CREATION OF A UNIFIED GLOBAL SYSTEM OF MEDICINES NAMES: AN EVIDENCE ANALYSIS

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Introduction

Prevention and treatment of various diseases is practically impossible without the use of medicines. According to the definition of WHO, patients should receive medicines according to clinical need, in doses that meet individual needs, during an adequate period of time and with the lowest costs for themselves and society [7]. The range of drugs with various trade names (TN) is extremely large and constantly growing [17]. A doctor, prescribing a drug for a specific patient, must choose from a huge number of generic analogs of a medicines with the optimal ratio of its effectiveness, safety and cost of treatment.

In the WHODrug global dictionary of medical information, which contains information on the drug substance, ingredients, dosage form and dosage of drugs intended for human use, 38,700 names of drugs were registered in 1995, and since then the number has increased to more than 620,000 names of drugs with 171 countries as of September 2023 [8, 20]. It is obvious that the huge number of TN drugs on the modern pharmaceutical market is the cause of inadequate choice of drugs and medical errors [5]. To minimize the possibility of error, practitioners may voluntarily limit themselves to only a few drug names, avoiding even considering any unfamiliar or new drugs. Physicians may accept the validity of pharmaceutical companies' advertising materials without published evidence of the advertised benefits. Errors in the appointment of drugs due to the exclusive use of their TN can lead to life-threatening complications [13,27].

Practical workers of the health care system have questions: to what limit is it possible to increase the number of TN and how to avoid inadequate selection of drugs and medical errors? Therefore, the purpose of this study was an attempt to study the problems of the modern state of drug naming and to determine ways to solve it.

Materials and methods. General scientific methods of cognition are used: analysis and synthesis, abstraction, deduction, modeling, generalization. The materials were publications from the Google Scholar and PubMed electronic search systems, the Crossref bibliographic database for the period 1984-2024. The following keywords were chosen: medicine and drug, naming, international nonproprietary names, trade name, original drug, generic, brand, branded generic, chemical name, medication error, drug information.

Results and discussion. At the first stage of our work, the problems of the modern system of names of medicines were studied. Such concepts as "international non-proprietary name", "trade name", "original drug", "generic", "brand", "branded generic", "blockbuster" have entered medical and pharmaceutical practice. Data from sociological surveys indicate that only about 60% of doctors, 75% of pharmacists, and 20% of consumers have an idea of the existence of such concepts and the differences between them [3,19]. The lack of objective information about the therapeutic equivalence of a specific drug with different TN causes specialists to be unsure of their quality and interchangeability, which creates the problem of the practitioner's choice of drug in each specific case.

The huge number of TN drugs causes informational problems with possible clinical consequences. From an informational point of view, one system of drug names is desirable. 102 Finnish doctors were interviewed to find out how well they remember the composition of combined drugs and TN of the corresponding INN drugs. It was found that the generic name of TN drugs was known to 83% of doctors who recently prescribed them. However, only 9% of doctors who prescribed INN combined drugs could remember their corresponding TN [21]. Other researchers also believe that the modern drug naming system needs radical intervention in order to standardize and simplify it, which will reduce the number of erroneously prescribed drugs [4].

Currently, each drug is assigned at least three names: chemical, INN and TN. The chemical name (Chemical Name) reflects the complete and exact chemical identification of the active pharmaceutical ingredient (API) of the drug. The chemical name of the drug (API or auxiliary substance included in its composition) determines the chemical structure of the corresponding compound by displaying the qualitative and quantitative composition of its molecule verbally and numerically (with the help of words, groups of words, indices, signs and numbers) and in an appropriate graphic way, sequence and nature of bonds of atoms in it. Chemical names contain a lot of information for a specialist chemist, but they are difficult for a non-specialist and the average citizen to understand, too cumbersome for use among medical personnel and patients. The complexity of formation and peculiarities of writing chemical names do not allow their wide application in the practical activities of doctors and pharmacists [15].

