*Ф А 2.2.1-32-367*

**MINISTRY OF HEALTH OF UKRAINE**
**NATIONAL UNIVERSITY OF PHARMACY**
**faculty for foreign citizens' education**
**department of social pharmacy**

# QUALIFICATION WORK

on the topic: « **STUDY ON THE MEDICATION ERRORS PROBLEMS IN PHARMACY PRACTICE»**

**Performed by**: higher education graduate of group Фм20*(4,10д)англ-02
specialty 226 Pharmacy, industrial pharmacy
educational program Pharmacy
Salma HASSINI
**Supervisor**: associates professor of higher education institution of department of social pharmacy, PhD, Iryna SURIKOVA
**Reviewer**: associate professor of higher education institution of department of pharmaceutical management and marketing department, PhD Iryna BONDARIEVA

**Kharkiv – 2024**

## ANNOTATION

The qualification paper presents the results of the study of the problem of drug-related errors during the dispensing of medicines. A review of the literature on this issue was carried out, the processes of creating the names and packaging of medicinal products were investigated. A survey of pharmaceutical workers regarding this problem was also conducted, with further development of recommendations to prevent the occurrence of medication errors in practice.

The work is presented on 44 pages of text, the number of tables - 9, the number of figures – 14, the list of used sources – 41 sources.

*Key words*: drug-related error, drug, name of the drug, LASA medications

## АНОТАЦІЯ

У кваліфікаційній роботі представлено результати дослідження проблеми лікопов'язаних помилок під час відпуску лікарських засобів. Здійснено огляд літератури з даної проблеми, досліджено процеси створення назв та упаковки лікарських засобів. Також проведено анкетування фармацевтичних працівників щодо цієї проблеми, з подальшою розробкою рекомендацій щодо попередження появи лікопов'язаних помилок у практичній діяльності.

Робота представлена на 44 сторінках тексту, кількість таблиць – 9, кількість рисунків – 14, список використаних джерел – 41 джерел.

*Ключові слова:* лікопов'язана помилка, лікарський засіб, назва лікарського засобу, LASA препарати

**CONTENT**

# LIST OF ABBREVIATIONS

AR – adverse reaction

EMA – European medicines agency

INN – International Nonproprietary Names

ISMP – Institute for Safe Medication Practices

LASA – look alike and sound alike

ME – medication error

NCC MERP – National Coordinating Council for Medication Error Reporting

WHO – World Health Organization

# INTRODUCTION

The eighth annual MEDMARX report, issued in February 2008 by the USP, detailed problems with 1,470 identical packages. The report found harms in 1.4% of events classified as errors, including 7 errors that may have caused or contributed to patient death. The World Health Organization's (WHO) Global Patient Safety Initiative, launched in March 2017, identified "similar medicines" as "a common source of harm and errors related to medicines."

In today's environment, when the volume of medical information is growing exponentially, it is important to pay attention to patient safety. Medication errors can lead to serious consequences for people's health. Research into the problem of medication errors during the dispensing of medicines is an urgent task, as it contributes to the improvement of pharmaceutical practice and ensuring patient safety. By analyzing the factors leading to errors, developing effective recommendations and implementing them in practice, we can improve the quality of medical care and reduce the risk of undesirable consequences for patients.

Therefore, this problem is relevant, because first of all, it can lead to a deepening of the problem of irrational use of medicines, an increase in morbidity, etc.

*The purpose of the qualification work* is to study the problem of medication-related errors during the dispensing of medicines.

*Research objectives.* In accordance with the goal, we set the following tasks:

• conduct a review of literary sources on the problem of drug-related errors and their classification,

• study the problem of consonance of names and similarity of drug packaging in pharmaceutical practice;

• investigate the process of "pharmaceutical naming" of drugs;

• study approaches to the creation and regulation of the appearance and labeling of drug packaging;

• conduct a questionnaire survey of pharmaceutical workers on the problem of phonetic and external similarity of drugs in pharmaceutical practice;

• summarize recommendations for preventing drug-related errors in the practical activities of a pharmacist.

*The object of research* became scientific sources on medication errors, regulatory and legal acts regulating the packaging and labeling of drugs, pharmaceutical company websites, questionnaires of pharmaceutical workers.

*The subject of the study* is to identify the problem of visual and phonetic similarity of drug names in pharmaceutical practice and the impact of this problem on the effectiveness and rationality of pharmacotherapy.

*Research methods.* During the research, we used such methods as systemic, analytical and comparative, graphic and logical methods, the method of descriptive and abstract modeling and generalization, and the sociological method.

*Scientific novelty and practical significance* of the obtained results is to conduct a comprehensive study on the problem of medication errors in pharmacies, namely, to study approaches to creating drug names and packaging, the opinions of pharmaceutical workers on this problem, with the subsequent development of recommendations for preventing the occurrence of medication errors.

The qualification work consists of an introduction, three chapters, conclusions, a list of used literary sources, appendices and is presented on 44 pages of printed text. The work is illustrated with 14 figures and 9 tables. The bibliography includes 41 information sources.

# CHAPTER 1.
# LITERATURE REVIEW ON THE PROBLEM OF MEDICATION ERRORS AND THEIR CLASSIFICATION

## 1.1 Medication errors: definition, classification approaches, causes, monitoring methods

Medicines are used in the provision of health and pharmaceutical care worldwide. However, with the significant and increasing use of medicines comes an increased risk of harm. This is compounded by the need to prescribe for an ageing population with increasingly complex medical needs and the introduction of many new medicines to the market. These issues are particularly relevant in primary care. In many cases, prescribing begins in primary care, and those prescribed in hospital may also continue to receive their medicines in primary care [15].

Much of the literature on medication errors describes problems in the hospital setting, but there is variation in the types of clinical problems encountered, the classes of drugs used, and the organization of services in primary care. This means that the risks in primary care and the solutions needed may differ from those in the hospital setting [15].

According to international experience, the negative consequences of drug use in patients do not always manifest themselves in the form of adverse reactions or lack of drug efficacy. In addition, these consequences are not necessarily the result of the therapeutic effect of drugs in the human body. Recently, in world practice, the terms “medication error” (ME) have been increasingly used to describe the negative consequences of treating patients with pharmaceutical drugs, which can be defined as “ drug-related error” (DRE), “drug related problem”, “drug therapy problem”, etc.

Based on the results of the review of literature sources, we determined that today there is no single system for defining and classifying ADRs in the world. The most widely implemented definition in the world is the definition of the US National Coordinating Council for Medication Error Reporting and Prevention (NCC

MERP): “A ME is any event (the occurrence of which could have been avoided) that occurred during the use of a drug under the control of a healthcare professional, patient, or consumer and that may lead to inappropriate use of the drug or harm to the patient’s health.” [1, 30].

Such events may be related to professional practices, healthcare products, procedures and systems, including prescribing; order communication; labelling, packaging and product nomenclature; compounding; dosing; distribution; administration; education; monitoring; and use.” However, there is no universally accepted single definition.

According to the definition presented in the European Medicines Agency (EMA) Good practice guide on recording, coding, reporting and assessment of medication errors, an ME is an unintentional failure in the process of medication administration that results in or is likely to result in harm to the patient [8].

Figure 1.1 shows the relationship between ME and harm (i.e., associated with adverse reaction(s)) and preventability. Thus, an adverse reaction (AR) that results from an error in the use of a drug is considered preventable, in contrast to an ME that is generally not preventable, which is defined as an undesirable effect of a drug, i.e., for which the probability of harm to the patient is known and accepted and is likely to occur depending on the frequency of the adverse reaction and other circumstances, such as concomitant medication [8].

There are also medication errors that do not necessarily result in harm (i.e. no associated AR), but may have other undesirable consequences, e.g. from an economic or environmental perspective. If an ME occurred but was recognized and intercepted before it reached the patient, the potential adverse reaction was prevented, and this is called an intercepted error. Potential errors may also be relevant for learning purposes, e.g. if there are circumstances or information that could lead to the error that are considered relevant to capturing the signal.

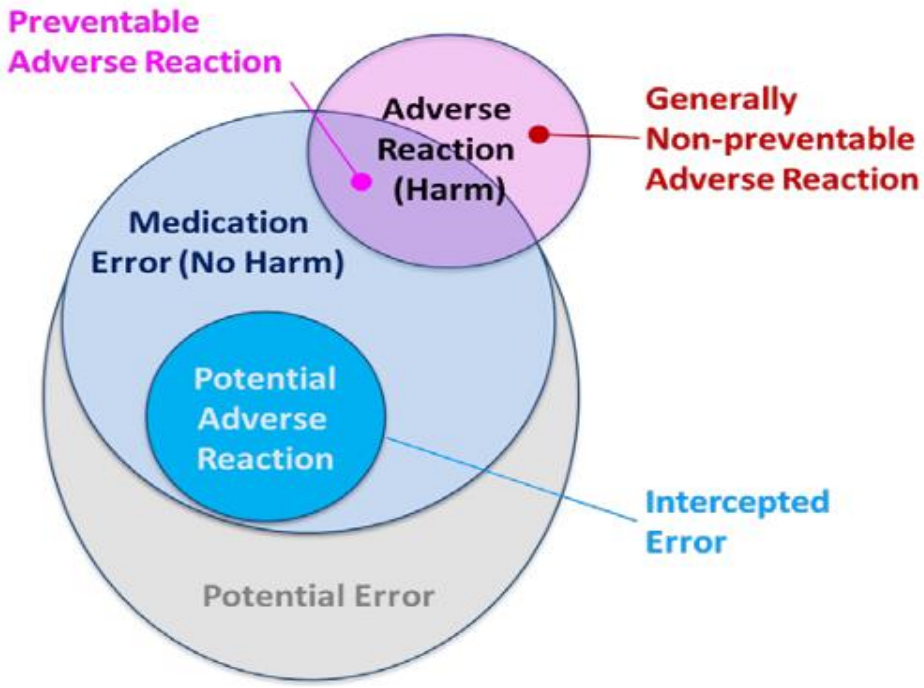



Fig. 1.1. Correlation between medication errors, preventable adverse reactions, and intercepted AR

In addition, in world practice there are different opinions on the classification of PAP. For example, D. Williams offers a contextual approach, which is related to the stage of pharmacotherapy: during the prescription of the drug by a doctor or the dispensing of the drug by a pharmacist, as well as during the direct use of the drug (Fig. 1.1) [25].

In the scientific works of Jeffrey K. Aronson, another approach to classification is presented, based on psychological theory, which, in his opinion, is more acceptable, since it explains the occurrence of BPD, and not just describes them (Fig 1.2) [2, 3].

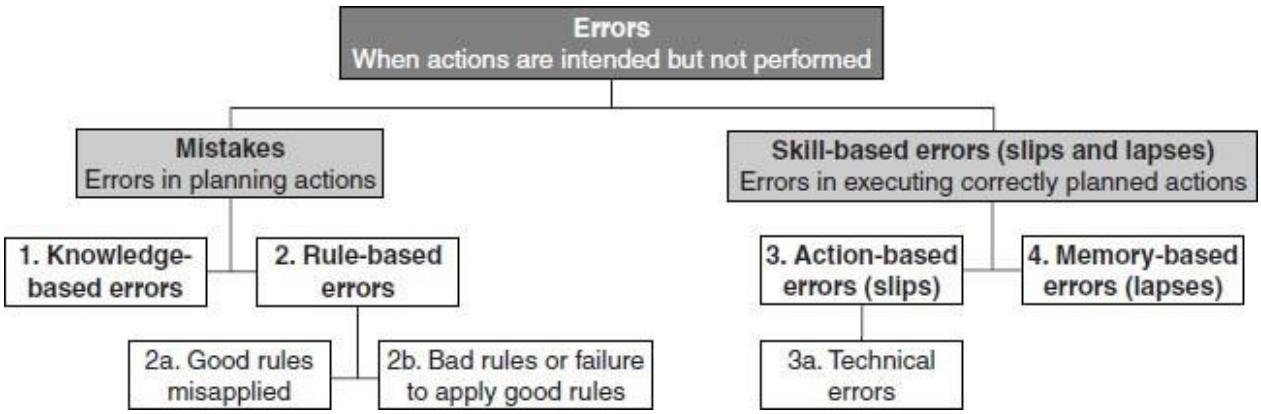



Fig. 1.2 Classification of types of LBP based on psychological principles (Jeffrey K. Aronson)

At the same time, systems for registering and evaluating PEPs, such as EudraVigilance, MedWatch, MERP, have created their own structured classification systems.

For example, the NCC MERP has developed the Medication Error Index, which categorizes errors by severity (Table 1.1). This index helps healthcare providers and institutions track medication errors in a consistent and systematic manner. This categorization takes into account factors such as whether the error reached the patient, whether the patient was harmed, and to what extent. The NCC MERP recommends that all healthcare institutions and researchers, as well as software vendors, use this index to track medication errors. The ISMP Medication Error Reporting Program has also implemented this index in its database [30].

