syndrome. Reporting of AE is a crucial pillar of prevention of adverse events in drug administration in nursing.
Aim. The aim of the study was to identify and analyse the factors leading to adverse events in the pharmocotherapy process and to present methods of prevention AE.
Material and Methods. The research was lead among 100 hospital nurses from Pomeranian region. A research and research questionnaire was based on the study "Attitudes and beliefs of health services about the causes and reporting of treatment errors in the British intensive care unit". The project was conducted between January to April 2020.
Results. Detailed analysis showed that the most important factors influencing the occurrence of adverse events in the drug administration are: nurses shortage (14%), stress and burnout syndrome (11%), incorrect labelling (13%). 85% of medical personnel are convinced that it is essential to monitor the situation of adverse events in drug administration. The Kruskal–Wallis test did not confirm the existence of a relationship between the: occurrence of adverse events in the area of pharmacotherapy and age (K–W=0; p=1), level of education (K–W=3.6328; p=0.3039) and work experience of the surveyed respondents (K–W=0.3651484; p=0.5457). Similarly, no significant relationships were found between the occurrence of adverse events and the department profile (K–W=0.330; p=0.5652).
Conclusions. The level of education, professional experience and age are not significantly related to making mistakes in the area of drug administration; the factors that significantly affect the occurrence of AD in the area of drug administration are: reduced nursing staff on duty, performing one's duties under stress and time pressure, insufficient variety of labels on medicinal products; the best method of prevention in the area of drug management and administration is the presence of a reporting and monitoring system; the was the majority of nurses reported the occurrence of a drug-related adverse event to the rest of the therapeutic team. **(JNNN 2022;11(2):65–73)**
Key Words: adverse events (AE), drug administration, medical errors, nursing personnel, pharmacotherapy, prevention, reporting AE, safety

Streszczenie

Wstęp. Zdarzenia niepożądane (ZN) w procesie farmakoterapii mogą prowadzić bezpośrednio do uszczerbku na zdrowiu bądź utraty życia pacjenta. Czynniki prowadzące do ZN dzieli się na ludzkie i systemowe. Najistotniejsze czynniki systemowe to znaczny niedobór personelu pielęgniarskiego oraz stres, zmęczenie i ogólnie pojęty Zespół Wypalenia

Zawodowego. Jednym z koronnych filarów prewencji zdarzeń niepożądanych w administrowaniu lekami w pracy pielęgniarskiej jest raportowanie o ZN.
Cel. Celem prowadzonego badania była analiza czynników prowadzących do ZN w procesie farmakoterapii oraz przedstawienie propozycji rozwiązań, które mogą zapobiec ich występowaniu.
Materiał i metody. W badaniu wzięło udział 100 pielęgniarek/pielęgniarzy zatrudnionych na różnych oddziałach szpitalnych. W sondażu został wykorzystany autorski formularz ankiety złożony z siedmiu pytań zamkniętych, który opracowano w oparciu o badania "The attitudes and beliefs of healthcare professionals on the causes and reporting of medication errors in a UK Intensive care unit". Badania przeprowadzono w okresie od stycznia do kwietnia 2020 r.
Wyniki. Szczegółowa analiza zgromadzonego materiału pozwoliła stwierdzić, że najistotniejszymi czynnikami wpływającymi na występowanie błędów w obszarze administrowania lekami jest, zbyt mała liczba personelu pielęgniarskiego na dyżurach (14%), stres i presja czasu (11%), złe oznakowanie etykiet (13%). Ponad 85% badanych mimo braku rejestru zdarzeń niepożądanych w swoim miejscu pracy zaistniałą pomyłkę związaną z podaniem leku zgłosiła pozostałym członkom zespołu terapeutycznego. Testy z wykorzystaniem testu Kruskala–Wallisa nie potwierdziły istnienia zależności pomiędzy zmiennymi: występowanie zdarzeń niepożądanych w obszarze farmakoterapii a wiek (K–W=0; p=1), poziom wykształcenia (K–W=3,6328; p=0,3039) oraz staż pracy badanych respondentów (K–W= 0,3651484; p=0,5457). Podobnie nie wykazano istotnych zależności pomiędzy występowaniem zdarzeń niepożądanych a profilem oddziału (K–W=0,330; p=0,5652).
Wnioski. Analiza dostępnego piśmiennictwa a także wyniki przeprowadzonych badań własnych pozwoliły na sformułowanie następujących wniosków: poziom wykształcenia, staż pracy w zawodzie oraz wiek nie mają istotnego związku z popełnianiem błędów w obszarze administrowania lekami; czynnikami, które istotnie wpływają na występowanie ZN w obszarze administrowania lekami są: zmniejszona obsada pielęgniarska na dyżurach, wykonywanie swoich obowiązków w stresie i pod presją czasu, zbyt mała różnorodność etykiet produktów leczniczych; najlepszym sposobem profilaktyki w obszarze zarządzania lekiem i jego administrowania jest obecność systemu raportowania i monitorowania; zdecydowana liczba badanych pielęgniarek zawsze raportowała występowanie zdarzenia niepożądanego związanego z lekiem pozostałym członkom zespołu terapeutycznego. **(PNN 2022;11(2):65–73)**
Słowa kluczowe: zdarzenia niepożądane, administrowanie lekiem, błędy medyczne, personel pielęgniarski, farmakoterapia, prewencja, raportowanie ZN, bezpieczeństwo