International non-proprietary names of medicinal products are considered and approved by WHO based on the developed general principles of compilation and the procedure for selecting INNs for APIs of newly created medicinal products. They perform the task of a single informative designation of pharmaceuticals for its use in the health care system. No one has ownership rights to the INN.

The *original drug* is a new, first-time drug that has undergone a full cycle of research and has been assigned an INN. As a rule, the active ingredients of the original drug are protected by a patent for a certain legally defined term. After the patent expires, any pharmaceutical company can purchase the right to produce its own version of the original drug, i.e. a generic. A *generic* is a

DOI: 10.5281/zenodo.11635653

reproduced drug that was put on the market after the expiration of the patent protection of the original drug. Their production requires much lower costs than the original drugs, because the cost of the drug does not include the costs associated with long-term clinical trials, verification of effectiveness and safety.

In the practical activities of doctors and pharmacists, the so-called "common names" or "national non-proprietary names" of medicinal products are quite widely used. These names differ from the INN and are used in the headings of pharmacopoeial articles. The usual name is generally accepted for this drug, used by several manufacturers, but not registered as an INN. For example: eufilin, furacilin, Ringer's solution, etc. Lists of national non-proprietary names of medicinal products in different countries of the world are called differently: in the United States - this is the United States Adopted Name (USAN), in France - Denomination commune francaise, in Italy - Denominazione comune italiana, in Japan - Japanese Accepted Name (JAN) [15].

The *trade name* of the drug is the name under which the drug enters the pharmaceutical market. The TN of the medicinal product can be both a specially invented, such as to be an INN or "usual name". The TN of the medicinal product based on the "common name" or INN usually includes the brand name of the manufacturer (for example, Diclofenac Teva, Diclofenac Sandoz).

Naming of medicinal products, as a factor of its promotion on the market, includes neurolinguistic programming (based on the method of semantic differential, which allows to reveal the emotional attitude of consumers to medicinal products and its name, to determine potential risks for the pharmaceutical brand). Many brand names are created by cutting and mixing words [18]. The brand TN is used as a tool to promote drugs on the pharmaceutical market, which requires significant financial investments, which do not always correspond to the actual properties of the drug. At the same time, branded medicines that bring their owners an annual income of more than 1 billion US dollars are called *blockbusters* [14].

It is extremely difficult for a practicing doctor and pharmacist to understand the variety of TNs of a specific drug and make a competent, objective decision about pharmacotherapy. This especially applies to the provision of medical assistance to victims in the conditions of liquidation of the consequences of emergency situations. Their extreme conditions, the simultaneous appearance of a significant number of victims who need urgent medical assistance, the lack of time to choose a drug in each specific case, do not allow a doctor and pharmacist to make a well-founded decision about the use of the most effective drug among hundreds of similar drugs with different TN.

We conducted an analysis of the occurrence of drug use errors, based on their TN. Medication errors are a separate type of medical error and remain an important health care problem. Every year in the USA alone, from 7,000 to 9,000 people die due to an error in the prescription and use of drugs. At the same time, the total cost of treating patients with medication errors exceeds $40 billion annually. This problem is determined by a large number of different factors, the fourth place among which is the similarity of the names of drugs [12].