*Table 1.1*

Medication errors Types and risk assessment index proposed by NCC MERP

| **Category** | **Description of category** |
|---|---|
| **No error** | |
| A | Circumstances or events that have the capacity to cause error |
| **Error, no harm** | |
| B | An error occurred, but the medication did not reach the patient |
| C | An error occurred that reached the patient but did not cause patient harm |
| D | An error occurred that resulted in the need for increased patient monitoring but no patient harm |
| **Error, harm** | |
| E | An error occurred that resulted in the need for treatment or intervention and caused temporary patient harm |
| F | An error occurred that resulted in initial or prolonged hospitalization and caused temporary patient harm |
| G | An error occurred that resulted in permanent patient harm |
| H | An error occurred that resulted in a near-death event (e.g., anaphylaxis, cardiac arrest) |
| **Error, death** | |
| I | An error occurred that resulted in patient death |

Also, for the purpose of good practice in recording, coding, reporting and evaluating medication errors and to facilitate their recording, the EMA guidance presents a classification based on factual case information (Figure 1.3). In particular, it emphasizes the need to clearly distinguish between ADRs, non-harmful ADRs, intercepted ADRs and potential ADRs depending on where the break in the chain of events leading to the error and its consequences for the patient occurs.

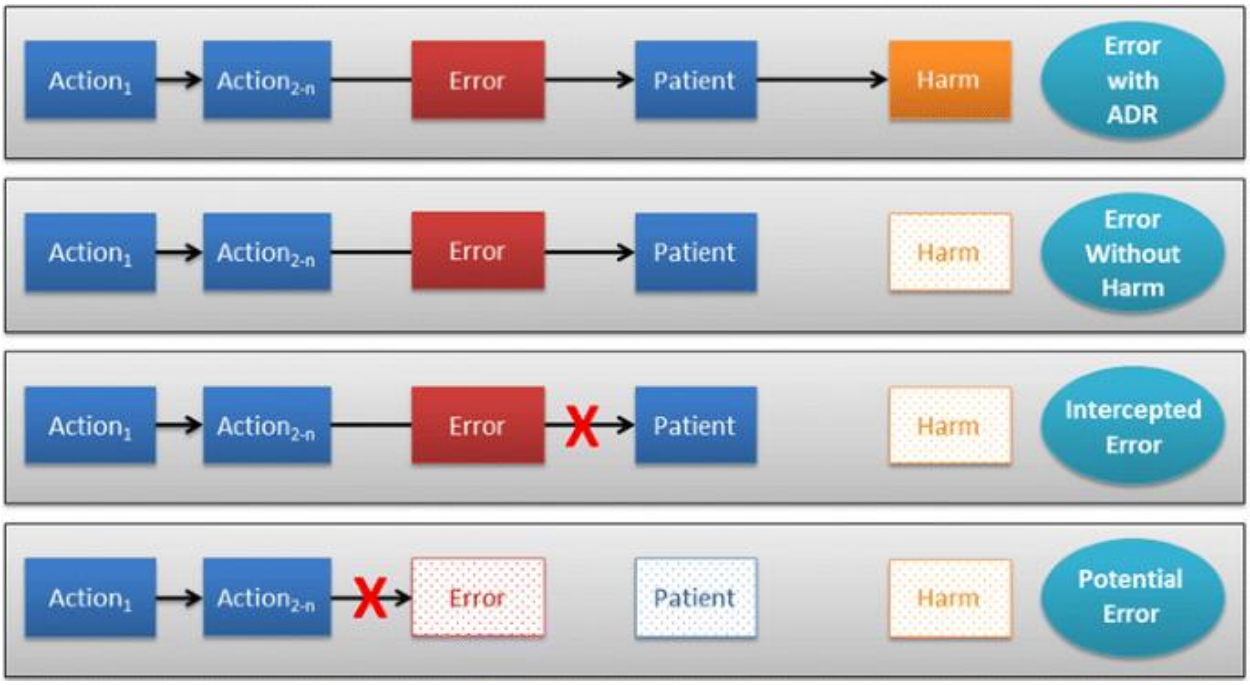



Fig. 1.3 Concept for classifying ME reports on medicinal products for pharmacovigilance purposes, developed by the EMA

Scientists have also developed other approaches to classification. For example, MEs can be classified according to the stage at which the ME occurred. Thus, they distinguish between prescription errors, transcription errors, dispensing errors, administration errors, or monitoring errors (Table 1.2) [15].

There is also an approach that considers the types of ADRs that occur, such as the wrong drug, dose, frequency, route of administration, or patient. A further approach classifies ADRs according to whether they occur due to errors made in planning actions (knowledge- or rule-based errors) or errors in executing properly planned actions (action-based errors, known as “slips” or memory errors). ADRs can also be classified by level of severity. These approaches are not mutually exclusive, and there is no convincing evidence to support specific methods for defining or classifying errors specifically in primary care [15].

*Table 1.2*

Generalization of approaches to the classification of ME

| ME type | Definition |
|---|---|
| **Prescribing Errors** | **Incorrect choice of medication** (based on indications, contraindications, known allergies, existing drug therapy, and other factors), dose, dosage form, quantity, route of administration;<br>**Illegible prescriptions** or orders for medications that lead to errors. |
| **Transcription errors** | Any **deviations in the decoding of the prescription** (order) for medication from the previous step (order on the order sheet, pharmacist's memo to the administration and/or order documentation in the pharmacy database) |
| **Dispensing errors** | Any **deviation from a prescription** or medication order. Errors in ancillary content and labeling;<br>Any unintentional deviation from professional or regulatory references or guidelines affecting dispensing procedures |
| **Administration errors** | Any deviation from the medication order as specified in the preparation/administration or relevant institutional policies |
| **Monitoring errors** | **Failure to review the prescribed regimen** for compliance and identify problems or failure to use appropriate clinical or laboratory data to adequately assess the patient's response to the prescribed therapy**.** |

Today, a lot of counties the standard “Guidelines for Medicinal Products. Good Pharmacovigilance Practices” was approved by legal act. Measures are also being taken to further develop the pharmacovigilance system. Despite the high assessment of international expertise, the domestic pharmacovigilance system, unfortunately, does not take into account data on medication errors, and the above-mentioned recommendations have not yet been included in the Guidelines.

Numerous studies have examined factors associated with medication errors. A Commonwealth Fund International Health Policy survey compared factors associated with patient-reported MEs across seven countries. In the 11% of patients who experienced a medication error, risk factors included poor care coordination,

barriers related to the cost of obtaining health services or medications, multimorbidity, and hospitalization.

Table 1.3 provides a summary of some of the key factors associated with ME, including the provider, patient, care team, work environment, tasks, computer system, and primary and secondary care interface [15].

*Table 1.3*

Summary of factors that may influence the occurrence of ME

| Group of factors | Examples of factors |
|---|---|
| 1 | 2 |
| Factors related to medical/pharmaceutical workers | • Lack of therapeutic training;<br>• Insufficient knowledge and experience of medication treatment;<br>• Inadequate patient knowledge;<br>• Inadequate risk perception;<br>• Overwork or fatigue of healthcare workers<br>• Physical and emotional health problems<br>• Poor communication between healthcare workers and patients |
| Patient-related factors | • Patient characteristics (e.g., personality, literacy, and language barriers);<br>• Complexity of the clinical case, including multiple comorbidities, polypharmacy, and high-risk medications |

*Continuation of Table 1.3*

| 1 | 2 |
|---|---|
| Factors related to the work environment | • Workload and time pressure;<br>• Distractions and interruptions (both by healthcare/pharmaceutical staff and patients);<br>• Lack of standardized protocols and procedures for some cases;<br>• Insufficient resources;<br>• Problems with the physical work environment (e.g. lighting, temperature and ventilation) |
| Drug-related factors | • Drug names<br>• Labeling and packaging |
| Task-related factors | • Repetitive systems for ordering, processing, and authorization;<br>• Patient monitoring (depending on the practice, the patient, other health care facilities, the prescribing physician) |
| Factors related to computerized information systems | • Complicated processes for creating initial prescriptions (e.g., lists of selected medications, default dosing regimens, and missed notifications);<br>• Complicated processes for creating correct repeat prescriptions;<br>• Insufficient accuracy of patient records;<br>• Inconvenient interface that allows for human error |

## Conclusions for chapter 1

An analysis of literary sources on definitions related to the negative consequences of drug use was conducted. It was determined that the most common definition characterizing errors during pharmacotherapy is the term “medication error”, or “drug-related error”, proposed by NCC MERP.

It was established that currently there is no single unified classification of drug-related errors in the world. Taking into account general trends, it is possible to distinguish errors that occur during drug prescription, drug use during inpatient treatment and when dispensing drugs by a pharmaceutical worker.

During the study of the relationship, it was determined that a drug-related error is not always the cause of a negative consequence of drug use, the occurrence of an adverse reaction and harm to the patient’s health.

# CHAPTER 2
# RESEARCH ON THE PROBLEM OF CREATING THE NAME AND PACKAGING OF MEDICATIONS

## 2.1 The problem of look alike and sound alike drigs in pharmaceutical practice

As indicated in Table 1.3. one of the risk factors for the occurrence of LPP is the consonance of names and visual similarity of drug packaging. Drugs whose packaging is visually similar to another product are classified as analogues. Drugs for which the generic or trade names of the product sound similar in oral or written form are classified as sound-alike drugs. Similar and sound-alike drug names can lead to unintentional drug exchange, which can lead to injury or death of the patient. In world practice, these groups of drugs are called LASA medications.

Look alike and sound alike (LASA) medications are those that are likely to be mis-selected during the dispensing process due to their similar names or packaging. LASA dosing errors are one of the most common causes of medication errors. Pharmacy plays a key role in patient safety, and there are several ways in which the pharmacy team can help reduce LASA errors [35].

Similar and similar-sounding (LASA) drug names are a serious problem in healthcare, accounting for 29% of medication errors. Name confusion is responsible for 15–25% of all medication errors [25].

LASA errors occur when the names of pairs or groups of drugs, such as cephalosporins, are similar both in written form (orthography) and spoken form (phonology). Confusion can also occur between brand or generic names. Sound similarity errors involve drug names that are easily mistaken for one another, especially when verbal orders are given. However, there is no generally accepted clear definition of LASA errors. The appearance of drugs can be misleading, as other drugs may look the same; conversely, the same drug from another source may look different. LASA medication errors can occur because of similarities in drug name,

dosage form, dosage, or product packaging. These errors often result from selecting the wrong drug from the shelf or even from an electronic list [32].

Recognizing the problem of LASA errors, the U.S. Food and Drug Administration initiated the Name Differentiation Project in 2001 to evaluate postmarketing reports of name pair confusion. Identification of LASA drugs is a requirement of medication management standards in many countries and healthcare settings. The ISMP publishes a regularly updated list of LASA drugs that can be used as a guide for identifying LASA drug pairs. [32].

An international expert group of the World Health Organization (WHO) is working to standardize the international nonproprietary names (INNs) of medicinal substances with the aim of their acceptance worldwide. However, the brand names of medicines developed by manufacturers and sponsors may differ in different countries. Some medicines with the same or similar name may contain different active pharmaceutical ingredients in different countries. Also, sometimes the same medicine from the same manufacturer may have different trade names depending on the country of sale. Table 2.1 provides examples of similar trade names of medicines that have been recorded in some countries [32].

*Table 2.1*

Examples of consonant trade names of drugs in countries around the world

| **Country** | **Trade name (INN)** | **Trade name (INN)** |
|---|---|---|
| 1 | 2 | 3 |
| **Australia** | Avanza (mirtazapine) | Avandia (rosiglitazone) |
| | Losec (omeprazole) | Lasix (frusemide) |
| **Brazil** | Losec (omeprazole) | Lasix (frusemide) |
| | Quelicin (succinilcolina) | Keflin (cefalotina) |
| **Ireland** | Losec (omeprazole) | Lasix (frusemide) |

*continuation table 2.1*

| 1 | 2 | 3 |
|---|---|---|
| **Spain** | Dianben (metformin) | Diovan (valsartan) |
| | Ecazide (captopril/hydrochlorothiazide) | Eskazine (trifluoperazine) |
| **Italy** | Diamox (acetazolamide) | Zimox (amoxicillina triidrato) |
| | Flomax (morniflumato) | Volmax (salbutamolo solfato) |
| **Canada** | Celebrex (celecoxib) | Cerebyx (fosphenytoin) |
| | Losec (omeprazole) | Lasix (frusemide) |
| **Sweden** | Avastin (bvacizumab) | Avaxim (hepatitis A vaccine) |
| | Lantus (insulin glargine) | Lanvis (toguanine) |
| **Japan** | Almarl (arotinolol) | Amaryl (glimepiride) |
| | Taxotere (docetaxel) | Taxol (paclitaxel) |

## 2.2 Research the process of "pharmaceutical naming"

In recent years, the pharmaceutical market has been growing rapidly. Each medication has its own name, but they can be difficult to perceive not only for patients, but even for medical and pharmaceutical specialists. A large number of similar names can potentially lead to the appearance of medication-related errors, which can lead to a deepening of the problem of irrational use of medications, an increase in morbidity, etc. Therefore, we investigated the process of "pharmaceutical naming" as a factor influencing the problem of consonance of drug names.