Introduction

The first research in Poland aimed at assessing medical professionals' awareness of and approaches applied to adverse events was conducted by the Healthcare Quality Promotion Society. Due to the lack of the main register of adverse events, none of healthcare centres is able to report the real number of adverse events observed by specialists in many fields of the medicine on a daily basis [1].

Patient safety at hospital should constitute a key objective of professional healthcare, while the latest world data indicate that around 770,000 patients get hurt every year as a result of medical errors, including errors in pharmacotherapy [1]. Errors in pharmacotherapy appear when the healthcare system is inefficient, which means that it is inadequately protected against such damages. The insufficient level of patient safety is a problem that must not be underestimated because negative consequences are felt both by patients and medical professionals. This does not benefit the economic standing of medical centres, either. Many adverse events could be prevented because obvious reasons for those events are system factors in the organisation.

The International Council of Nurses divides medication errors into 2 major groups:

— errors related to the organisation of the system (system failures),
— human errors [2].

Actions taken to improve the quality are still a great challenge. One of priorities for healthcare staff is to ensure the safety of patients and nurses. Some of quality improvement actions aim, among others, at recognising risk factors in a cultured way to prevent the stigmatisation or public exclusion of people that have made an error [2].

Given the multitude and diversity of factors faced every day by nurses, the work in the healthcare sector is strictly connected with specific stressors. Taking into account responsibility for human health and life, contacts with suffering patients or even death in the worst case, relatively low wages, insufficient equipment, shift work, excessive work load, this profession can be considered an exceptional stressor [3].

A nurse can make an error while administering drugs at any time during the treatment or care of a patient. That is why it is important that nurses are aware of risks, control their way of conduct, and obey standards applicable to specific activities and responsibilities stemming from the Act on the Professions of Nurse and Midwife of 15 July 2011 and the Regulation of the Minister of Health of 28 February 2017 on the type and scope of preventive, diagnostic, treatment and rehabilitation services to be provided by nurses and midwives on their own without the doctor's instruction [4,5].

Surveys conducted by the American quality research agency with regard to errors and mistakes in drug administration indicate that 30% of drugs administered

in healthcare centres are subject to medical errors resulting in health impairments. The vast majority of medicinal products are administered at hospitals by nurses. Nurses are directly responsible for the safety of patients connected with that procedure [6].

Given epidemiologic data, approximately 40% of all adverse events are related to drug administration. Clinical observations confirm that 1% of such adverse events results in the death of a patient and 12% in a direct threat to life. A therapy where intravenous medicinal products are used is subject to the greatest risk of errors due to the complexity of actions that must be taken [5,7].