Table 1. Examples of drugs with similar trade names

Country	Trade name	INN (ATC code)	Trade name	INN (ATC code)
Slovenia India	Abaktal	Pefloxacin J01M A03.	Abyclav	Amoxicillin J01C R02.
Turkey Germany	Abizol	Aripiprazol N05AX12	Stabisol	Hydroxyethyl starch B05AA07
India	Airtec	Salmeterol R03AK06	Argitec	Arginine A05BA01
Slovenia Germany	Avelox	Moxifloxacin J01MA14	Valarox	Rosuvastatin C10BX10
Turkey Serbia	Azax	Azithromycin J01FA10	Enzix	Enalapril C09BA02
India Belgium	Asomex	Amlodipine C08CA01	Nasonex	Mometasone R01AD09
India	Bandy	Albendazole P02C A03.	Candy	Clindamycin J01F F01.
Canada	Celebrex	Celecoxib M 01A H01.	Celexa	Citalopram N06A B04.
Italy	Diamox	Acetazolamid S01EC01	Zimox	Amoxicillin J01C A04.
Australia Ireland	Losec	Omeprazol A 02B C 01	Lasix	Furosemid C 03CA 01
Bangladesh	Maprocin	Ciprofloxacin J01M A02.	Macrocin	Erythromycin J 01 FA.
Brazil	Quelicin	Succinilcolin M03A B01.	Keflin	Cefalotin J01DB03
Italy Macedonia	Flomax	Morniflumat M01AX22	Flamax	Ketoprofen M01AE03

DOI: 10.5281/zenodo.11635653

Bad spelling, shortening of the TN of drugs, their bad pronunciation, similarity of writing on the packaging, memory errors and a large number of drugs used in medical practice can serve as a source or cause of its mistake appointment. The name of a drug is considered similar to the name of another drug if it is associated with it as a whole, despite their individual differences. Sound similarity is determined on the basis of the following features: the presence of close and matching sounds in the compared designations; location of close sounds and sound combinations in relation to each other; presence of matching compounds and their location; the number of syllables in the designations; the place of matching sound combinations in the composition of designations; proximity of vowels; proximity of consonants; the nature of the matching parts of the designations; emphasis [30]. Table 1 shows examples of drugs with similar trade names. It is worth noting that in the US, to reduce errors in the use of drugs, generic names do not begin with the letters H, J, K or W, because these letters do not exist in some of the 130 countries that use US generic names, or have different sounds in different languages.

There is also a moratorium on the use of the letters X and Z as the first letters in the names of generic drugs, because they often sound the same at the beginning of words. In addition, in the USA, when naming generic drugs, such prefixes and bases as *brev*, *vel mal* or *mor* are avoided, because they mean other things (shortness, speed, bad or death, respectively) [16].

Another problem with the names of drugs is related to the sources of information about them. Modern pharmacotherapy requires the doctor to comply with three main requirements: the use of the most effective drug; the use of a safe drug that has the least number of side effects; the use of drugs with an acceptable cost for the entire course of treatment. A practicing physician, prescribing a drug to a patient, must choose a drug with the optimal ratio of the specified requirements from a large number of analogues that have various TN. In real medical practice, it is extremely difficult to do this due to the lack of available and objective information about drugs.

Information about drugs should be aimed at the choice by a doctor and pharmacist of the most effective and available drugs, their optimal dosage form and dose, rational treatment regimen and method of their administration. The availability of a reliable source of medical information is critically important for the use of the most effective and safe drug that has the least number of side effects with an acceptable cost for the entire course of treatment.

Different sources of information about drugs can be classified as primary, secondary and tertiary. The primary sources of information on pharmacotherapy include original articles published in well-known peer-reviewed journals that report original research, ideas, or opinions. Secondary sources of information about medicines are indexing and referencing systems that organize and provide easy search for primary resources. Tertiary sources of information about drugs summarize data from the primary literature and include directories and compendiums of drugs, lists of the main drugs, treatment recommendations, drug formularies, drug bulletins, and pharmacopoeias. Other sources of information about drugs are computerized information systems [2].

Without access to actual clinical trial data, medical journals publish unverified articles that doctors rely on to treat their patients, according to research. Pharmaceutical companies control the "knowledge" that informs doctors about drug clinical trials. This leads to skyrocketing profits for pharmaceutical companies and devastating health care costs, while doctors are unable to know which treatment methods are more effective. The lack of transparency of clinical trial data in peer review is similar worldwide. In addition, there is no formal evaluation comparing the medical benefits and economic value of new drugs to older treatments, so doctors do not have access to this critical information [11].

