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Kovalenko Svitlana

*Doctor of Pharmacy, Professor,
Professor of the Department of Management and Assurance of Quality
National University of Pharmacy*

Коваленко Світлана Миколаївна

*доктор фармацевтичних наук, професор,
професор кафедри управління та забезпечення якості у фармації
Національний фармацевтичний університет*

ORCID: 0000-0001-9473-685X

Lisna Anastasiia

*Candidate of Pharmaceutical Sciences, Associate Professor
Associate Professor of the Department of Management and Assurance of Quality
National University of Pharmacy*

Лісна Анастасія Геннадіївна

*кандидат фармацевтичних наук, доцент,
доцент кафедри управління та забезпечення якості у фармації
Національний фармацевтичний університет*

ORCID: 0000-0003-3863-8889

**MAIN ASPECTS OF THE USE OF ARTIFICIAL INTELLIGENCE IN
THE FIELD OF LABOR PROTECTION AT PHARMACEUTICAL
ENTERPRISES**

**ОСНОВНІ АСПЕКТИ ВИКОРИСТАННЯ ШТУЧНОГО ІНТЕЛЕКТУ
В СФЕРІ ОХОРОНИ ПРАЦІ НА ФАРМАЦЕВТИЧНИХ
ПІДПРИЄМСТВАХ**

Summary. *Technical progress determines the expansion of the range of pharmaceutical products and, accordingly, provides for the development of pharmaceutical production. In today's world, the issue of creating safe working conditions through the introduction of digital technologies that are safe for the life and health of personnel is extremely important and relevant at pharmaceutical enterprises of all forms of ownership. Digitization in the field of occupational health and safety is a transformation of the occupational health and safety management system, which involves the use of digital technologies to optimize management, increase the productivity of pharmaceutical enterprises and improve working conditions and reduce the number of occupational diseases and accidents. The paper reviews the practice of using artificial intelligence technology in the pharmaceutical industry. The main advantages of the introduction of artificial intelligence technology in the field of labor protection at pharmaceutical enterprises are determined.*

Key words: *digital technologies, artificial intelligence, occupational health and safety, health care system, pharmaceutical enterprise.*

Анотація. *Технічний прогрес обумовлює розширення асортименту фармацевтичної продукції і, відповідно, передбачає розвиток фармацевтичного виробництва. У сучасному світі вкрай важливими та актуальними на фармацевтичних підприємствах усіх форм власності є питання створення безпечних умов праці через впровадження безпечних для життя та здоров'я персоналу цифрових технологій. Цифровізація в сфері охорони праці – це трансформація система управління охороною праці, що передбачає використання цифрових технологій для оптимізації менеджменту, підвищення продуктивності фармацевтичних підприємств і поліпшення умов праці і зниження кількості профзахворювань і нещасних випадків. У роботі проведено огляд практики застосування технології штучного інтелекту у фармацевтичній галузі. Визначені основні переваги*

впровадження технології штучного інтелекту в сфері охорони праці на фармацевтичних підприємствах.

Ключові слова: цифрові технології, штучний інтелект, сфера охорони праці, система охорони здоров'я, фармацевтичне підприємство.

Introduction. As world practice shows, digital technologies (DT) profoundly changed the functioning of people, society and organizations. They have become indispensable for life in all sectors of the economy. These technological advances have caused fundamental changes in how, when, how much, and with whom people work. The labor function is filled with new meaning, and the working conditions acquire a new character. To date, the development of technologies related to the use of artificial intelligence (AI), becomes one of the main global priorities. DT are becoming more and more common, spreading to production, the service sector, agriculture, the health care system, trade and other areas of employment. An important issue is the socialization of technology implementation AI is the protection of the company's employees and the preservation of their basic capabilities, for example, in making difficult decisions regarding the protection of their own health and safe working conditions. Therefore, the use of artificial intelligence in the field of labor protection (LP) is a certain question.

Practical implementation of technologies AI into the system LP not often found in ordinary enterprises. In part, this can be explained by the rather high cost of such DT, but in our opinion, one of the main problems of implementation AI in the economic activity of modern enterprises, there is a lack of regulatory and legal acts that would determine the degree of data confidentiality and the legal status of each participant in this process.

Implementation of technologies AI into the sphere LP involves close collaboration between software developers, enterprise employees, lawyers, researchers and engineers. This is due to the specificity of the field, joint

development overcomes many non-obvious barriers, for example, obvious problems that the employee can see, the developer cannot see and vice versa [1].