Errors in drug administration are a global problem. Insufficiently safe pharmacotherapy and drug-related errors cause damages that could be avoided. Worldwide costs of errors related to the preparation and administration of drugs are estimated at USD 42 billion. The sum does not include the value of lost wages, productivity or healthcare costs and constitutes 1% of global expenditure for health [8]. Irregularities in communication are one of the most frequent factors directly resulting in errors in drug administration (46–60%) [6]. According to surveys published by the "Journal Patient of Safety", from 210,000 to 440,000 thousand of patients hospitalised during the year suffered errors that could have been avoided. Some of those errors were fatal. Moreover, according to the Health Safety Score, medical errors form the third major reason for deaths among patients hospitalised in the United States. The data indicate that 41% of errors are connected with the preparation and administration of a wrong dose of a drug and 16% with the administration of a wrong drug [9].

The purpose of the research was to investigate the opinion and approach of nursing personnel to errors/incidents/adverse events connected with drug administration. The value added consists in the preparation of proposals of solutions which, in the opinion of nursing personnel, will significantly improve the situation of nursing practices.

Material and Methods

The research was addressed to professionally active nursing personnel working in the wards of various profiles at hospitals of the Pomorskie Voivodeship. The participation of nursing personnel in the project was agreed with the hospital managers. Their participation is voluntary and fully anonymous. The respondents were also informed that they had the right to opt out of the project at any stage. It was a cognitive research. The project involved 100 female and male nurses. The research was conducted in the form of a diagnostic survey and a questionnaire prepared on the basis of the research entitled "The attitudes and beliefs of healthcare professionals on the causes and reporting of medication errors in a UK Intensive care unit" [10]. The questionnaire included an interview form containing sociodemographic data, like sex, age, work experience, education and ward profile. The second part of the questionnaire included questions concerning factors that, in the respondents' opinion, contributed to adverse events in pharmacotherapy and the proposals of feasible solutions that will improve the situation. The respondents were requested to prioritise AE factors from 1 to 6, where 1 meant the least significant factor and 6 meant the most significant one. The nurses were also asked about the frequency of adverse events related to pharmacotherapy, the way they reported such events, if any, and whether, in their opinion, the system of AE reporting was important. The questionnaire only included closed questions. The statistical analysis of the results was prepared by use of Statistica 13.2 and Microsoft Excel. The programme allowed for the analysis and objective assessment of the impact of factors on the respondents' answers. The results of the analysis were presented in the form of contingency tables, size tables and figures. In addition, a chi-square test (Pearson's test), which is appropriate for quality variables, and a Kruskal–Wallis test (a single-factor analysis of variations for quality variables) were used to compare the patients' responses based on a relevant grouping characteristic. Relations between variables were verified by use of Spearman's rank correlation test. For the verification of all analyses, a significance factor of $\alpha=0.05$ was applied, which let us consider variables at $p<0.05$ as statistically important.

Results

Sociodemographic Characteristics of the Target Group

The research involved 100 respondents, including 92 women and 8 men aged from 23 to 59 (M 34.15 years, SD±11.98 years). The vast majority of the nurses had a long professional experience: 37 years (M 10.78; SD±12.10 years). Both the age and professional experience of the respondents were diversified. The coefficient of variation in that field was 35% and 112%, respectively. In terms of the education level, the nursing personnel with a short professional experience of less than 4.5 years mostly graduated from the bachelor or master nursing programme of higher education. Only 10% of the group declared to have graduated from a medical college or secondary school. The respondents' place of work was also quite diversified: among treatment wards, the respondents mentioned: general surgery, orthopaedics, urology, cardiology, anaesthesiology and

intensive care, operating theatre, neurology, nephrology, children haematology, hospital emergency ward. The project also involved preventive wards, including: psychiatry and internal diseases.

The detailed list of sociodemographic information is presented in Table 1.