"Pharmaceutical naming" is a complex process of creating and selecting image names for medicines.

It is a well-known fact that each drug has 3 names – chemical, international non-proprietary and trade. The chemical name reflects the composition and structure of the drug, the international non-proprietary name (INN) is accepted for use

worldwide for the convenience of drug identification, but may be incomprehensible to the consumer. Therefore, manufacturers create trade names for drugs, which are most often short, understandable and easy to remember [4].

INN — the common name of the active substance that is part of the medicinal product, provided during the registration of the active ingredient. The INN is also referred to as the "generic name". This name is approved by WHO, is not the property of a specific manufacturer, and cannot be protected by a patent [4].

The International Nonproprietary Names (INN) system was first established by the World Health Assembly in 1950 by resolution WHA3.11. It became operational in 1953, when the first INN List was published. Today, the list includes about 7,000 names and is constantly being updated. The International Nomenclature of Pharmaceutical Substances in the form of INNs is essential for the clear identification of drugs, their safe prescription and dispensing to patients, and for the exchange of information between health professionals and scientists around the world [4].

The names that are given INN status are chosen by WHO on the recommendation of the WHO Expert Advisory Group on the International Pharmacopoeia and Pharmaceuticals. Each INN is unique, but may contain elements that are common to all drugs belonging to the same class. They indicate common features, such as the diseases for which these drugs are prescribed, their effect on the body, etc. Thanks to these common bases, a doctor or pharmacist can understand that this substance belongs to a group of substances with similar pharmacological activity [4].

Trade or brand name is a name invented by the manufacturer (applicant of the drug). The name of the drug is the name given to the drug, which can be either invented by the applicant (manufacturer), or generally accepted or scientific, which may be accompanied by the name of the trademark or the name of the applicant (manufacturer). The generally accepted name is the INN of the active substance recommended by the WHO [2, 4, 15].

Medications are substances utilized for therapeutic purposes, specifically to address various medical conditions. These substances often possess multiple names. Initially, when a drug is discovered, it is assigned a chemical name that reflects its atomic or molecular structure. However, this chemical name can be overly complex for everyday use. Consequently, a simpler version of the chemical name or a code name (like RU 486) is created for easier reference among researchers.

Once a drug receives approval from the Food and Drug Administration (FDA)—the U.S. agency tasked with ensuring the safety and efficacy of marketed drugs—it is assigned both a generic (official) name and a brand (proprietary or trademark) name. For instance, phenytoin is the generic name, while Dilantin is the brand name for a commonly prescribed antiseizure medication.

In the United States, the generic name is designated by the United States Adopted Names (USAN) Council, while the brand name is created by the pharmaceutical company seeking approval, marking it as the exclusive property of that entity. During the period of patent protection, the company promotes the drug using its brand name. Once the patent expires, the company can market the drug under either its generic name or brand name. Other companies wishing to market the off-patent drug must use the same generic name but can establish their own brand names. This results in the same generic drug being available under its generic name (e.g., ibuprofen) or various brand names (such as Advil or Motrin).

To avoid confusion and ensure clarity in prescribing and dispensing medications, both generic and brand names must be distinct. The FDA must approve all proposed brand names to prevent potential mix-ups. Professionals, including government officials, doctors, and researchers, typically use the generic name when discussing the drug, as it refers to the substance itself rather than a specific company's product. However, doctors often prefer to write prescriptions using the brand name, as it is generally easier to recall, and they usually learn about new drugs through their brand names.

Generic names tend to be more intricate and less memorable than brand names. Many generic names are abbreviated versions of the drug's chemical name,

structure, or formula. In contrast, brand names are often designed to be catchy and related to the drug's intended purpose, making them easier for doctors to prescribe and for consumers to recognize. For example, Lopressor is associated with lowering blood pressure, Glucotrol is linked to managing high blood sugar levels, and Skelaxin is for relaxing skeletal muscles. Occasionally, brand names are simply shortened forms of the generic name, such as Minocin for minocycline.

The term "generic," when applied to products like food and household items, often denotes a less expensive, sometimes lower-quality imitation of a brand-name product. However, generic drugs, while typically more affordable than their brand-name counterparts, are generally just as effective and of comparable quality (see Bioequivalence and Interchangeability of Generic Drugs). In fact, many brand-name drugs are produced by generic manufacturers for the companies that hold the brand names. In some cases, multiple generic versions of a drug may be available, as seen with acetaminophen, a commonly used nonprescription medication for pain and fever relief.

During the study, we analyzed and summarized the following approaches to creating drug names, which are presented in Table 2.2.

*Table 2.2*

Generalization of approaches to creating drug names by manufacturers

| Approach | Examples |
|---|---|
| Use of INN | Loperamide, Paracetamol, Ibuprofen, |
| Adding the manufacturer's name to the INN | L-THYROXINE 100 BERLIN-CHEMI, Loratadine Sandoz, Ambroxol-Ratiopharm, Ibuprofene Viartis |
| Made-up word | AERTAL, CO-PRENESA, NUROFEN, MUCOSOLVAN |

It has also been established that names may contain descriptive or associative bases such as “kor”, “kard” – for cardiovascular drugs, “derm” – for dermatological drugs, “gastro” – drugs for the digestive system. Also, the names use stressed

morphemes that indicate belonging to the drug group – for example, the ending "-azole" in antifungal drugs – clotrimazole, fluconazole; the ending "-cain" in local anesthetics – Lidocaine, Novocaine, Longocaine [**Помилка! Джерело посилання не знайдено.**]. A summary of the analysis of drug names according to the presence of descriptive or associative elements is presented in Table 2.3.

*Table 2.3*

Generalization of the analysis of drug names according to the presence of descriptive or associative elements

| End | Application | Examples |
|---|---|---|
| -adol | Painkillers | Pharmadol, Tramadol |
| -afil | Erectile dysfunction | Tadalafil, sildenafil |
| -aron | Irregular heartbeat, arrhythmia | Amiodarone, dronedarone, cordarone |
| -azepam, -azolam | Anxiety and anxiety states | Gidazepam, alprazolam |
| -barb | Anxiety, seizures, insomnia (barbituric acid derivatives) | Phenobarbital, Barboval |
| -ase | Enzymes | Lipase, Nolpase |
| -cain | Local anesthetics | Lidocaine |
| -grel- | Platelet aggregation inhibitors | Clopidogrel, ticagrelor |
| -statin | Lipid-lowering agents. HMG-CoA reductase inhibitors | Lovastatin, simvastatin |
| -derm- | Dermatological products | Dermasol, Mesoderm |
| -card- | Cardiovascular diseases | Advocard, Cardipril |
| -cor- | | Kandecor, Corvalol |
| -enter- | Intestinal diseases | Enterol, Enterogermina |
| -gastr- | Stomach diseases | Gastritol, Pangastro |
| -immune- | Means for increasing immunity | Immunophyte |
| -herb- | Plant-based remedies | Herbion |
| -phyto- | | Phytodent, Sedaphyton |

## 2.3 Research into approaches to creating and regulating the appearance and labeling of drug packaging

An equally important factor is the issue of the outer packaging of medicines.

Drug packaging plays a crucial role in the pharmaceutical industry, serving as a critical risk minimization measure and providing essential product information to healthcare professionals and patients. Packaging design should take into account the needs and capabilities of the widest possible range of potential users and, in particular, older and partially sighted users.

The design of drug packaging is a multifaceted process that involves considering various factors, including the physical properties of the drug, the target patient population, and the overall brand identity of the pharmaceutical company.

One key consideration in the design process is the package's ability to protect the drug from environmental factors, such as light, temperature, and humidity, which could compromise the drug's stability and efficacy. Additionally, the packaging must be designed to facilitate ease of use, ensuring that patients can easily access and administer the medication.

As noted in a study on the "Strategic Implication of Pharmaceutical Packaging to Enhance Prescription from Indian Doctors", packaging can also significantly influence consumer perceptions and contribute to the overall brand equity of the product.

The design and labeling of drug packaging are subject to extensive regulatory oversight, with regulatory agencies such as the U.S. Food and Drug Administration and the European Medicines Agency playing a critical role in ensuring the safety and efficacy of pharmaceutical products.

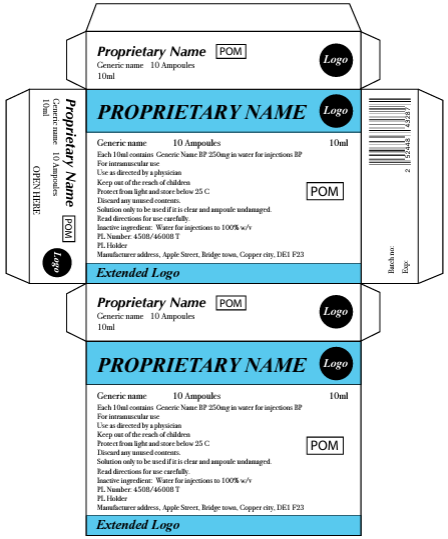
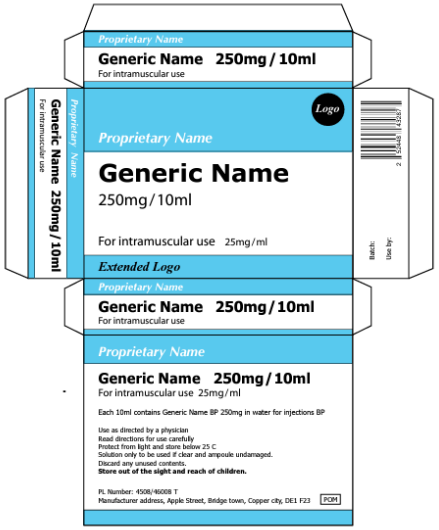
These regulatory bodies establish guidelines and standards for the packaging and labeling of drug products, addressing elements such as the size and placement of the drug name, the inclusion of safety warnings, and the use of color-coding and visual cues to enhance patient understanding.

It is also advised that European health authorities work on revising the European Medicines Regulations utilized by both the European Medicines Agency (EMA) and National Medicines Agencies. This revision should incorporate design elements for the packaging and labeling of medicinal products that consider human factors and promote safe usage in real-world scenarios [6].

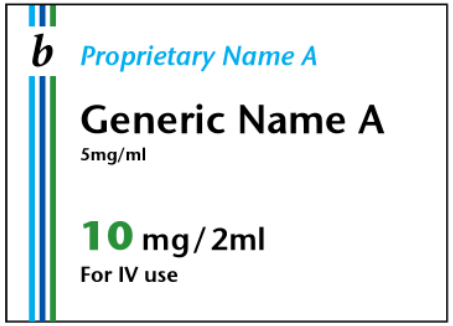
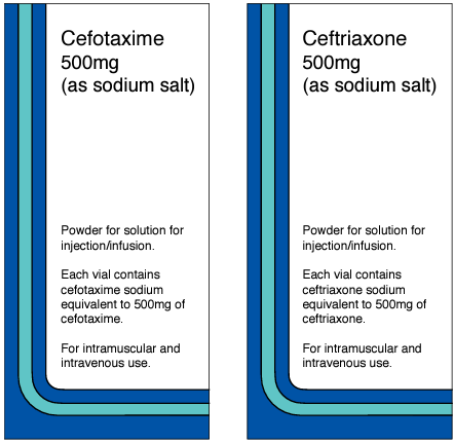
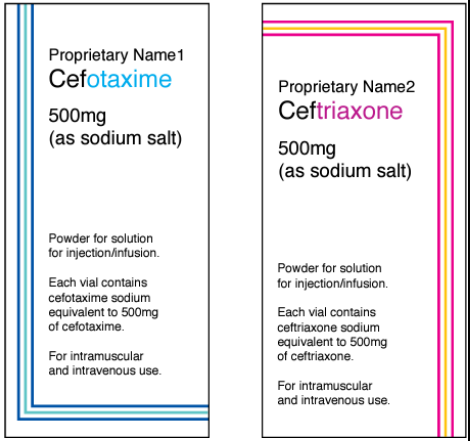
Existing design guidance was reviewed and consultations were undertaken with experts in graphic and information design, and design for patient safety. The outcome was a design rationale to enhance patient safety and a fully illustrated set of design considerations with both good and bad examples. Generalization recommendation for packaging design of drugs with graphic examples presents in Table 2.4