Global market AI is valued at \$327.5 billion and continues to grow due to investment in it. During the period 2015-2020, annual corporate investments in AI grew by 55 billion dollars [2]. A significant number of researchers believe that AI will significantly affect the production potential of the entire global economy, increase labor productivity in many industries. According to PWC research, global GDP will be 14% higher in 2030 as a result of accelerating development and implementation AI – the equivalent of an additional \$15.7 trillion [3]. AI will contribute to more efficient production due to process automation, increased labor efficiency, and increased consumer demand due to personalization and a better understanding of customer needs. Available statistics show that 37% of companies in the world already use it AI [4]. One of the recent studies IBM Institute for Business Value shows that 94% of companies believe that AI is a competitive business advantage [5].

In the report PWC industries that have the greatest potential for changes due to use are presented AI, first of all, this is the health care system, automotive industry, and finance. The least changes will affect the manufacturing sector. It is estimated that within the next 7 years the potential impact of use AI will decrease in all industries, with the exception of the health care system (including the pharmaceutical industry) [3]. Therefore, the relevance of the research topic is determined by the need for implementation AI in the field LP at pharmaceutical enterprises (ФП).

Review of information sources. In Ukraine, many scientists study the latest technologies in the field LP In Ukraine, many scientists study the latest technologies in the field Pistun I.P., Katrenko L.A., Kit Yu.A., Vakhoneva T.M., Levchenko O.G., Polukarov O.I., Zatsarny V.V., Polukarov Yu.O., etc. [6-8]. However, due to lack of funding, the number of such studies is insufficient.

Currently, the issue of introducing innovative technologies remains relevant AI in the field LP in the health care system.

Setting Objectives. The purpose of the study is to substantiate the need for the use of technology AI in the system LP in the pharmaceutical industry.

Results and discussion. To date, creation AI is often compared with the invention of the steam engine, which in the 18th century gave rise to the industrial revolution. This comparison can be considered literal, because in the modern world DT and AI can directly improve the efficiency of the manufacturing process.

Currently, this DT is just entering the mainstream, but early studies show that it increases labor efficiency in almost any industry by 10-60%. For example, according to the findings of the Nielsen Norman Group, the introduction of generative AI tools into a business increases labor productivity by 66% on average. And this is only one direction of AI development [9].

Today, the concept of digitalization changes the usual approach to pharmaceutical production, and also enables pharmaceutical companies to bring their products to the market and deliver medicines faster (MF) patients This concept includes a range of measures aimed at optimizing production processes, reducing the amount of waste, reducing risks, as well as increasing reliability, predictability, etc. [10; 11].

Generally speaking, the implementation of DT, namely the use of AI, has the following main areas of application:

1. Development of pharmaceutical products to accelerate R&D processes and optimize future production processes. According to Forbes, several international PE have already announced the beginning of the development of MF with the help of AI and have moved to the stage of clinical trials. These include Exscientia, Verge Genomics and Recursion Pharmaceuticals.

2. 3D printing of dosage forms is particularly relevant for personalized medicine and the improvement of the MF delivery system. Database-based AI

algorithms facilitate the design and formulation of 3D-printed dosage forms based on patient characteristics such as age, body weight, medical history, etc.

3. Pharmaceutical supply chain optimization through demand forecasting, supply chain disruption analysis and improved MF inventory management.

4. Detection of MF defects in order to improve quality control processes in pharmaceutical production. AI algorithms are used to analyze MF images, helping to automatically and effectively detect defects such as cracks, chips, changes in color, shape and size.

5. CTs allow PE to make more informed business decisions based on transparent transactions. This transparency of data provides valuable information that these PE can use to study existing processes and improve their MF.

6. Reducing the frequency of equipment breakdowns, minimizing repair and downtime costs, resulting in greater cost savings.

7. It was digitalization during the pandemic that made it possible not to stop such processes as FAT equipment. Now, during the war, the pharmaceutical industry of Ukraine has adapted and widely uses virtual or remote FAT. But world leaders - suppliers of equipment and solutions do not stand still, so all global PE are waiting for the CPHI exhibition, where the latest developments will be presented.

8. Integrating DT into pharmaceutical processes allows PE to improve manufacturing operations, reduce costs, and improve the quality of pharmaceutical products. With significant benefits, digitalization gives PE that implement it a clear new competitive advantage over those manufacturing PE that have not yet digitized their operations. By prioritizing digitization in their pharmaceutical supply chains, PE can achieve greater business results that will differentiate them from their competitors.

9. Increases safety in pharmaceutical production. AI can use cameras, motion detectors and weather sensors to analyze and collect data. The received information will help to identify dangerous conditions and warn about it. Such

technologies should be integrated into the work of PE, which have an increased level of danger to human life.

AI can take over a significant part of the work of LP specialists and help in the following matters: preparation of training materials, briefings; creation of material for communications on LP issues; administrative work; audit; updating and creating documents; analyzing accidents, statistics, identifying patterns and trends; planning measures to improve the risk management system; optimization of routine tasks; organization of meetings; investigation of accidents and incidents, etc. [12].