The Internet is increasingly becoming one of the fairly common sources of medical information. Although social media, websites, and Internet search engines are considered readily available sources of health information, these sources still contain ambiguities. There is growing evidence that the instant sharing of news from random sources and the lack of verification and determination of the accuracy and reliability of information shared by non-professionals raises many concerns about the harmful effects on human health [1].

Using information about drugs from the Internet has certain difficulties. Innovation in both digital technology and the biological sciences is developing at breakneck speed, and the amount of data being generated is growing exponentially. It is estimated that 2.5 quintillion bytes of data are created every day, and this rate will only accelerate as technology advances, not least thanks to portable devices and the Internet. Automation and digitization with centralized processing of medical information should become the norm, ensuring that doctors have immediate access to the information they need, how, where and when they want it [10,22].

Often, the only information that doctors receive about drugs comes from pharmaceutical companies and can be biased, so independent (unbiased) information is important [25]. According to the results of a survey conducted by CMI/Compas Media Vitals, doctors widely use the Internet to find information about drugs and treatment methods. For example, 46% of oncologists search the Internet four or more times a day. However, when physicians have more time to search for information, they use traditional resources such as print journals, peer consultations, and even pharmaceutical representatives. Although the negative attitude of doctors towards visits by sales representatives of pharmaceutical companies is increasing, doctors more often limit their visits to certain days or by appointment only, but, according to the survey, 52% of primary care doctors reported that they would accept their visits without restrictions [7,31].

The most comprehensive source of information on drugs is WHODrug, a global health information directory that contains the names of drugs intended for human use, including active chemicals, biotherapeutics, vaccines, dietary supplements, herbal medicines, radiopharmaceuticals and diagnostics. Information about

DOI: 10.5281/zenodo.11635653

pharmaceuticals in WHODrug includes TN, dosage form, country of sale. The development and support of WHODrug is managed by the Uppsala WHO Collaborating Center for International Drug Monitoring. All pharmaceuticals are linked by a structured alphanumeric code that links TN and ingredient variants to the active pharmaceutical ingredient and are classified using the ATC system [20].

As evidenced by the results of our analysis, there are no sources of accessible and objective information about drugs in real medical practice. Modern sources of information about drugs are too bulky and contain a huge number of drugs that have various TNs, which creates the problem of choosing and using the most effective and safe drug with the least number of side effects and an acceptable cost for the entire course of treatment. A further increase in the number of TN only deepens this problem and threatens to increase the number of medical errors and cause harm to public health.

Therefore, at the final stage of our work, we considered the issue of creating a unified system of drug names. To date, there is no international regulatory system that would guarantee that the names of new TNs differ from existing TNs in other countries to the extent to avoid the risk of misappropriation of drugs due to name confusion [23]. There are practically no evidence-based studies on the methods of assigning new TNs to reduce the risk of incorrect drug prescriptions due to name confusion. Over the last decade, only a few unverified solutions have been published to solve the problem of such TNs [24].

So, for example, it has been proposed to use only common names or INNs to reduce errors of similarity in sound, or to use only TNs to avoid confusion among similar-sounding common names [6]. Other methods have been reported, such as: informing healthcare professionals about drugs that look or sound the same; installation of pop-up notifications and bar coding on computer systems; pasting distinctive labels and warning stickers; storage of drugs that can be confused in non-contiguous places [26].

Some researchers have already proposed a list of actions that can be taken by regulators, pharmaceutical manufacturers, prescribers, pharmacists and patients to reduce the risk of errors caused by drug name confusion. [3,24]. The essence of the proposal is to use the INN in the process of choosing a TN. That is, the INN must be present above the brand name when labeling the packaging and information for the consumer or the doctor who prescribes the drug. This requirement is fulfilled by drug manufacturers. However, pharmaceutical companies do not consider safety engineering as their responsibility. They only feel obliged to comply with regulatory requirements for information on packaging, placing responsibility for errors on those who prescribe and consume them [18].