*Table 2.4*

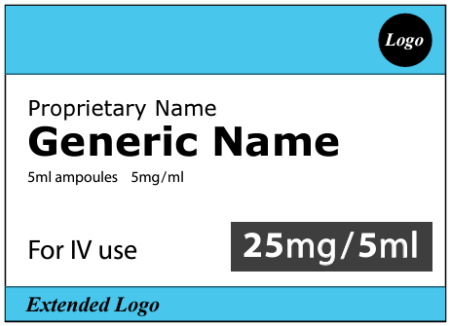
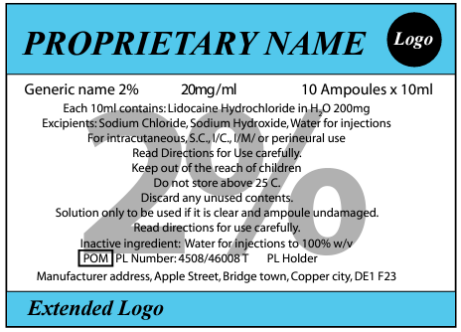
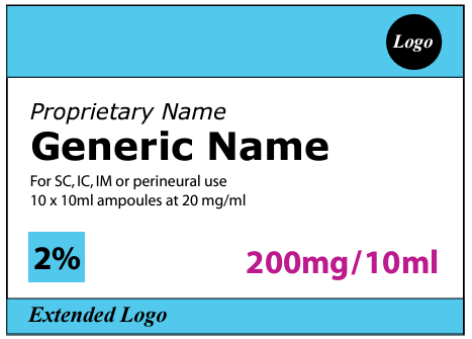
**Generalization recommendation for packaging design of drugs with graphic examples**

| Problems | Bad example | Recommendations | Good example |
|---|---|---|---|
| 1 | 2 | 3 | 4 |
| **Key information panel** | | | |
| Information is often printed on packaging in a dense block using text in a small font. Key information becomes difficult to find. |  | Create a front panel that features only the key information. Subsequent information can be shown on the back panel. Key information consists of: INN, Strength of the medicine: total quantity in the container (larger font); and strength per unit volume (smaller font); Administration route(s), Warnings |  |

*Continuation Table 2.4*

| 1 | 2 | 3 | 4 |
|---|---|---|---|
| **Use of colour** | | | |
| Colour and design may be used as a branding tool to identify a manufacturer rather than emphasising a particular drug or dosage. This may cause picking errors where the wrong medicine or dose is selected. |  | Use colour to highlight key differences in information: the drug name, the quantity or concentration.<br>Apply the colour scheme consistently throughout th primary and secondaty packaging |  |
| **Similar drug name** | | | |
| Similar names can be easily mistaken for each other, especially with smaller labels which require small font sizes. |  | Highlight the differences between the generic drug names. This could be done through the use of colour, tallman lettering or font sizes.<br>Change the graphic component to ensure an added element of differentiation. |  |

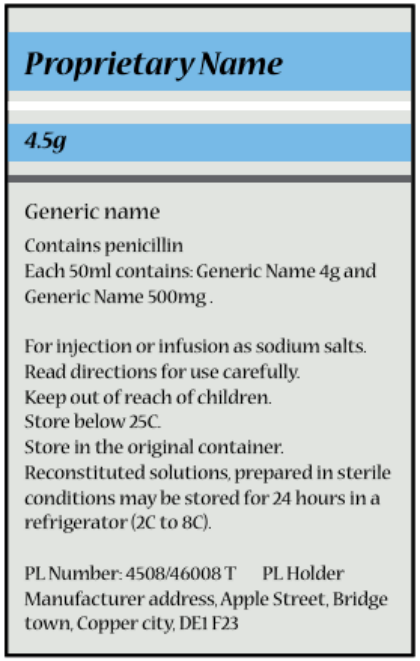
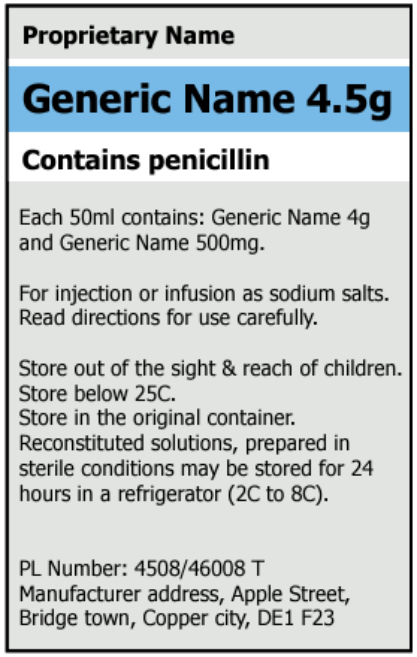
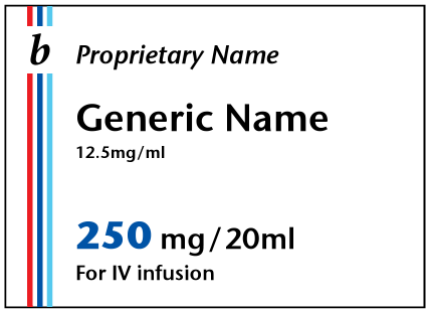
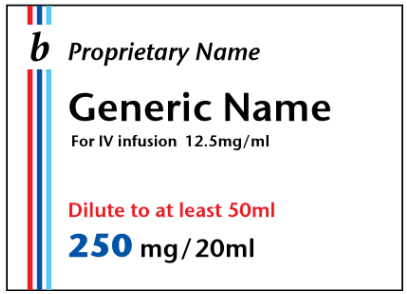
*Continuation Table 2.4*

| 1 | 2 | 3 | 4 |
|---|---|---|---|
| **Strength** | | | |
| It can be misleading if the strength of a medicine is expressed in quantity/unit volume as this can be confused with the total quantity in the ampoule, vial or syringe. |  | Express the strength of injectable medicines in quantity/ unit volume (mg/ml).<br>Include a representation of the full volume strength, i.e. total quantity in total volume (mg/ ml). This should be emphasised for single-dose containers.<br>Care to be taken with the spacing between mg and ml. Adjust the kerning so as to leave sufficient space around the '/' to achieve maximum legibility. |  |
| **Concentration** | | | |
| Different representations of concentration can create confusion and complicate dose calculations |  | Display concentration in total quantity/total volume, even if other units of concentration such as percentage and ratios (for example '1 in 1,000') are also present.<br>When using numbers of 1,000 and above, use commas to help prevent misreading.<br>Do not superimpose information on other information. |  |

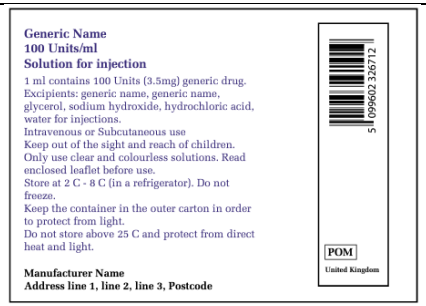
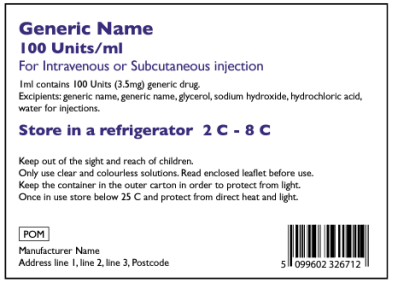
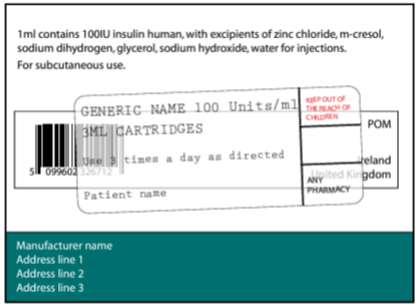
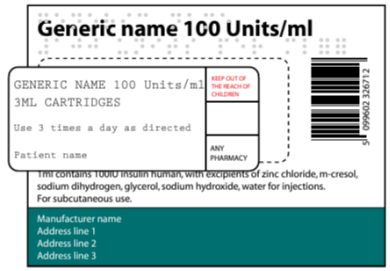
*Continuation Table 2.4*

| 1 | 2 | 3 | 4 |
|---|---|---|---|
| **Administration route** | | | |
| Routes which should not be used are stated rather than routes that should. | NOT FOR I.M. OR BOLUS USE<br>***Proprietary Name i.v.***<br>***500mg Sterile powder***<br>Generic name<br>FOR INTRAVENOUS USE.<br>Each vial contains: 500mg Generic Name, Lactobionic Acid, Sodium Hydroxide, Ph Eur, Nitrogen<br>DO NOT USE DILUENTS CONTAINING PRESERVATIVES OR INORGANIC SALTS<br>PL Number: 4508/46008 T PL Holder<br>Manufacturer address, Apple Street, Bridge town, Copper city, DE1 F23 | Make positive statements – use 'do's', rather than 'do not's'. • Use specific directions and avoid using technical terms that are not well understood, e.g. NOT FOR I.M. OR BOLUS USE 'For Parenteral Use' meaning 'For Injection or Infusion'. Proprietary Na | Proprietary Name<br>**Generic name**<br>500mg Sterile powder<br>**For intravenous infusion**<br>**Dilute before use**<br>Each vial contains: 500mg generic name, lactobionic acid, sodium hydroxide, ph eur, Nitrogen<br>**Only use preservative-free and inorganic salt-free diluents.**<br>Pl number: 458/4600<br>Manufacturer address, Apple Street, Bridge Town, Copper City, DE1 F23 |

*Continuation Table 2.4*

| 1 | 2 | 3 | 4 |
|---|---|---|---|
| **Warnings** | | | |
| Warnings about unusually high doses or potential allergies, for example, are often not highlighted and become lost in dense blocks of text. |  | Separate warning notices from the main body of text, and highlight the warning. |  |
| **Medicines for dilution** | | | |
| Medicines which must be diluted are often not indicated, which may lead to fatal doses being administered. |  | Highlight the fact that the medicine requires dilution, and state a minimum dilution volume where appropriate. |  |

*Continuation Table 2.4*

| 1 | 2 | 3 | 4 |
|---|---|---|---|
| **Storage conditions** | | | |
| Storage conditions are often not highlighted and may be lost in dense blocks of text. If storage conditions are not followed, medicines may become unusable |  | Highlight storage conditions, particularly if the drug requires refrigeration.<br>Use positive statements to give directions. |  |
| **Injectable medicines intended for use by patients (for example, insulin)** | | | |
| Some injectable medicines, for example insulin and adrenaline products, are intended for use by patients. These medicines have to be labelled with a dispensing label before they are issued to patients. Dispensing labels may obscure important information such as batch number and expiry date |  | For injectable medicines that are intended for use by patients, leave a clearly designated blank space that is a minimum size of 70 x 35mm. Position the drug name and strength next to this space.<br>For injectable medicines that come in a multidose format, such as insulin, it is recommended that the drug strength be represented as quantity/unit volume. This will also help prevent confusion for the patient.<br>Braille will need to be present on the packs. Ensure that the use of Braille does not detract from the other design features. |  |

*Continuation Table 2.4*

| 1 | 2 | 3 | 4 |
|---|---|---|---|
| **Text orientation in ampoules** | | | |
| When the medicine name is printed horizontally around the vial or ampoule, similar names can be more easily confused with one another.<br>This is particularly important for the smaller ampoules of 1, 2 and 5m |  | Print the medicine name longitudinally, along the length of the ampoule.<br>A good rule of thumb is: if the visible width of the label is less than the height of the label then the name should be printed longitudinally.<br>The information that must be present on containers 10ml or smaller |  |
| **Labelling methods** | | | |
| Ampoules can be hard to identify when labelled with ceramic printing or clear plastic labels.<br>The text may show through from the reverse side making the details difficult to read. This is particularly problematic if the text is oriented horizontally around the ampoule. |  | Use paper labelling where possible, but ensure an area is left free to allow for inspection of contents.<br>If ceramic or clear plastic labelling must be used, highlight key information by inverting the text colour.<br>Keep the information to a minimum and reduce overlapping with text from the reverse as much as possible.<br>Labels should not come off in use and should be printed with ink that does not run when sprayed with alcohol to disinfect the ampoule surface in the pharmacy or during clinical procedures |  |

## Conclusions for Chapter 2

1. It was determined that naming in the pharmaceutical industry is very important, as it affects not only the effectiveness of marketing, but also the safety of patients.

2. According to the results of the analysis, various approaches to naming have been established, including the use of only INN, adding the manufacturer's name, or creating new unique names. Foreign manufacturers are more often oriented towards creating new unique names, while domestic manufacturers often use traditional names.

3. It was determined that the process of examination of the consonance of names during the registration of intellectual property rights determines the similarity in sound of the names of medicines, but, unfortunately, this does not exclude the existence of similar names.

4. The appearance of the packaging of a medicinal product is regulated in accordance with domestic legislation. Thus, clear requirements have been established for the composition of the information applied to the packaging of medicines, elements and labeling text.