AI, if used correctly, will allow you to save time and save the strength of employees, plan or forecast, sketch out ideas and even help with the issue of safety in pharmaceutical production.

The primary purpose of using AI in the field of LP is to promote the well-being and safety of people, as well as the public interest in the context of the effective functioning of PE.

Let's analyze several areas of activity in which AI can be useful for LP specialists:

1. Risk analysis and forecasting. AI can process large amounts of data on workplace safety and health, including incidents, injuries and illnesses. It can use analytical algorithms to detect trends, identify potential risks and provide predictions about possible problems. This will help LP professionals make informed decisions and take appropriate action to prevent accidents and injuries.

2. Development of safety and training programs. AI can help design workplace safety programs by analyzing standards, rules and regulatory requirements. It can provide recommendations for solving specific security problems, point out oversights and errors in programs, and suggest optimal strategies to improve employee safety.

3. Automated monitoring. AI can provide oversight and monitoring of work processes and environments to identify potential threats and risks. It can use sensor data, video surveillance and other sources of information to

automatically detect dangerous situations or violations of safety rules. This will enable LP professionals to respond immediately and effectively to potential hazards.

4. Training and raising the level of consciousness of employees. AI can be used to create training materials, e-textbooks, and interactive modules that help educate workers about safety and proper emergency procedures. It can provide one-on-one training and personalized safety guidance, ensuring safety awareness and responsibility among employees.

5. Analysis of incidents. AI can analyze information about workplace accidents and incidents to identify causes and find ways to avoid similar situations in the future. It can perform retrospective data analysis and develop recommendations for improving security and risk management.

So, to help employees with LP, in his opinion, AI can take on, in particular, the following functions:

- collection and analysis of data on labor safety at PE (information on accidents, level of air and water pollution, state of the power grid, etc.);
- data visualization — creation of images with data on labor safety at the FP with fixation of factors influencing worker safety;
- assessment of risks associated with production activities at PE (identification of potential problems and proposal of ways to eliminate them);
- development of action plans necessary to ensure the safety of workers on PE (evacuation plans, instructions on the safety of working with special equipment, fire safety instructions, etc.);
- control of the level of worker safety (assistance in establishing a labor safety monitoring system to identify risks and dangers and prevent accidents at the workplace);
- staff training (creation of training materials, visual support of briefings, tests to confirm completed training).

Not always a person who follows the rules can perform his work perfectly, considering the human factor. That is, one person can confidently control only one technological process or simulate control over many processes, observing each of them from time to time. This is where modern DT come to the rescue.

Data exchange, new production technologies, automated production with minimal or no human intervention in the technological process are signs of the fourth industrial revolution (Industry 4.0). Scientific and technological progress has made it possible today to create and use AI.

Finally, it is also important to highlight the barriers to implementing AI in the LP system in the pharmaceutical industry. One of the main barriers to AI is the negative subjective perception of innovations by the subjects of the pharmaceutical market, due to the risk of personal responsibility for the introduction and implementation of new DT. This problem can be described as a lack of understanding in the field of DT of the principles of operation of AI systems and the fear of negative consequences from their use. It should be noted that this point of view is supported by serious gaps in the legal system of our country. Today, there are no clear rules of the game, the observance of which could protect PE from claims by supervisory authorities or unjustified economic losses.

In Ukraine and other countries, the legal status of AI is not defined. This raises numerous questions for PE, which in the context of legal uncertainty are forced to take on additional DT risks. At the same time, the full list cannot even be accurately predicted. Until the mass use of AI in the global pharmaceutical industry does not occur, there is no necessary empirical material for research. But already today, significant risks can be identified, for example, the possibility of creating an emergency situation in pharmaceutical production due to an error made by the AI system. Due to the lack of legal norms regulating the actions of the parties in a similar situation, there may be difficulties in distinguishing

responsibility for the accident. Of course, the existence of such barriers in the pharmaceutical industry will limit the use of AI.

Within the framework of the regulation of AI systems in the pharmaceutical industry, changes in the provisions of the legislation on mandatory civil liability insurance of dangerous production facilities should be recognized as necessary. Given the fact that programs created on the principle of machine learning are currently a "black box", all the technological processes they control should be recognized as dangerous production processes. Then the losses caused by the error of the algorithm should be compensated through the system of appropriate insurance coverage.

Since a key factor for decision-making regarding the introduction of AI systems to the pharmaceutical industry is the need to ensure safe working conditions, the legal institution of LP needs to be changed. For example, a certification institute for AI systems is needed. Currently, all PE must undergo an assessment of working conditions. Of course, without an external evaluation of the AI systems used in the pharmaceutical industry, no one will be able to properly assess the industrial risks in the workplace.