As you know, a generic drug must have the same quantitative and qualitative API composition and the same dosage form as the reference drug, and whose interchangeability with the reference drug has been proven on the basis of relevant studies. However, unlike original drugs, comprehensive evidence from clinical trials of generic drugs is not always mandatory for approval by national authorities. There may be differences in the formulation between the original drug and its analogue. Small changes or impurities in excipients used by manufacturers can change the properties of the generic drug and lead to unwanted side effects. Some patients are intolerant to certain excipients, including lactose and gluten, as well as some dyes. In addition, the appearance, taste, allergenicity and shelf life may differ between generic and original drugs due to differences in the form of the active ingredient, which may be applied in the form of its salt or complex ether [28,29].

In our opinion, the solution to this problem from an informational point of view is to create a single global system of TN drugs on the basis of the INN system, generally accepted throughout the world. We consider the proposal to use the INN in the process of choosing a TN to be quite rational. We believe that for the safety of the patient, the TN should contain the INN and the name of the manufacturer, which will allow the patient to be prescribed a generic drug with a high-quality composition of API and excipients. For instance: **INN – the name of the manufacturer's company - pharmaceutical form.** According to resolution WHA46.19, registration of the INN together with the manufacturer's name is perfectly acceptable. In addition, according to Article 1 (20) of the Directive of the European Parliament and the Council of the European Union No. 2001/83/C, the name of the medicinal product "may be a scientific name accompanied by a TN or the name of the holder of the marketing authorization", that is, the manufacturer of the medicinal product [9].

Medicines are the main resource of modern medicine. The decision on its appointment for each specific patient is made by the doctor. However, there is another intermediate link between the patient and the doctor, this is the pharmacist, who can also indirectly influence the decision to purchase a particular medicine. It should be noted that in the future, in connection with the creation of a unified system of names of generic drugs based on the INN and the name of the manufacturer, the role of the pharmacist will significantly increase.

The creation of a unified naming system for generic drugs should be carried out under the auspices of the WHO, which will make it possible to unify the names of generic drugs in all countries of the world and prevent the situation of favoring one manufacturer over others and provide an opportunity for patients to receive quality drugs.

Conclusions

Based on the results of the study of the problems of the modern system of names of drugs, the possibility of errors in the use of drugs, based on their TN, the imperfection and excess of information support regarding drugs, it is proposed to create a single global system of TN of drugs under the auspices of WHO on the basis of the universally accepted INN system, which consists of that the TN should contain the INN and the name of the manufacturer and allow the doctor, pharmacist and patient to choose a generic drug with a high-quality composition of API and excipients.

DOI: 10.5281/zenodo.11635653

Prospects for further research consist in a comprehensive study of the principles and mechanism of building a single global system of trade names of generic drugs, which will reduce the number of cases of inadequate selection of drugs and medication errors.

Funding and conflict of interest. The authors declare the absence of any potential conflict of interest concerning the research, authorship, and publication of this article.

Creation of a unified global system of medicines names: an evidence analysis

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Introduction. The range of medicines with various trade names is extremely large and constantly growing. This is the reason for inadequate selection of medicines and medical errors. **The aim:** To study the problems of the modern state of medicines naming and to determine the ways of its solution. **Materials and methods.** General scientific methods of cognition are used: analysis and synthesis, abstraction, deduction, modeling, generalization. The materials were publications from the Google Scholar and PubMed electronic search systems, the Crossref bibliographic database for the period 1984-2024. The following keywords were chosen: medicine and drug, naming, international nonproprietary names, trade name, original drug, generic, brand, branded generic, chemical name, medication error, drug information. **Results.** It was found that the huge number of trade names of medicinal products causes informational problems with possible clinical consequences. Today, there is no international regulatory system that would guarantee that the trade names of medicines from different manufacturers from different countries differed enough to avoid the risk of incorrect prescriptions due to confusion of their names. It is obvious that the breadth of the modern pharmaceutical market and the huge number of trade names of medicines on it are the reasons for their inadequate selection and medical errors. **Conclusions.** Based on the results of the study of the problems of the modern system of drug names, the possibility of errors in the use of drugs due to the similarity of their trade names, it is proposed to create, under the auspices of the WHO, a single global system of trade names of drugs based on the globally accepted system of international non-proprietary names, which consists of that the trade name must contain the international non-proprietary name and the name of the manufacturer. The unified global system of trade names of medicines will allow the doctor, pharmacist and patient to choose a generic medicine with a high-quality composition of the active pharmaceutical ingredient and auxiliary substances.