# CHAPTER 3.
# ANALYSIS OF THE PROBLEM OF MEDICATION-RELATED ERRORS IN THE PRACTICAL ACTIVITIES OF PHARMACISTS

## 3.1 Analysis of the problem of look alike and sound alike medicines in pharmaceutical practice

In order to analyze the problem of phonetic and external similarity of drugs, we conducted a survey of pharmacists who can say in practice how this affects the dispensing of drugs.

During the survey, we interviewed 40 pharmaceutical workers. The survey was conducted at pharmacy establishments in the period September-October 2024.

Based on the results of the answers to the general questions (questions 1-4), we can draw a general portrait of the respondent (Fig. 3.1-3.4):

- • Gender of respondents: female – 80%, male – 20%, from which we can conclude that the majority of respondents are female.
- • Age of respondents: up to 25 years old – 53.3%, 26-35 years old – 30%, 35-45 years old – 16.7%; we see that based on this question, the majority of respondents are under 25 years old.
- • Position of respondents: Pharmacy manager – 20%, deputy managers – 13.3%, pharmacists – 40%, assistant pharmacists – 16.7%, sales floor administrator – 10%; as we can see, most young specialists work as pharmacists.

• Work experience of respondents: up to a year – 23.3%, from 1 to 2 years 26.7%, from 2 to 5 years – 23.6%, from 5 to 10 years – 16.7%, from 10 to 15 years – 6.7%, from 15 to 20 years – 3.3%. Most respondents have been working in a pharmacy for quite a short time, less than a year, which correlates with the age of the respondents.

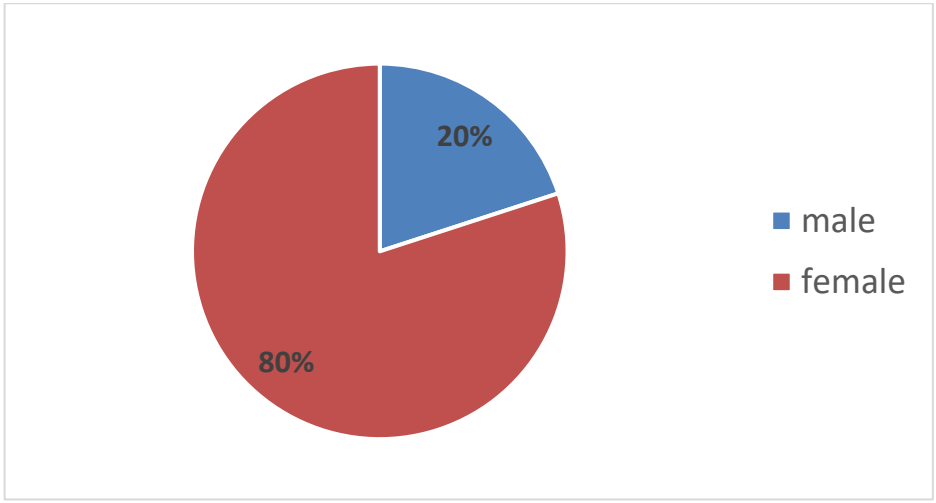



Fig. 3.1 Distribution of respondents by gender

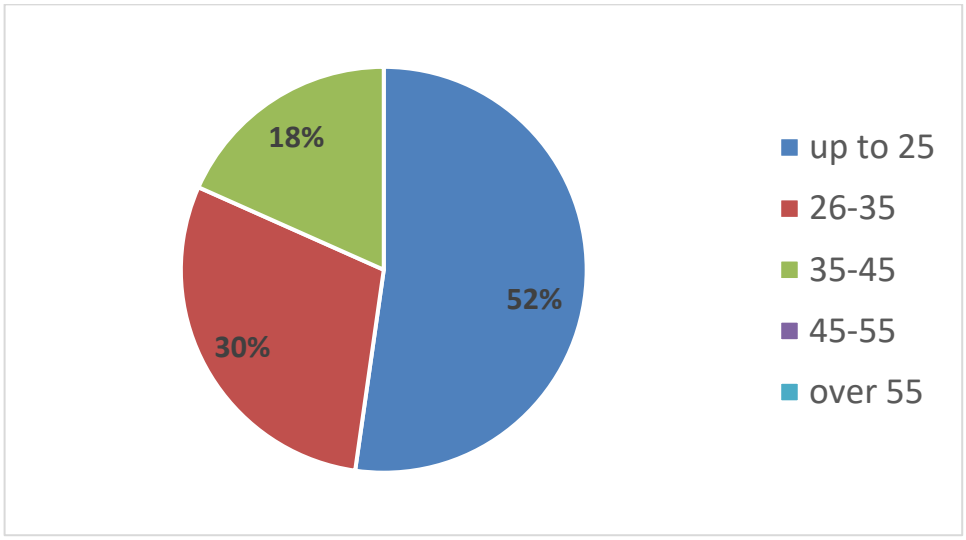



Fig. 3.2 Distribution of respondents by age

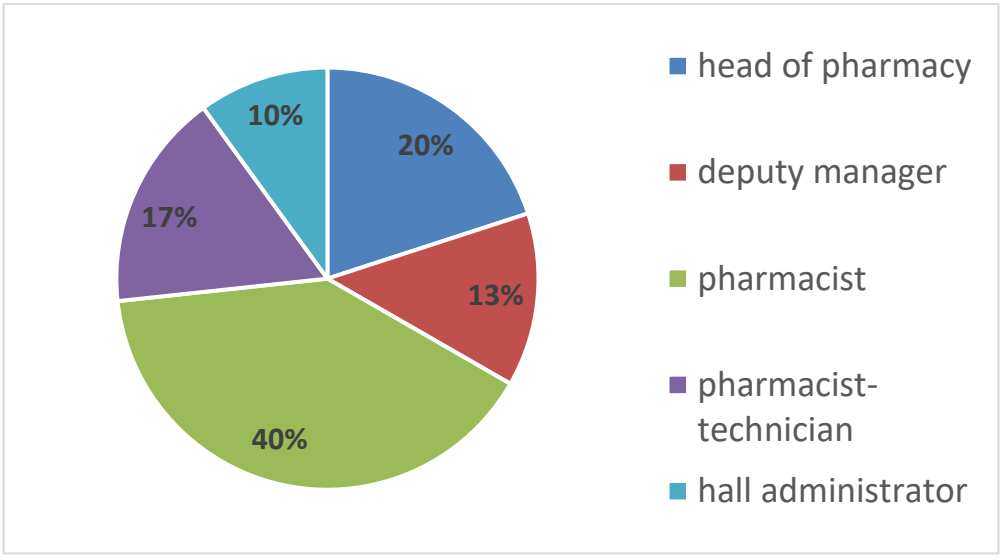



Fig. 3.3 Distribution of respondents by position

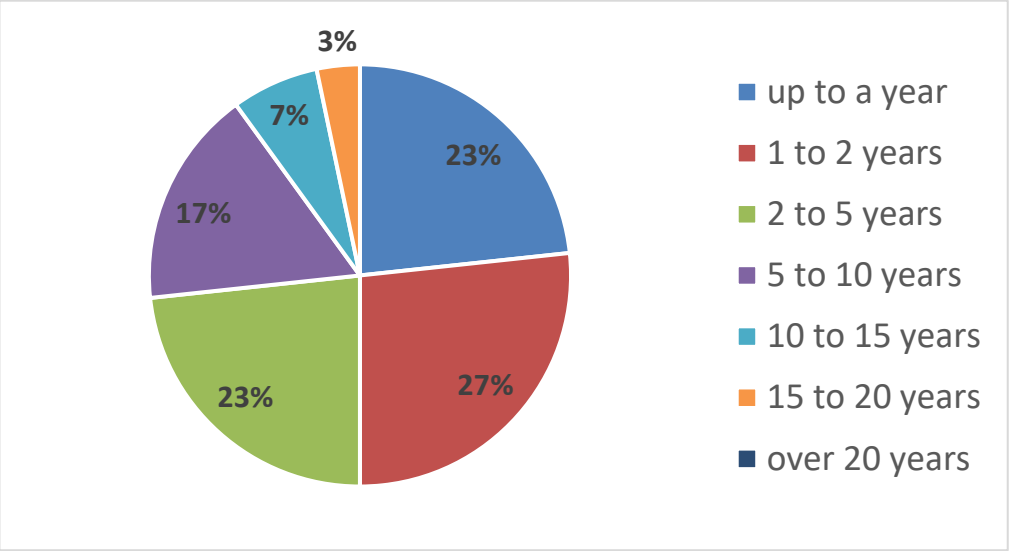



Fig. 3.4 Distribution of respondents by work experience.

The most important part of the survey was about the number of pharmacists/cashiers in pharmacies during peak hours. Because the amount of workload per pharmacist depends on this and this directly affects the number of errors. So, according to the results of our survey, the number of pharmacists/cashiers in a pharmacy during peak hours: 1 pharmacist – 10%, 2 pharmacists – 30%, 3 pharmacists – 46.7%, 4 pharmacists – 10%, 5 pharmacists – 3.3%, more than 6 pharmacists – 0 (Fig. 3.5). Thus, the largest number of pharmacies during peak hours has 3 pharmaceutical employees.

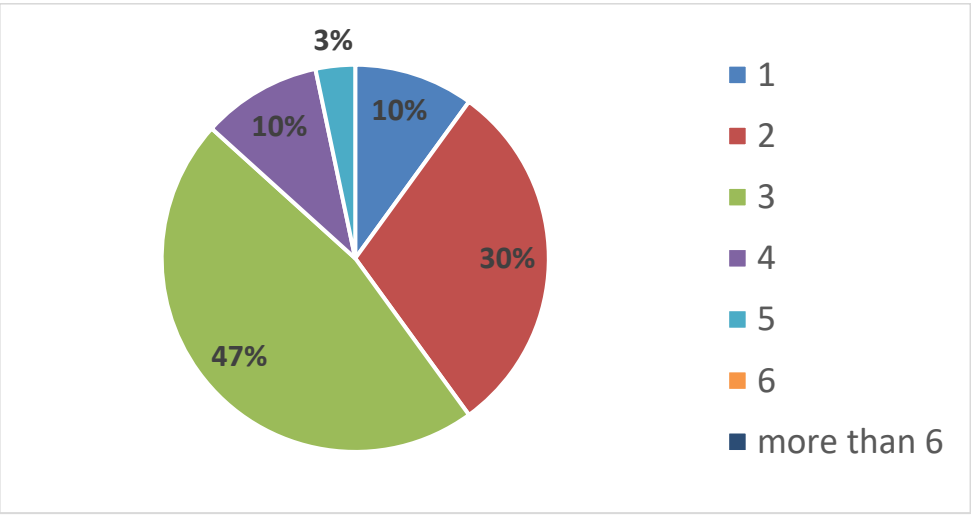



Fig. 3.5 Distribution of respondents by number of pharmacists/cashiers in the pharmacy during peak hours.

Also in our survey there was a question about the assessment of how important the (graphic) aspect is for the pharmacist when searching/dispensing drugs. As we can see from Fig. 3.6, respondents are quite concerned about the appearance of drug packaging. Also in (Fig. 3.7) we can see that respondents confirm the existence of this problem, which proves the relevance of this problem.

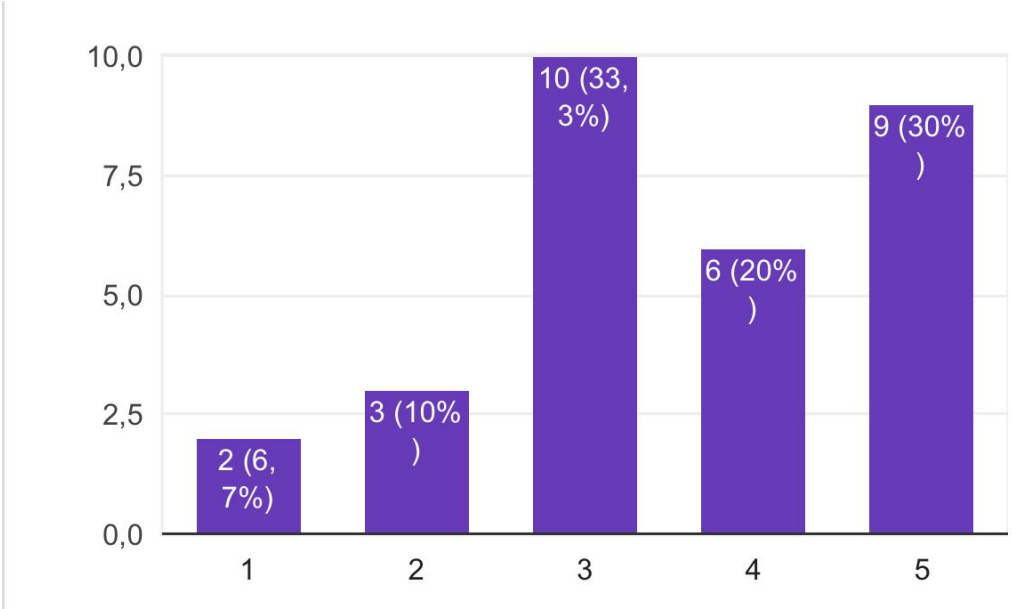



Fig. 3.6 Distribution of respondents by answer to the question “How important is the (graphic) aspect for you when searching for/dispensing medicines?”