Factors Contributing to Errors and Mistakes in Drug Administration — Proposals of Solutions

In the second part of the questionnaire, the respondents were requested to rank and prioritise the factors in terms of their contribution to errors and mistakes in drug administration. The responses differed, however the majority of the personnel was of the opinion that one of significant factors contributing to drug-related errors was the insufficient number of nursing personnel per the present number of patients, and the

Table 1. Sociodemographic characteristic of the research group

Variable	Tertiles			Median		Total	(p<0.05)*
	≤2 years	≤11 years	≤37 years	≤4.5 years	>4.5 years		
Gender							
Women	54	7	31	45	47	92	0.816!/ 0.460**
Men	5	1	2	5	3	8	
Education							
Nursing course	0	0	5	0	5	5	p<0.01
Nursing school	0	0	5	0	5	5	
BSc in nursing	40	1	7	37	11	48	
MNSc in nursing	19	7	16	13	29	42	
Age							
23–24 years	40	0	0	40	0	40	p<0.01
24–35 years	18	8	1	9	18	27	
35–59 years	1	0	32	1	32	33	

*χ^2 — chi-square test, ! — p calculation made on the basic of second tertiles (≤11 years of work experience) of work experience, ** — p calculation made on the basic of median of work experience

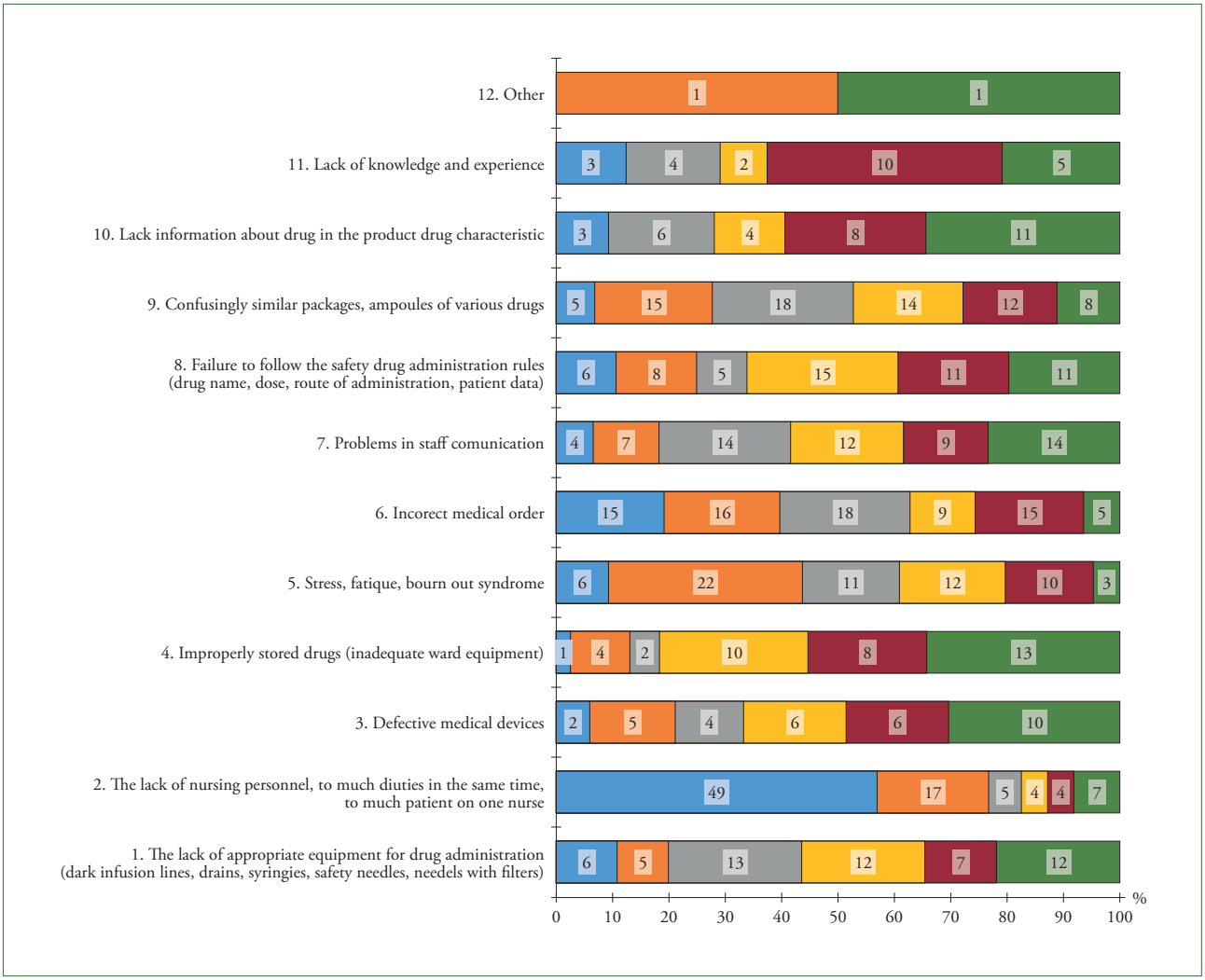

Figure 1. Factors which, in the respondents' opinion, contribute to the occurrence of drug administration errors/mistakes

Table 2. Detailed list of answers given by the respondents about factors influencing the risk of adverse events in relation to drug administration

Statement	Range of answers (%)						%
	6	5	4	3	2	1	
1. The lack of appropriate equipment for drug administration (dark infusion lines, drains, syringies, safety needles, needels with filters).	6	5	13	12	7	12	9
2. The lack of nursing personnel, to much diuties in the same time, to much patient on one nurse.	49	17	5	4	4	7	14
3. Defective medical devices.	2	5	4	6	6	10	6
4. Improperly stored drugs (inadequate ward equipment).	1	4	2	10	8	13	6
5. Stress, fatique, bourn out syndrome.	6	22	11	12	10	3	11
6. Incorect medical order.	15	16	18	9	15	5	13
7. Problems in staff comunication.	4	7	14	12	9	14	10
8. Failure to follow the safety drug administration rules (drug name, dose, route of administration, patient data).	6	8	5	15	11	11	9