Key words: medicinal product, naming, trade name, international nonproprietary names, medication error, drug information.

References

1.Alduraywish SA, Altamimi LA, Aldhuwayhi RA, AlZamil LR, Alzeghayer LY, Alsaleh FS. et al. Sources of Health Information and Their Impacts on Medical Knowledge Perception Among the Saudi Arabian Population: Cross-Sectional Study. J Med Internet Res, 2020; 22(3): e14414. DOI: 10.2196/14414
2.Anandabaskar N. Drug Information. In: Raj G, Raveendran R. (eds) Introduction to Basics of Pharmacology and Toxicology. Springer, Singapore, 2019. https://link.springer.com/chapter/10.1007/978-981-32-9779-1_14
3.Aronson JK. Medication errors resulting from the confusion of drug names. Expert Opin Drug Saf. 2004; 3(3):167-72. Doi: 10.1517/eods.3.3.167.31069.
4.Balagura MV. Legal protection of the name of the medicinal product in Ukraine. Journal of the Kyiv University of Law. 2017;4: 301-304.
5. Berberich FR. Cephalosporin trade names. Pediatric Infectious Disease Journal 2003; 22(4): 388-389. Doi: 10.1097/01.inf.0000060827.62204.2b
6. Berman A. Reducing medication errors through naming, labeling, and packaging. J Med Syst. 2004; 28(1): 9-29. Doi: 10.1023/b:joms.0000021518.606 70.10.
7. Bulik BS. Physicians use Doctor Google daily, but they still rely on traditional info sources, too: study. Fierce Pharma, 2016. https://www-fiercepharma-com.translate.goog/marketing/doctor-google-physicians-report-daily-online-searches-for-info-still-also-rely
8.Cumming R, Gregory O. Pharmaceutical trade marks: the name and numbers game. Appleyard Lees, 2018. https://www.appleyardlees.com/pharma ceutical-trade-marks-the-name-and-numbers-game-3/
9.Directive 2001/83/EC of the European Parliament and of the council of 6 November 2001 on the Community code relating to medicinal products for human use (OJ L 311, 28.11.2001, p. 67) https://eurlex.europa.eu/LexUriServ/LexUri Serv.do?uri=CONSLEG:2001L0083:20121116:EN:PDF.(accessed 15 April.2024).
10. Evers M, Ghatak A, Holt E, Ostojic I, Pradel C, Suresh B. et al. A vision for Medical Affairs in 2025. Pharmaceuticals and Medical Products Practice. 2019.
11. Halloran EC. Sickening: How Big Pharma Broke American Health Care and How We Can Repair It. Fam Med. 2023; 55(3): 207-208. DOI: 10.22454/FamMed.2023.648056
12. Hampton T. Similar drug names: a risky prescription. JAMA. 2004; 291: 155-160. Doi: 10.1001/jama.291.16.1948.
13. Hemminki E, Enlund H, Hellevuo K, Laurila R, Turakka H. Trade names and generic names. Problems for prescribing physicians. Scand J Prim Health Care. 1984; 2: 84–87. Doi: 10.3109/02813438409017709
14. Hoffman JM, Proulx SM. Medication errors caused by confusion of drug names. Drug Saf. 2002; 26: 445-452. Doi: 10.2165/00002018-200326070-00001.
15. Holquist C. Medication errors: an FDA perspective. European Union Regulatory Workshop on Medication Errors. 2013. http://www.ema.europa. eu/docs/en_GB/document_library/resentation/2013/03/WC500139886.pdf
16. Jha AK, Prasopa-Plaizier N, Larizgoitia I, Bates DW. Research Priority Setting Working Group of the WHO