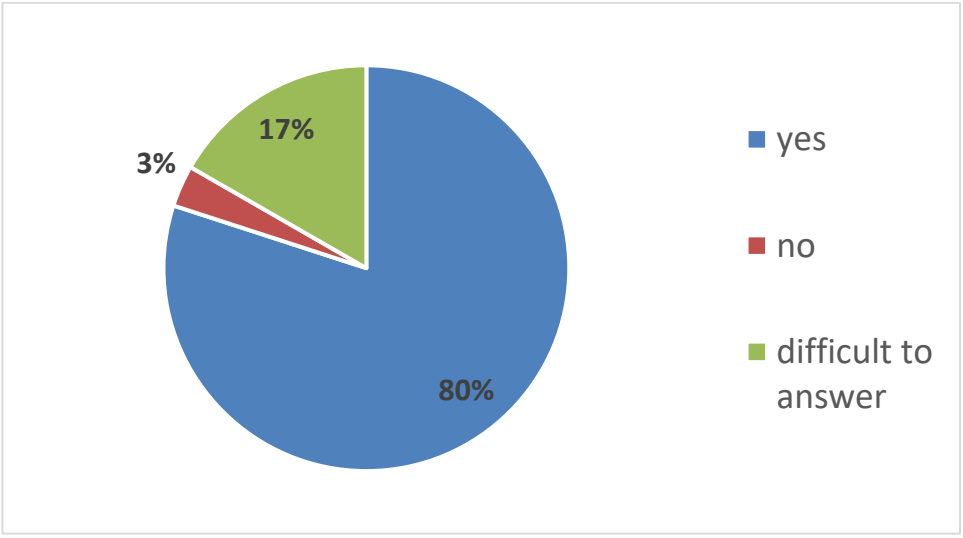



Fig. 3.7 Distribution of respondents by answer to the question “Do you really think there is such a problem as the external similarity of drugs?”

In the next question, pharmacists confirmed that in their practice there was such a problem as erroneous dispensing of drugs: 60% of respondents noted that such cases occurred, for 10% it was difficult to determine (Fig. 3.8). 62.5% of respondents associated the dispensing of another drug from the same manufacturer with the dispensing of another drug, but in a different dose (Fig. 3.9)

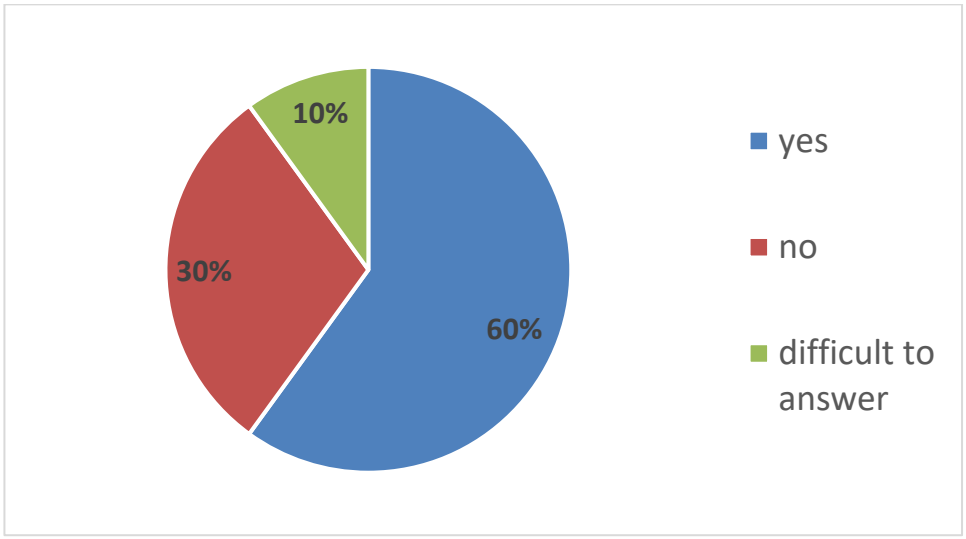



Fig. 3.8 Distribution of respondents by answer to the question “Have there been any cases in your practice of dispensing the wrong drug due to similarity of packaging?”

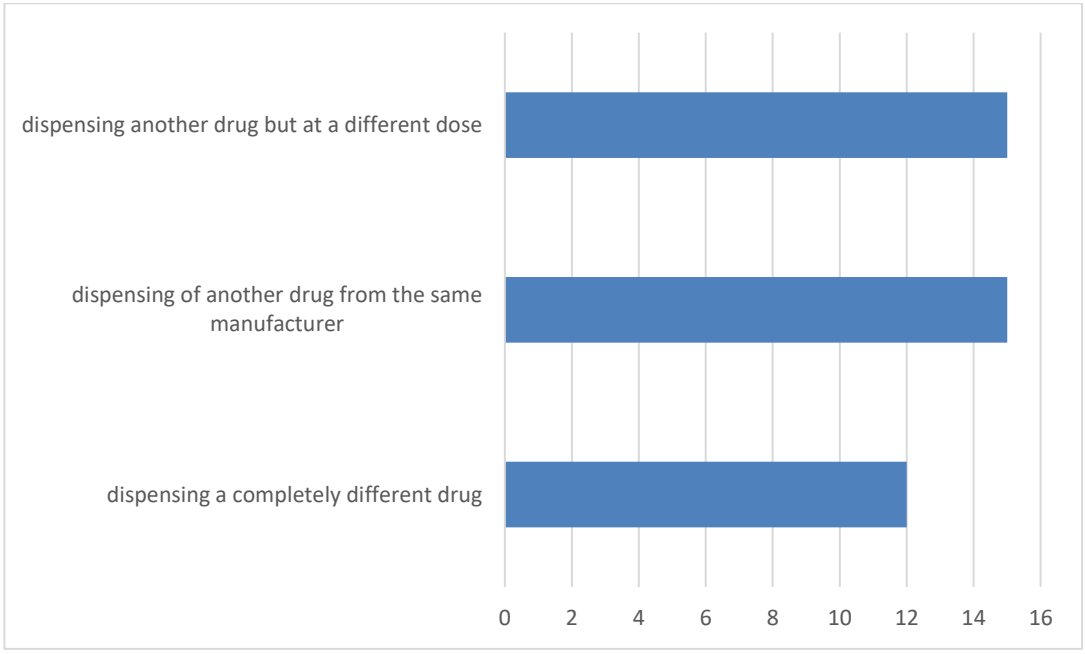



Fig. 3.9 Distribution of respondents by answer to the question “If so, what kind of mistake was made?”

Fig. 3.10 presents the results of respondents' answers to the question "Do you really think there is such a problem as the consonance of drug names?". Thus, 83.3% of respondents confirmed the problem of consonance, which shows the existence of this problem. 60% of respondents noted that they confused consonant drugs in their practice (Fig. 3.11).

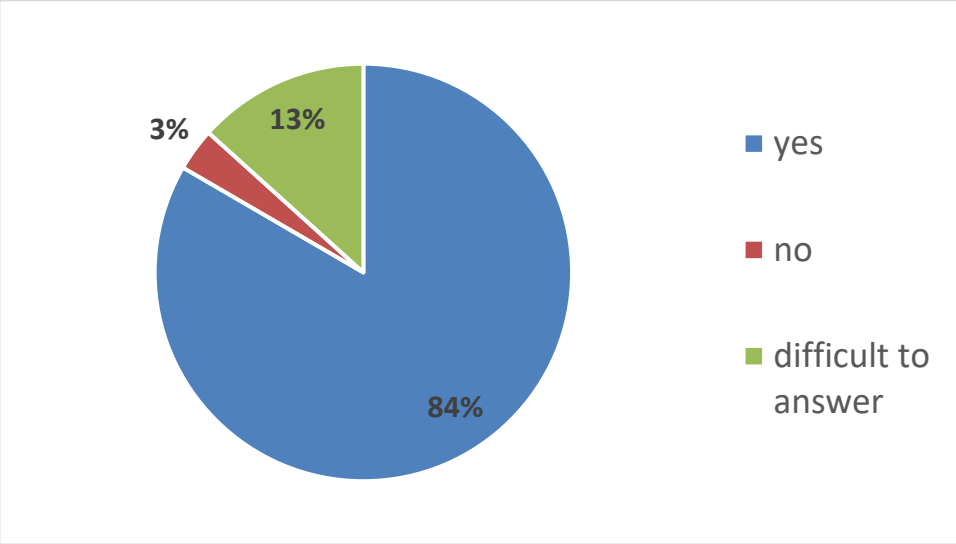



Fig. 3.10 Distribution of respondents by answer to the question “Do you really think there is such a problem as the consonance of drug names?”

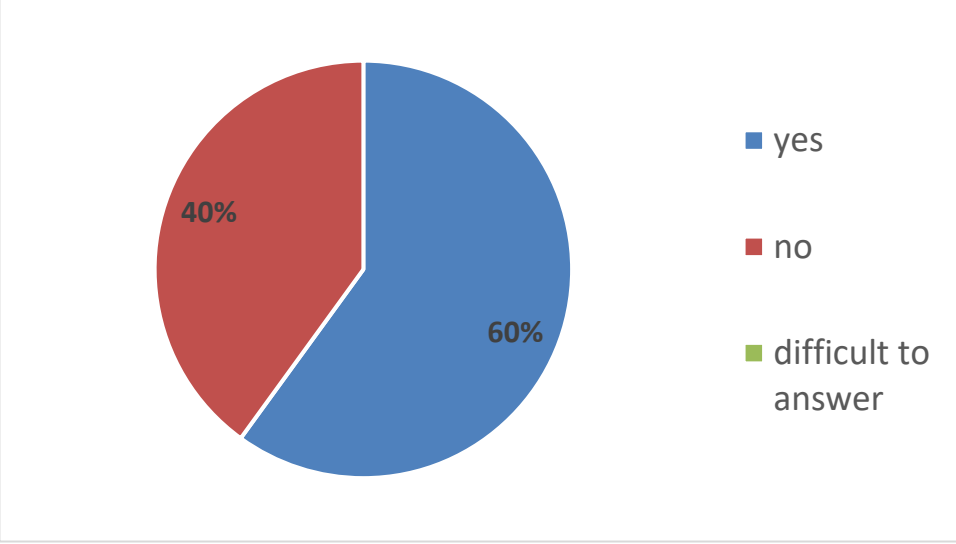



Fig. 3.11 Distribution of respondents by answer to the question “Have there been any cases of confusion between drugs due to their similarity in your practice?”

Overall, the results of this study confirmed the presence of risks associated with LASA drugs, which was confirmed by more than 80% of pharmacists.

In general, LASA errors can occur at the stages of drug prescription, dispensing, administration to the patient, or monitoring. A summary of the causes of LASA errors at each of these stages is presented in Table 3.1.

*Table 3.1*

Generalization of the reasons for the appearance of ME to the phonetic and visual similarity of drugs

| Stage | Possible causes of ME |
|---|---|
| 1 | 2 |
| Prescribing | • Illegible or poorly legible paper prescriptions, leading to misinterpretation;<br>• Oral and telephone orders for medications, leading to potential confusion with similar drugs;<br>• Failure to engage patients and their families in understanding and confirming the name and purpose of the drug;<br>• Inappropriate use of abbreviations, which can lead to errors;<br>• Using a trailing zero (e.g., 5.0 mg may be interpreted as 50 mg) or not using a zero (e.g., 0.5 mg instead of 0.5 mg may be interpreted as 5 mg), leading to dosing errors. |
| Dispensing of medicines | • Storing LASA drugs on the same shelf side by side, which may be incorrectly selected at the time of dispensing;<br>• Changing the appearance or packaging of the drugs, making them look like other products;<br>• Not using color coding for different dosages and failing to recognize any changes in the usual strength or appearance of the product at the time of dispensing;<br>• Failing to communicate with patients to communicate the name and purpose of the drugs;<br>• Failure to recheck accurately at the time of dispensing due to lack of time;<br>• Failure to notify patients of any changes in the appearance of the drugs. |

*Continuation Table 3.1*

| 1 | 2 |
|---|---|
| Administering medication to the patient | • Unclear administration instructions, such as use “as directed,” leaving instructions open to misinterpretation;<br>• Unfamiliarity with medication, leading to selection of a similar product;<br>• Product selection based on familiarity with packaging or dosage, rather than confirmation and double-checking of drug name and dosage;<br>• Lack of patient engagement during medication administration. |

### 3.2 Summary of recommendations for preventing medication errors in pharmacist practice

The basic concept of “rights” in medication administration had been around for decades, although earlier versions had fewer elements. By the 1960s, the 5 Rights (right patient, drug, dose, route, time) had been agreed upon and widely used in nursing education

In the 1980s, sources cited additional rights, such as proper documentation and reason, bringing the list to 7 rules: right patient, right drug, right dose, right route of administration, right time, proper documentation, right reason for using the drug.