9. Confusingly similar packages, ampoules of various drugs.	5	15	18	14	12	8	12
10. Lack information about drug in the product drug characteristic.	3	0	6	4	8	11	5
11. Lack of knowledge and experience.	3	0	4	2	10	5	4
12. Other.	0	1	0	0	0	1	1

6 (the most significant factor) → 1 (the least significant factor)

second factor mentioned by the respondents was the excessive work load (14%). Other situations mentioned by the respondents included: wrong medical instructions (13%), stress, tiredness and professional burnout syndrome (11%), difficulties resulting from confusingly similar drug labelling (12%), errors in interpersonal communication (10%). The detailed list of responses is presented in Figure 1 and Table 2.

In the second part of the research, the respondents were also requested to suggest solutions which, in their opinion, could improve drug administration. Opinions of the nursing personnel differed. One of proposals which, in the respondents' opinion, could reduce the risk of adverse events in drug administration was the reduction of bureaucracy connected with patient care (14%). Other solutions included an increase in the number of nursing personnel on duty (13%), the performance of nursing activities in accordance with competences (11%), as well as the provision of adequate equipment at work (12%) (Table 3).

The respondents were asked whether they had ever made an error related to the preparation of a medicinal

Table 3. Proposals of solutions which could reduce the number of drug administration errors

Statement	Range of answers (%)						%
	6	5	4	3	2	1	
1. Performing the nursing activities in the area of their competences.	12	12	19	17	8	7	12.5
2. Less of burocracy in patient care.	9	25	14	13	10	8	13.2
3. The attendence in conferences and medical qurses uptodateing the knowledge.	5	6	7	9	14	13	9.0
4. Diversity in drug graphic.	5	10	20	12	19	8	12.3
5. The proper salary to reduce the necessity for nurses to work in more than one hospital.	6	9	3	7	9	17	8.5
6. The proper selection oft he staff fort he shift.	17	12	6	11	11	13	11.7
7. The proper amounts nurses on the unit.	39	18	17	7	6	5	15.3
8. Education in the area of drug administration errors.	3	2	4	5	9	11	5.7
9. The proper equipment for drug administration and preparation.	4	6	9	19	13	15	11.0
10. Other.	0	0	1	0	1	3	0.8