World Alliance for Patient Safety. Patient safety research: an overview of the global evidence. Qual Saf Health Care. 2010;19(1):42–47. Doi: 10.1136/qshc.2008.029165.
17. Karet GB. How Do Drugs Get Named? AMA J Ethics. 2019; 21(8): 686-696. DOI 10.1001/amajethics.2019.686.
18. Kenagy JW, Stein GC. Naming, labeling, and packaging of pharmaceuticals. Am. J. Health Syst. Pharm. 2001; 58: 2033-2041. Doi: 10.1093/ajhp/58.21.2033.
19. Kwo CE, Kamat P, Steinman AM. Physician use of brand versus generic drug names in 1993-1994 and 2003-2004. Ann Pharmacother. 2009; 43(3): 459-468. Doi: 10.1345/aph.1L502.
20. Lagerlund O, Strese S, Fladvad M, Lindquist M. WHODrug: A Global, Validated and Updated Dictionary for Medicinal Information. Ther Innov Regul Sci. 2020;54:1116–1122. Doi: 10.1007/s43441-020-00130-6
21. LeBelle MJ. Drug naines and nmedication errors, Who is responsible? Can Med Assoc J. 1993;149(7):941 – 943. https://www.ncbi.nlm.nih. gov/pmc/articles /PMC1485595 /?page=1
22. Marr B. How Much Data Do We Create Every Day? The Mind-Blowing Stats Everyone Should Read. Forbes.com.Forbes. 2018. https://www.forbes. com/sites/bernardmarr/2018/05/21/how-much-data-do-we-create-every-day-the-mind-blowing-stats-everyone-should-read/?sh=446f6bb560ba
23. Merchant L, Lutter R, Chang S. Identical or similar brand names used in different countries for medications with different active ingredients: a descriptive analysis. BMJ Qual Saf. 2020; 29(12): 988-991. Doi: 10.1136/bmjqs-2019-010316.
24. Ostini R, Roughead EE, Kirkpatrick CM, Monteith GR, Tett SE. Quality Use of Medicines – medication safety issues in naming; look-alike, sound-alike medicine names. International Journal of Pharmacy Practice 2012; 20(6): 349–357. DOI: 10.1111/j.2042-7174.2012.00210.x
25. Rational use of medicines: key points. WHO information. Rational pharmacotherapy. 2007;1(2): 5-6.
26. Schulmeister L. Look-alike, sound-alike oncology medications. Clin J Oncol Nurs. 2006;10(1):35-41. Doi: 10.1188/06.CJON.35-41.
27. Schwab M, Oetzel C, Morike K, Jagle C, Gleiter CH, Eichelbaum M. Using trade names: a risk factor for accidental drug overdose. Arch Intern Med. 2002; 162(9):1065-1066. Doi:10.1001/archinte.162.9.1065.
28. Shtrigol SY, Tovchyga OV. Original and generic drugs. Rational pharmacotherapy. 2012; 4(25): 15-18.
29. Straka RJ, Keohane DJ, Liu LZ. Potential Clinical and Economic Impact of Switching Branded Medications to Generics. Am J Ther. 2017;24(3): e278-e289. Doi: 10.1097/MJT.00000000 00000282.
30. Tackling medication errors: European Medicines Agency workshop calls for coordinated EU approach. Press release. 2013. http://www.ema.europa.eu /ema/index.jsp?curl=pages/news_and_events/news/2013/03/news_detail_001729.jsp&mid=WC0b01ac058004d5c1 (accessed: 15 April.2024).
31. Zielińska M, Hermanowski T. Sources of Information on Medicinal Products Among Physicians – A Survey Conducted Among Primary Care Physicians in Poland. Front. Pharmacol. 2022; 12:801845. Doi:10.3389/fphar.2021.801845