During the 1990s, the full list of rules was expanded to 10 to also include correct actions/methods, response, refusal, and education. Thus, although the exact origin is unknown, the basic five rights existed for decades before gradually expanding into a comprehensive system of 10 rules [7, 9].

Thus, we have summarized 10 rules for drug administration that pharmaceutical workers must follow and that prevent the occurrence of drug interactions, which are as follows::

1. Correct Patient – Confirm that the patient’s details match the name on the medication label and prescription (e.g. name, date of birth, medical record number). Prevents potential side effects from prescribing medication to the wrong patient.

2. Correct Drug – Verify the medication name, strength and composition on the label with the medication record to ensure that the prescribed medication is the correct one. Prevents medication errors.

3. Correct Dose – Verify that the prescribed dose matches the dose that will be dispensed to prevent over- or under-dosing errors. Correct formulation is also key.

4. Correct Route – Verify that the appropriate route (IV, oral, topical, etc.) is being used to administer the medication as intended. Following the correct route is vital for sedation and safety.

5. Right timing – the patient's attention should be drawn to the time of administration of the medication (e.g., within 30 minutes before or after the scheduled time) to maintain therapeutic levels.

6. Right documentation – recording details such as the name of the drug, dose, route of administration, time in the patient's medical record, which provides legal proof of the provision of treatment and tracks the response.

7. Right action – performing all steps of preparation, double-checking, administration, and monitoring according to medical standards and policies.

8. Right reason – the need to verify the drug's indication or diagnosis to ensure proper therapeutic use versus unauthorized use without clinical indication.

9. Right response – evaluating the expected therapeutic effects, as well as adverse events or reactions after administration, to determine whether the drug is tolerated and effective.

10. Right education – providing the patient with the necessary instructions on drug use, precautions, side effects, storage, etc. for safe and appropriate use [7, 9].

Thus, the above rules are important for ensuring patient safety and improving the quality of pharmaceutical care.

## Conclusions to Chapter 3

1. 1. According to the results of the questionnaire survey, 80% of pharmaceutical workers confirmed the presence of risks associated with LASA drugs; 60% confirmed cases of erroneous dispensing of drugs for this reason.
2. 2. The recommendations of the 10 Rights rule for preventing medication errors in the practice of a pharmacist are summarized.

# CONCLUSIONS

1. An analysis of the literature on definitions related to the negative consequences of drug use was conducted. It was determined that the most common definition characterizing errors during pharmacotherapy is the term “medication error” or “drug-related error” proposed by the NCC MERP.

2. It has been established that currently there is no single unified classification of medication errors in the world. Taking into account general trends, it is possible to distinguish errors that occur during the prescription of drugs, the use of drugs during inpatient treatment, and when dispensing drugs by a pharmaceutical worker.

3. The analysis revealed different approaches to naming, including using only INNs, adding the manufacturer's name, or creating new unique names. Foreign manufacturers are more likely to focus on creating new unique names, while domestic manufacturers often use traditional names.

4. It has been determined that the process of examining the consonance of names during the registration of intellectual property rights determines the similarity in sound of the names of medicinal products, but, unfortunately, this does not exclude the existence of similar names.

5. The appearance of the packaging of a medicinal product is regulated in accordance with domestic legislation. Thus, clear requirements are established for the composition of the information applied to the packaging of medicinal products, the elements and text of the labeling.

6. According to the results of the questionnaire survey, 80% of pharmaceutical workers confirmed the presence of risks associated with LASA drugs; 60% confirmed cases of erroneous dispensing of drugs for this reason.

7. The recommendations of the 10 Rights rule for preventing medication errors in the practice of a pharmacist are summarized.

# REFERENCES

1. Adusumilli P. K., Adepu R. Drug related problems: an over view of various classification systems. *Asian Journal of Phamaceutical and Clinical Research*. 2014. Vol. 7, Iss. 4. P. 7–10.

2. Aronson J. K. Medication errors: definitions and classification. *B.r J. Clin. Pharmacol*. 2009. Vol. 67, Iss. 6. P. 599–604.

3. Aronson J. K. Medication errors: what they are, how they happen, and how to avoid them. *An. International Journal of Medicine*. 2009. Vol. 102, Iss. 8. P. 513–521.

4. Medication errors as malpractice-a qualitative content analysis of 585 medication errors by nurses in Sweden / K. Björkstén et al. *BMC Health Services Research*. 2016. Vol.16, Iss. 10. P. 1695–1699.

5. The problem of look-alike, sound-alike name errors: Drivers and solutions / R. Bryan et al. *Br. J. Clin. Pharmacol*. 2021 Vol. 87, Iss. 2. P. 386–394.

6. Design for patient safety series: A guide to labeling and packaging injectable medicine. Ed. 1. 2008 / National patient Safety Agency (NHS). URL: https://www.intmedsafe.net/wp-content/uploads/2014/01/0592_InjectablesBookV9Web1.pdf (Date of access: 14.02.2024).

7. Sharon E., Axe S. The 10 R's of safe multidisciplinary drug administration. *Nurse Prescribing*. 2015. № 13. P. 398–406. DOI: 10.12968/npre.2015.13.8.398 (Date of access: 14.02.2024).

8. Good practice guide on recording, coding, reporting and assessment of medication errors / European Medicines Agency. 2015. URL: https://www.ema.europa.eu/en/documents/regulatory-procedural-guideline/good-practice-guide-recording-coding-reporting-and-assessment-medication-errors_en.pdf (Date of access: 14.02.2024).

9. How to ensure your staff are administering medication safely-r’s of medication. URL: https://caringforcare.co.uk/ensure-staff-administering-medication-safely/ (Date of access: 14.02.2024).

10. Dispensing errors in community pharmacies in the United Arab Emirates: investigating incidence, types, severity, and causes / O. M. Ibrahim et al. *Pharm Pract (Granada)*. 2020. Vol. 18 (4). P. 2111. DOI: 10.18549/PharmPract.2020.4.2111 (Date of access: 14.02.2024).

11. ISMP's list of confused drug names / Institute for Safe Medication Practices
(ISMP). 2015. URL: https://www.ismp.org/sites/default/files/attachments/2017-11/confuseddrugnames%2802.2015%29.pdf (Date of access: 14.02.2024).

12. Um I. S., Clough A., Tan E. C. K. Dispensing error rates in pharmacy: A systematic review and meta-analysis. *Res. Social. Adm. Pharm*. 2024. Vol. 20 (1). P. 1–9. DOI: 10.1016/j.sapharm.2023.10.003 (Date of access: 14.02.2024).

13. Lee J. H., Aubert B. A., Barker J. R. Risk mapping in community pharmacies. *Journal of Patient Safety and Risk Management*. 2023. Vol. 28, Iss. 2. P. 59–67. DOI: 10.1177/25160435231154167 (Date of access: 14.02.2024).

14. Medication errors statistics 2024. URL: https://www.singlecare.com/blog/news/medication-errors-statistics/ (Date of access: 14.02.2024).

15. Medication Errors. Technical Series on Safer Primary Care / WHO. 2016. 32 p. URL: https://apps.who.int/iris/bitstream/handle/10665/252274/9789241511643-eng.pdf;jsessionid=FDB1BE2683396D2DA592F947714EBF5E?sequence=1 (Date of access: 14.02.2024).

16. 25 Years of Building Medication Safety / Ed. by Rita Munley Gallagher, Deborah Melnyk ; National Coordinating Council for Medication Error Reporting and Prevention. URL: https://www.nccmerp.org/sites/default/files/nccmerp-25-year-report.pdf (Date of access: 14.02.2024).

17. Pharmacist Role in Patient Safety. URL: https://psnet.ahrq.gov/perspective/pharmacist-role-patient-safety (Date of access: 14.02.2024).

18. The utility of real-world evidence for benefit-risk assessment, communication, and evaluation of pharmaceuticals: Case studies / C. A. Radawski et al. *Pharmacoepidemiol Drug Saf*. 2020. Vol. 29, Iss. 12. P. 1532–1539.

19. Safety Considerations for Container Labels and Carton Labeling Design to Minimize Medication Errors Guidance for Industry / U.S. Department of Health and Human Services Food and Drug Administration. URL: https://www.fda.gov/media/158522/download (Date of access: 14.02.2024).

20. Medication Dispensing Errors and Prevention / R. A. Tariq et al. URL: https://www.ncbi.nlm.nih.gov/books/NBK519065/ (Date of access: 14.02.2024).

21. The Role of Community Pharmacists in Patient Safety. URL: https://psnet.ahrq.gov/perspective/role-community-pharmacists-patient-safety (Date of access: 14.02.2024).

22. The Role of Pharmacists in Reporting Medication Errors in Pharmacy. URL: https://www.performancehealthus.com/blog/medication-errors-in-pharmacy (Date of access: 14.02.2024).

23. Incidence of Medication Error in Critical Care Unit of a Tertiary Care Hospital: Where Do We Stand? / K. G. Zirpe et al. *Crit Care Med*. 2020. Vol. 24, Iss. 9. P. 799–803. DOI: 10.5005/jp-journals-10071-23556 (Date of access: 14.02.2024).

24. World Health Organization. WHO Global Patient Safety Challenge: Medication Without Harm. 2017 (WHO/HIS/SDS/2017.6). URL: https://www.who.int/patientsafety/medication-safety/medication-without-harmbrochure/en/ (Date of access: 14.02.2024).

25. World Health Organization. Patient safety. 2019. URL: https://www.who.int/features/factfiles/patient_safety/en/ (Date of access: 14.02.2024).

26. World Health Organization. Medication Safety in High-risk Situations. 2019 (WHO/UHC/SDS/2019.10). URL: https://apps.who.int/medicinedocs/documents/s23708en/s23708en.pdf (Date of access: 14.02.2024).

27. International Pharmaceutical Federation (FIP). Patient safety Pharmacists' role in «Medication without harm» 2020. URL: https://www.fip.org/file/4757 (Date of access: 14.02.2024).

28. What is the epidemiology of medication errors, error-related adverse events and risk factors for errors in adults managed in community care contexts? A systematic review of the international literature / G. A. Assiri et al. *BMJ Open*. 2018. Vol. 8 (5). P. e019101.

29. Holmström A–R. Learning from medication errors in healthcare – How to make medication error reporting systems work? Academic dissertation. University of Helsinki. 2017. URL: https://researchportal.helsinki.fi/en/publications/learning-from-medication-errors-in-healthcare-how-to-makemedicat (Date of access: 14.02.2024).

30. National Coordinating Council for Medication Error Reporting and Prevention. Taxonomy of medication errors. URL: https://www.nccmerp.org/ (Date of access: 14.02.2024).

31. Phillips D. P., Bredder C. C. Morbidity and mortality from medical errors: An increasingly serious public health problem. *Ann. Rev. Public Health*. 2002. Vol. 23. P. 135–150.

32. Acheampong F., Anto B. P. Perceived barriers to pharmacist engagement in adverse drug event prevention activities in Ghana using semi-structured interview. *BMC Health Serv. Res.* 2015. Vol. 15. P. 361.

33. National and local medication error reporting systems: a survey of practices in 16 countries / A. R. Holmstrom et al. *J. Patient. Saf.* 2012. Vol. 8 (4). P. 165–76.

34. Medication safety in community pharmacy: a qualitative study of the sociotechnical context / D. L. Phipps et al. *BMC Health Serv. Res*. 2009. Vol. 9. P. 158.

35. Brown L. Patient safety unifies us all. American Pharmacist Association. 2016. URL: https://www.pharmacist.com/article/patient-safety-unifies-us-all (Date of access: 14.02.2024).

36. Pharmapod. How it works: patient safety software for pharmacies. URL: https://www.pharmapodhq.com/healthcare-incident-reporting-software/ (Date of access: 14.02.2024).

37. International Pharmaceutical Federation. Pharmacists in the supply chain: The role of the medicines expert in ensuring quality and availability. URL: https://www.fip.org/files/fip/publications/Pharmacists_in_the_supply_chain_The_role_of_the_medicines_expert_in_ensuring_quality_and_availability_2018_05.pdf (Date of access: 14.02.2024).

38. European Medicines Agency. Recommendations on medication errors. URL: https://www.ema.europa.eu/en/human-regulatory/post-authorisation/pharmacovigilance/medicationerrors/recommendations-medication-errors (Date of access: 14.02.2024).

39. WHO Collaborating Centre for Patient Safety Solutions. Look-alike, sound-alike medication names. URL: https://www.who.int/patientsafety/solutions/patientsafety/PS-Solution1.pdf (Date of access: 14.02.2024).