6 (the most significant factor) → 1 (the least significant factor)

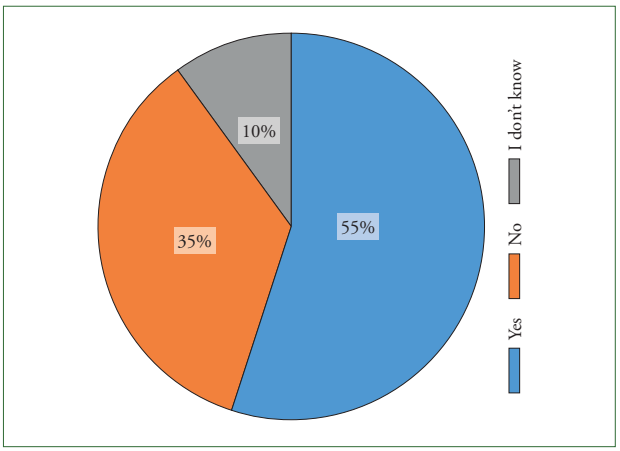

Figure 2. In your professional work, have you ever made an error related to the preparation or administration of a medicinal product (wrong dose, wrong concentration, wrong solvent, wrong quantity of solvent, wrong identification of patient, wrong drug administration time)?

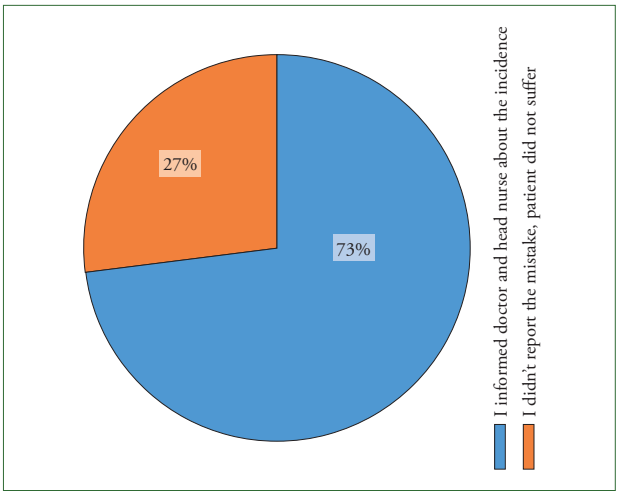

Figure 3. If the adverse event has taken place, what actions have you taken?

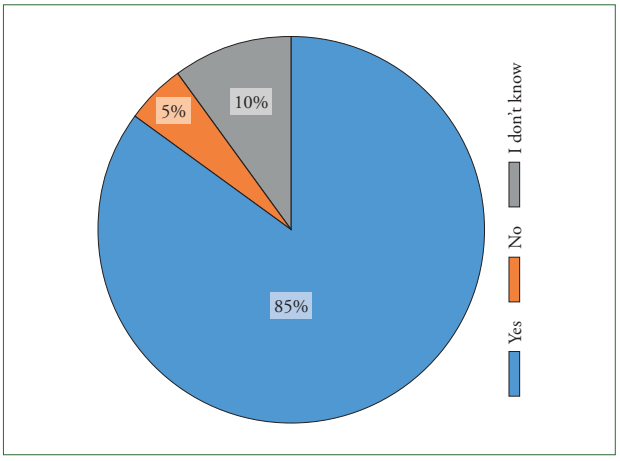

Figure 4. Is, in your opinion, the reporting of adverse events one of important pillars of counteracting such events?

product (wrong dose, wrong concentration, wrong solvent). 50% of the personnel taking part in the research answered in the affirmative to that question (Figure 2). Then, the respondents were requested to say what they had done in the case of the drug-related adverse event. The analysis indicated that 73% of the respondents reported that fact to their superior/a doctor in charge of the treatment. 27% did not intervene anyhow because the situation did not have a significant impact on the patient's health and life (Figure 3). The analyses confirmed that over 85% (N=85) of medical personnel found it necessary to monitor and report drug-related adverse events because the existence of the reporting system was, in the opinion of nurses, an important preventive measure (Figure 4). The Kruskal–Wallis tests did not confirm the existence of a relation between the following variables: the existence of adverse events in pharmacotherapy and age (K–W=0; p=1), the level of education (K–W= 3.6328; p=0.3039) and the professional experience of the respondents (K–W=0.3651484; p=0.5457). No significant relation between the existence of adverse events and the ward profile were identified, either (K–W=0.330; p=0.5652).