It is important to note that AI technology can be widely used in the pharmaceutical industry until appropriate legislative changes are made. For this, it is necessary to establish a special legal regime. The experimental legal regime in the field of DT is the application to the participants of the experimental legal regime during a certain period of special regulation in the areas of development, approval and implementation of DT.

The pharmaceutical industry has always been at the forefront of technological progress. Innovation has played a key role in increasing the productivity and efficiency of the industry. So far, the introduction of AI has become a game changer and has allowed for more efficient exploration, taking automation to the next level, significantly improving safety and maximizing mining, maintenance and operational productivity.

Conclusions. So, it is quite obvious that AI technology is the future. In the conditions of further digitalization of society, their breakthrough innovative nature is capable of providing sustainable competitive advantages both to individual PE in the field of LP and to the country as a whole.

However, like any new technology, AI can be used for both good and bad for humanity. One of the biggest risks is the possible inability of humanity in the future to control the development and its impact on intelligent machines. The massive spread of AI in the future, the transfer of responsibility for decision-making from humans to machines exposes PE activities to significant business threats, but on the other hand, these threats can be easily offset by significant benefits for PE in the field of LP from its effective implementation.

Considering that Ukraine has a strong intellectual potential, many domestic scientists-practitioners were among the first researchers in the field of AI, and modern domestic specialists in the field of DT are considered among the best in the world, effective implementation of the latest achievements of AI technologies in the activities of Ukrainian PE in the field LP, together with the implementation of the necessary economic reforms, will contribute to the fastest possible integration of the economy of Ukraine into the global world economy, where it will be able to take a worthy place among the leading countries in the development of AI technologies in the field of LP.

References

1. Lisna A.G., Kovalenko Sv.M., Litvinova O.V. Directions for improvement of the system of labor protection management at a pharmaceutical enterprise using digital technologies. *Annals of Mechnikov Institute*. 2023. № 2. P. 31-36.
2. Махова Г., Вострякова В. Перспективи використання штучного інтелекту в підприємстві. *Економіка підприємства: теорія і практика* : зб. матеріалів ІХ Міжнар. наук.-практ. конф., 12–13 жовт. 2022 р. / М-во

- освіти і науки України, Київ. нац. екон. ун-т ім. Вадима Гетьмана. Київ : КНЕУ, 2022. С. 314–317.
3. Sizing the prize. What's the real value of AI for your business and how can you capitalise?. *PWC*. 2017. URL: <https://www.pwc.com/gx/en/issues/analytics/assets/pwc-ai-analysis-sizing-the-prize-report.pdf> (date of access: 11.03.2024).
 4. Jovanovic B. 55 Fascinating AI Statistics and Trends for 2022. *DataProt*. 2024. <https://dataprot.net/statistics/ai-statistics/> (date of access: 11.03.2024).
 5. The business value of AI. Peak performance during the pandemic. *IBM Institute for Business Value*. 2020. URL: <https://www.ibm.com/downloads/cas/ZENVBND4> (date of access: 11.03.2024).
 6. Пістун І. П., Катренко Л. А., Кіт Ю. В. Охорона праці : навч. посіб. з практикумом. Київ : Університетська книга, 2020. 540 с.
 7. Вахонєва Т. М. Основи охорони праці в Україні : навч. посіб. Київ : Дакор, 2019. 505 с.
 8. Левченко О. Г., Полукаров О. І., Зацарний В. В., Полукаров Ю. О. Охорона праці та цивільний захист : підручн. Київ : КПІ ім. Ігоря Сікорського, 2019. 420 с.
 9. Штучний інтелект у виробництві: переваги та приклади застосування. *WEZOM*. 2023. URL: <https://wezom.com.ua/ua/blog/shtuchniy-intelekt-u-virobnitstvi-perevagi-ta-prikladi-zastosuvannya> (date of access: 11.03.2024).
 10. Гавриленко С. Штучний інтелект та диджиталізація у Фармі. *Фармацевтична галузь*. 2023. № 5 (98). URL: <https://promoboz.com/journal/2023/5-98-october/shtuchnyj-intelekt-ta-dydzhytalizatsiya-u-farmi/> (date of access: 11.03.2024).
 11. Лісна А. Г., Посилкіна О. В., Літвінова О. В., Братішко Ю. С. Дослідження сучасних трендів розвитку цифрової логістики у

фармацевтичній галузі. *Соціальна фармація в охороні здоров'я*. 2022. Т. 8, № 1. С. 34-50.

12. Захарчук К. Відкриття – 2023: штучний інтелект в охороні праці й не тільки. *Охорона праці*. 2024. URL: <https://ohoronapraci.kiev.ua/article/bezpeka-praci/vidkryttia-2023-stucnij-intelekt-v-ohoroni-praci-j-ne-tilki> (date of access: 11.03.2024).