40. Institute for Safe Medication Practices. Improving medication safety in community pharmacy: Assessing risk and opportunities for change. URL: https://www.ismp.org/resources/improving-medication-safety-communitypharmacy-assessing-risk-and-opportunities-change (Date of access: 14.02.2024).

41. US Food Drug Administration. Working to reduce medication errors. URL: https://www.fda.gov/drugs/druginformation-consumers/strategies-reduce-medication-errors-working-improve-medication-safety (Date of access: 14.02.2024).

*Ф А 2.2.1–32-366*

**National University of Pharmacy**

Faculty for foreign citizens' education
Department of social pharmacy

Level of higher education master

Specialty 226 Pharmacy, industrial pharmacy
Educational program Pharmacy

**APPROVED**
**The Head of Department**
**of Social Pharmacy**

**_____**
**Alina VOLKOVA**
"15" of April 2024

**ASSIGNMENT**
**FOR QUALIFICATION WORK**
**OF AN APPLICANT FOR HIGHER EDUCATION**

## Salma HASSINI

1. Topic of qualification work: «Study on the medication errors problems in pharmacy practice», supervisor of qualification work: Iryna SURIKOVA, PhD, associated professor,
approved by order of NUPh from "6th" of February 2024 № 34

2. Deadline for submission of qualification work by the applicant for higher education: October 2024.

3. Outgoing data for qualification work: data from scientific and periodical literature in accordance with research objectives; reports of international organizations, statistical data.

4. Contents of the settlement and explanatory note (list of questions that need to be developed):
• to conduct a review of literary sources on the problem of drug-related errors and their classification,
• to study the problem of consonance of names and similarity of drug packaging in pharmaceutical practice;
• to investigate the process of "pharmaceutical naming" of drugs;
• to study approaches to the creation and regulation of the appearance and labeling of drug packaging;
• to conduct a questionnaire survey of pharmaceutical workers on the problem of phonetic and external similarity of drugs in pharmaceutical practice;
• to summarize recommendations for preventing drug-related errors in the practical activities of a pharmacist.

5. List of graphic material (with exact indication of the required drawings):
Figures – 14, Tables – 9

6. Consultants of chapters of qualification work

| Chapters | Name, SURNAME, position of consultant | Signature, date | |
|---|---|---|---|
| | | assignment was issued | assignment was received |
| 1 | Iryna SURIKOVA, associated professor of higher education institution of department Social Pharmacy | 19.04.2024 | 19.04.2024 |
| 2 | Iryna SURIKOVA, associated professor of higher education institution of department Social Pharmacy | 15.05.2024 | 15.05.2023 |
| 3 | Iryna SURIKOVA, associated professor of higher education institution of department Social Pharmacy | 17.06.2024 | 17.06.2024 |

7. Date of issue of the assignment: «15» of April 2024.

**CALENDAR PLAN**

| № | Name of stages of qualification work | Deadline for the stages of qualification work | Notes |
|---|---|---|---|
| 1 | Review of literary sources on the problem of drug-related errors and their classification. | April 2024 | **done** |
| 2 | Research into the processes of creating the name and packaging of medicines. | May – June 2024 | **done** |
| 3 | Analysis of the problem of phonetic and external similarity of medicines in pharmaceutical practice | September 2024 | **done** |
| 4 | Analysis of recommendations for preventing medication-related errors in the practical activities of a pharmacist and their generalization. | September 2024 | **done** |
| 5 | Summary of the results of the study | October 2024 | **done** |
| 6 | Finalizing the work, preparing the report | October 2024 | **done** |

**An applicant of higher education** Salma HASSINI

**Supervisor of qualification work** Iryna SURIKOVA

**ВИТЯГ З НАКАЗУ № 34**
**По Національному фармацевтичному університету**
**від 06 лютого 2024 року**

1. Затвердити теми кваліфікаційних робіт здобувачам вищої освіти 5-го курсу 2 циклу Фм20*(4,10д) 2024-2025 навчального року, ступінь вищої освіти «магістр», галузь знань 22 Охорона здоров'я, спеціальність 226 – Фармація, промислова фармація, освітньо-професійна програма – Фармація, денна форма здобуття освіти (термін навчання 4 роки 10 місяців). Мова навчання англійська.

| № з/п | Прізвище, ім'я здобувача вищої освіти | Тема кваліфікаційної роботи | | Посада, прізвище та ініціали керівника | Рецензент кваліфікаційної роботи |
|---|---|---|---|---|---|
| • **по кафедрі соціальної фармації** | | | | | |
| 20. | Хассіні Салма | Дослідження проблем лікопов'язаних помилок в аптечній практиці | Study on the medication errors problems in pharmacy practice | доцент Сурікова І.О. | доцент Бондарєва І. В. |

Ректор

**Вірно.** Секретар

ФА2.8-03-317

# ВИСНОВОК

**експертної комісії про проведену експертизу**
**щодо академічного плагіату у кваліфікаційній роботі**

**здобувача вищої освіти**

«22» листопада 2024 р. № 329648913

Проаналізувавши кваліфікаційну роботу здобувача вищої освіти Хассіні Салма, Фм20*(4,10д)-англ-02, спеціальності 226 Фармація, промислова фармація, освітньої програми «Фармація» навчання на тему: «Дослідження проблем лікопов'язаних помилок в аптечній практиці / Study on the medication errors problems in pharmacy practice», експертна комісія дійшла висновку, що робота, представлена до Екзаменаційної комісії для захисту, виконана самостійно і не містить елементів академічного плагіату (компіляції).

**Голова комісії,**
**проректор ЗВО з НПР,**
**професор** **Інна ВЛАДИМИРОВА**

*Ф А 2.2.1-32-353*

**REVIEW**

**of scientific supervisor for the qualification work of the master's level of higher education of the specialty 226 Pharmacy, industrial pharmacy**

**Salma HASSINI**

**on the topic: « STUDY ON THE MEDICATION ERRORS PROBLEMS IN PHARMACY PRACTICE »**

**Relevance of the topic.** At the current stage of development, the Ukrainian pharmaceutical market has long been one of the most profitable sectors of the economy. Over the past 20 years, the number of drugs on the market has increased tenfold, and in this regard, a large number of similar or identical packages of drugs have appeared, which sometimes leads to errors when dispensing. Therefore, this problem is relevant, because first of all, it can lead to a deepening of the problem of irrational use of drugs, an increase in morbidity, etc.

**Practical value of conclusions, recommendations and their validity.** During the research in accordance with the topic, goals and objectives of the qualification work, the applicant conducted comprehensive research on the problem of medication errors, their classification and causes of occurrence. A questionnaire survey of pharmaceutical specialists on the problem under study was also conducted. The results obtained during the study became the basis for generalizing recommendations on preventing the occurrence of medication errors in the practical activities of a pharmacist.

**Assessment of work**. The applicant has diligently conducted research work, the generalization and presentation of the results indicates awareness of the problem under study and the appropriate level of its elaboration. The work has been performed at a sufficient scientific level.

**General conclusion and recommendations on admission to defend.** In general, the qualification work of Salma HASSINI on the topic «Study on the medication errors problems in pharmacy practice» is performed at the proper level, meets the requirements of the "Regulations on the preparation and protection of qualification works at the National University of Pharmacy" and can be recommended for defense in the Examination commission.

Scientific supervisor Iryna SURIKOVA

«7th» of November 2024

*Ф А 2.2.1-32-356*

**REVIEW**

**for qualification work of the master's level of higher education, specialty 226 Pharmacy, industrial pharmacy**

**Salma HASSINI**

**on the topic: «STUDY ON THE MEDICATION ERRORS PROBLEMS IN PHARMACY PRACTICE»**

**Relevance of the topic.** The World Health Organization's Global Patient Safety Initiative, launched in March 2017, identified "similar medicines" as "a common source of harm and medication errors." This is why this issue is so urgent, as it can lead to an increase in the irrational use of medicines, increased morbidity, etc.

**Theoretical level of work.** The structure and content of the qualification work are traditional. The applicant conducted an analysis of publications by domestic and foreign authors on the research topic, an analysis of regulatory legal acts regulating the packaging and labeling of drugs, and a questionnaire survey was conducted on the impact of the problem of similarity of drug packaging on the quality of pharmaceutical services. The generalized results of this analysis are systematized and reflected in the work.

**Author's suggestions on the research topic.** The applicant's comprehensive analysis of the impact of medication errors on the quality of pharmaceutical care for the population in international and domestic practice, as well as the conduct of practically-oriented research on this problem in the practical activities of pharmaceutical workers, deserves attention.

**Practical value of conclusions, recommendations and their validity.** Familiarization with the work gives grounds to assert the feasibility of the research conducted and the practical value of the recommendations.

**Disadvantages of work.** There are errors, incorrect expressions in the text. The comments given do not fundamentally change the positive assessment of the work.

**General conclusion and assessment of the work.** According to the relevance and the results of the research qualification work of Salma HASSINI on the topic «Study on the medication errors problems in pharmacy practice» meets the requirements for master's works and can be recommended for official defense in the Examination commission.

Reviewer Associate professor Iryna BONDARIEVA

«8th» of November 2024

**ВИТЯГ**
**з протоколу засідання кафедри соціальної фармації**
**№ 5 від «08» листопада 2024 року**

**ПРИСУТНІ:** зав. каф. доц. Аліна ВОЛКОВА, проф. Ганна ПАНФІЛОВА, проф. Вікторія НАЗАРКІНА, доц. Галина БОЛДАРЬ, доц. Наталія ГАВРИШ, доц. Тетяна ДЯДЮН, доц. Юлія КОРЖ, асист. Альміра НОЗДРІНА, доц. Вікторія МІЩЕНКО, доц. Ірина ПОПОВА, доц. Олександр СЕВРЮКОВ, доц. Ірина СУРІКОВА, доц. Любов ТЕРЕЩЕНКО, доц. Наталія ТЕТЕРИЧ.

**ПОРЯДОК ДЕННИЙ:**

Про представлення до захисту в Екзаменаційній комісії кваліфікаційних робіт.

**СЛУХАЛИ:** завідувачку кафедри доц. Аліну ВОЛКОВУ з рекомендацією представити до захисту в Екзаменаційній комісії кваліфікаційну роботу здобувача вищої освіти спеціальності 226 Фармація, промислова фармація Хассіні Салми на тему: «Дослідження проблем лікопов'язаних помилок в аптечній практиці».
Науковий керівник к. фарм. н., доцент кафедри СФ Ірина СУРІКОВА.
Рецензент к. фарм. н., доцент кафедри ММЗЯФ Ірина БОНДАРЄВА.

**УХВАЛИЛИ:** Рекомендувати до захисту в Екзаменаційній комісії кваліфікаційну роботу здобувача вищої освіти Хассіні Салми на тему: «Дослідження проблем лікопов'язаних помилок в аптечній практиці».

Завідувачка каф. СФ, доцент Аліна ВОЛКОВА

Секретар, доцент Наталія ТЕТЕРИЧ

*Ф А2.2.1-32-042*

# НАЦІОНАЛЬНИЙ ФАРМАЦЕВТИЧНИЙ УНІВЕРСИТЕТ

## ПОДАННЯ
## ГОЛОВІ ЕКЗАМЕНАЦІЙНОЇ КОМІСІЇ
## ЩОДО ЗАХИСТУ КВАЛІФІКАЦІЙНОЇ РОБОТИ

Направляється здобувач вищої освіти Салма Хассіні до захисту кваліфікаційної роботи
за галуззю знань 22 Охорона здоров'я
спеціальністю 226 Фармація, промислова фармація
освітньою програмою Фармація
на тему: «Дослідження проблем лікопов'язаних помилок в аптечній практиці».

Кваліфікаційна робота і рецензія додаються.

Декан факультету _____ / Світлана КАЛАЙЧЕВА /

### Висновок керівника кваліфікаційної роботи

Здобувач вищої освіти Салма ХАССІНІ під час виконання кваліфікаційної роботи продемонструвала уміння працювати з науковими даними, проводити їх узагальнення, аналізувати та узагальнювати результати дослідження. Усі поставлені завдання відповідно до мети роботи було виконано у повному обсязі. Результати дослідження належним чином оброблені і представлені.

Таким чином, кваліфікаційна робота може бути рекомендована до офіційного захисту в Екзаменаційній комісії Національного фармацевтичного університету.

Керівник кваліфікаційної роботи Ірина СУРІКОВА

«07» листопада 2024 р.

### Висновок кафедри про кваліфікаційну роботу

Кваліфікаційну роботу розглянуто. Здобувач вищої освіти Салма ХАССІНІ допускається до захисту даної кваліфікаційної роботи в Екзаменаційній комісії.

Завідувачка кафедри
соціальної фармації Аліна ВОЛКОВА

«08» листопада 2024 р.

Qualification work was defended
of Examination commission on
« 18 » November 2024
With the grade _____
Head of the State Examination commission,
DPharmSc, Professor
_____ / Oleh SHPYCHAK /