Discussion

The problem of adverse events in the medicine is broadly described in the Polish and international literature. The events/errors are mostly referred to in the context of unclear job descriptions prepared for the nursing personnel. In the opinion of Głowacka, Rezmerska, Kochman and Soleta, the nurses often have to face debatable situations connected with the performance of medical instructions without relevant qualifications or the refusal of performance of those instructions. The majority of the nursing personnel sometimes take risky actions to administer or prepare a drug, which, in the authors' opinion, is connected with their ignorance of applicable legal regulations. Such operations include, for example, vaccinations, tuberculin testing or the transfusion of blood or blood products without relevant training [11].

The authors of the article entitled "Medical errors in the nursing profession" point out that during their professional training and education the nurses become entitled to perform particular services on their own or at the doctor's request. The nursing personnel's knowledge of their rights in this respect should form the basis for making a decision whether to perform or refuse to perform a given instruction. Smarczewska and Kopański underline in their publication that each activity entails legal and professional consequences, in particular in the case of errors [12].

The analysis of US epidemiologic data indicated that adverse events resulting from the wrong administration of drugs/medicinal products had contributed to the death of around 44,000 patients per 98,000 of hospitalisations.

Both Głowacka and others, as well as Kryst confirmed that in Poland there was no reliable register of adverse events/medical errors related to drug administration, which does not change the fact that both adverse events and medical errors occur and very often contribute to deaths [11].

In 2008, Katarzyna Zięzio, the Institute of Nursing and Midwifery in Cracow, published the results of surveys conducted under the project entitled "Safe pharmacotherapy in the opinion of nurses" [13]. The survey was attended by 350 nurses working in various hospital wards. The sociogeographical analysis of the research group brought about similar results to the authors' own studies. There were differences regarding the question about the frequency of errors related to pharmacotherapy. In the opinion of Zięzio, only 8% and 15% of nurses stated that the problem connected with wrong drug administration had occurred, respectively, very often or often in their clinical practice. In turn, 35% of the respondents were of the opinion that those incidents were quite rare and 33% stated that they were even extremely rare. The project revealed the great awareness of the problem among the medical personnel. Over 50% of the respondents, having analysed their clinical activities, admitted that they had made an error connected with proper drug administration, including the preparation of a wrong drug, the administration of a wrong drug or even the choice of a wrong drug. 35% of the respondents claimed that they had never experienced such an adverse event. For the question concerning factors having an impact on the occurrence of adverse events, the female respondents from Cracow specified, among others: the excessive amount of duties, large work load (48%), haste (27%), irregularities in team work and wrong information flow (19%). In addition, 66% of the respondents pointed out that the errors were connected with the wrong preparation of the doctor's instruction [13]. The research indicated that almost 50% of the medical personnel with professional experience of less and more than 4.5 years confirmed that key factors contributing to adverse events in drug administration included the insufficient number of staff per the present number of patients and haste connected with a mass of duties. In the second place, the respondents mentioned stress, tiredness, time pressure, and the Professional Burnout Syndrome. Another factor was the confusingly similar labelling of ampoules of different medications.

One of important objectives of the research was to analyse what steps were taken by the nursing personnel when the adverse event had occurred. Over 77% of the respondents reported the problem to their immediate superior and the practitioner and no more than 23% reported the incident to anyone due to slight harmfulness. The results of studies conducted by Zięzio and others differ from our own results. Over 59% of the responding nurses would report a drug-related error or mistake directly to the practitioner, 38% to the ward nurse, and only 1% would not disclose the problem at all [13]. In the aforementioned survey, the respondents were also requested to specify factors that were likely to contribute to the improvement of patient safety in terms of drug administration. 57% pointed out "the improved transparency of doctor documentation", 50% "the improvement of information circulation within the treatment team", and 47% "the development and implementation of uniform and comprehensible procedures for drug dissolving and administering" [13]. In the own survey, as solutions that could significantly improve the situation, the respondents mentioned "the increased safety of personnel and patients by hiring a greater number of nurses", "the performance of duties in accordance with competencies of the nursing personnel", "the proper selection of colleagues on duty".

The US Joint Commission for Patient Safety pointed out the AE problem, in particular in terms of related costs, several times. It is estimated that around USD 4 trillion is lost every year due to adverse events. Those adverse events include radiological errors, surgical errors, infections, technical errors. Difficulties related to pharmacotherapy are at the last place in the report [9].

Based on the analysis of the world literature on the areas of safe pharmacotherapy, it can be observed that it mainly emphasises the presence of various factors contributing to drug-related errors and mistakes. In the article, the most risky factors include "overwork, shift work, tiredness, and even exhaustion […]" [14]. The above observations coincide with the results of our own project.

Katarzyna Zięzio, the Institute of Nursing and Midwifery in Cracow, is of the opinion that an adverse event in pharmacotherapy should be analysed in terms of two major factors: both human errors, as well as system inaccuracies and organisational irregularities. The author points out that it is necessary to take into account the culture of openness and honesty among healthcare professionals and to talk openly about problems connected with drug administration [13]. London researchers of S. Sangher suggested that medical events related to drug administration should be divided into: wrong prescription, wrong administration and supply of pharmaceuticals.

In the article entitled "The attitudes and beliefs of healthcare professionals on the causes and reporting of medication errors in a UK Intensive care unit", they described the results of two then latest studies on reporting errors in drug prescriptions. They pointed out that when the system of electronic prescriptions had been implemented, the number of errors had been reduced by 29%, however reasons for previous irregularities had never been studied [13].

Another article describes the opinion of "An Organisation with a Memory", which is a London organisation dealing with adverse events as a section of the Health Department in London. In the article, it stated that the system and mechanisms of reporting errors in the UK were still insufficient [10].

The prevention of adverse events in pharmacotherapy is still being analysed as a problem of the modern healthcare system [15]. The analyses have confirmed that major factors resulting in the errors have not changed for the latest 12 years. The nursing personnel are aware of the problem in their clinical practice and of factors that have a significant impact on the existing situation. The medical personnel have better and better approach to and awareness of drug administration errors and mistakes. Therefore, various actions are taken to improve the quality and safety of patient care in the healthcare centres.

Conclusions

Based on the analysis of the literature and the results of our own studies, the following conclusions could be drawn:

1. The level of education, professional experience and age have no significant bearing on drug administration errors.
2. Factors that significantly contribute to adverse events related to drug administration include: the insufficient number of nurses on duty, the performance of duties in stress and under time pressure, the insufficient diversity of medicinal product labelling.
3. In the respondents' opinion, the system of reporting and monitoring drug administration and management errors will be the best preventive measure in this area.
4. The majority of the respondents always reported drug-related adverse events to other members of the treatment team.

Implications for Nursing Practice

Each medical centre should implement an anonymous system for reporting and monitoring problems connected with the wrong administration and management of drugs. It is worth studying which (organisational/human) factor is the main reason for adverse events in the organisation. One of solutions will be to make significant changes in the organisation of work of the nursing personnel, including an increase in the number of nurses on duty, courses and training on the improvement of information circulation and communication between team members, as well as the provision of a therapy in case of stress or the professional burnout syndrome.

In each medical centre, managers should implement new solutions and technologies, including pharmacy dispensers, which will minimise the risk of errors connected with mixing up the packaging or dose of a drug. It is necessary to strengthen cooperation within the treatment team between a doctor, a nurse and a hospital pharmaceutist.

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