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DOI https://doi.org/10.36059/978-966-397-406-4-43

THE IMPLEMENTATION OF ARTIFICIAL INTELLIGENCE TECHNOLOGIES IN HEALTHCARE DURING MARTIAL LAW AND WAR

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During martial law and war in a country, health care systems face unprecedented challenges that require an immediate strategic response. Under such circumstances, the main directions of changes in the country's health care system should be focused on stability, adaptability and priority of intensive medical care. Increasing the capacity of health systems to cope with the increasing number of victims is critical. This includes establishing emergency centers, stockpiling basic medical supplies and establishing field hospitals. Under these conditions, the priority directions for changes in the country's health care are: ensuring continuous and coordinated work of all health care management systems; – urgent training of medical personnel to work in the

conditions of hostilities and martial law; – transfer of all medical facilities to work in war time; – providing them with all the necessary resources both on the ground and at the stages of evacuating the wounded from the battlefield to larger hospitals and other medical institutions of the country. The implementation of artificial intelligence (AI) technologies in healthcare during marital law and wartime presents unique challenges and opportunities. AI can play a crucial role in mitigating these challenges and improving care under these difficult circumstances. As stated in the 2021 report of the U.S. National Security Commission on AI, "The ability of a machine to perceive, evaluate, and act more quickly and accurately than a human represents a competitive advantage in any field – civilian or military. AI technologies will be a source of enormous power for the companies and countries that harness them" [1; 2, p. 2].

AI-powered telemedicine can facilitate remote diagnosis and treatment, connecting patients in conflict zones with specialists around the world. This is especially crucial when local medical expertise is scarce or when travel to medical facilities is dangerous. Integrating AI into telemedicine has emerged as a groundbreaking approach, revolutionizing the delivery of healthcare services. AI, with its ability to analyze vast amounts of data, make predictions, and learn from patterns, has the high potential to enhance diagnostic accuracy, streamline patient care, and improve overall healthcare outcomes during military conflicts and war. One of the key benefits of AI in telemedicine is its capacity to assist in the diagnostic process. By analyzing medical images, such as X-rays and MRIs, AI algorithms can quickly and accurately detect abnormalities, enabling healthcare providers to make more informed decisions as soon as possible, which is very important during war time [3, p. 2]. AI can help in developing more efficient triage systems to manage and prioritize the treatment of casualties. By quickly analyzing medical data and injury severity, AI systems can assist medical personnel in making rapid decisions about who needs urgent care, which is vital when resources are constrained. Special AI assisting driven drones can be used for delivering blood products, medications, vaccines and other medical supplies to the battlefields and remote areas. Drones can be used for the rapid transportation of organs with high delicacy. This can potentially prevent any damage to the organs during transportation. Large drones can be used for evacuation of wounded soldiers to the medical facilities.

AI can optimize the logistics of medical supplies, ensuring that limited resources are used efficiently. This includes predictive analysis for medical supply needs, optimizing delivery routes, and managing inventory in a way that matches the fluctuating demands of a wartime healthcare system. During war, the risk of disease outbreaks increases due to displaced populations and compromised sanitary conditions. AI can monitor and predict the spread of infectious diseases, providing early warnings and enabling better preparedness

and response strategies. Drones can also be used for medical surveillance. Real-time data from sensors, surveillance cameras can provide up-to-date information about ongoing conflicts, road conditions, and changing threats, identifying safe paths and allowing evacuation teams to make informed decisions. An example of drone with such abilities is DJI Mavic 2 Enterprise Advances. In the battlefield areas with a high prevalence of wounded soldiers, drones with integrated cameras can take videos or pictures of on-ground situations to help to identify and evacuate them to the safe place. Drones have been used to deliver automated external defibrillators and save the lives of outpatients suffering cardiac arrest [4; 5 p. 3]. In war injuries, particularly those involving shrapnel and complex fractures, AI-enhanced imaging tools can help in quickly assessing the extent of injuries. This assists in planning surgeries and other treatments under pressure. In the emergency department, it is important to identify and prioritize who requires an urgent intervention in a short time. Triage helps recognize the urgency among patients and identifies high and low-urgency patients. An accurate triage decision helps patients receive the emergency service in the most appropriate time [6, p. 3].

AI technologies, including chatbots and virtual therapy platforms, can provide psychological support to individuals affected by the stress and trauma of war. These tools can offer coping mechanisms and basic therapeutic interactions, especially where mental health professionals are not available. The war in Ukraine has created a huge need for psychological support ranging from psychological first aid to comprehensive psychological care. People have experienced fear, trauma and isolation and are showing symptoms of anxiety, depression and stress. While many have sought safety in the west of the country, missile strikes continue to endanger civilian lives and cause loss of life even far from the frontlines. The physical threat of the strikes is also causing phycological impact on people across the country. For people facing the aftermath of an attack, psychological first aid is essential to help them cope with symptoms such as shock, panic attacks, changes in appetite and sleep patterns, and withdrawal from daily activities [7, p. 3].

AI-driven simulations and training programs can help in rapidly training healthcare workers on the battlefield or in conflict zones, providing them with crucial updates on emergency care procedures and other necessary skills without the need for extensive physical training setups. AI can also enhance communication systems, ensuring that medical data and updates are efficiently shared among healthcare providers, even in disrupted environments. Secure, AI-managed networks can maintain the flow of vital information despite the challenges of warfare.

Implementing these technologies during wartime requires careful consideration of ethical, security, and reliability aspects. AI systems need to be robust against cyber threats, which can be heightened in conflict settings.

Moreover, ensuring that these technologies do not exacerbate inequalities or become targets themselves is critical. Overall, the potential of AI to support and enhance healthcare in wartime is significant, offering hope for improved medical care in some of the most challenging conditions. Machine learning models can predict the development of complications after complex surgical military injuries and their outcomes based on patient data. This can lead to more effective treatments with fewer side effects. AI models can predict how wounded patients will respond to various medications, allowing for more personalized and effective treatment plans. AI-driven robots may assist surgeons to increase precision in operations on wounded patients. These robots can perform complex surgical tasks with high precision, reducing human error and improving patient outcomes. Robotic assistance in surgery often leads to smaller incisions, less blood loss, and quicker recovery times. AI-powered virtual assistants can provide 24/7 health monitoring and basic healthcare support. AI automates many administrative tasks in healthcare facilities on the battlefields, such as scheduling, wounded patient data management. This reduces the workload on human staff, increases efficiency, and decreases the likelihood of errors. Despite these advantages, the integration of AI into healthcare during martial law and war also raises significant ethical, privacy, and regulatory challenges. Issues such as data security, patient consent, and algorithmic bias need careful management to ensure that the benefits of AI are maximized without compromising patient welfare or equity.

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DOI https://doi.org/10.36059/978-966-397-406-4-44

ВПРОВАДЖЕННЯ ТЕХНОЛОГІЙ ШТУЧНОГО ІНТЕЛЕКТУ В ГАЛУЗІ ОХОРОНИ ЗДОРОВ'Я

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Штучний інтелект і пов'язані з ним технології все більше поширюються в бізнесі та суспільстві та починають застосовуватися в охороні здоров'я. Ці технології мають потенціал для трансформації багатьох аспектів догляду за пацієнтами, а також адміністративних процесів у постачальниках, платниках і фармацевтичних організаціях.

Незважаючи на всі досягнення в медицині, ефективна діагностика захворювань все ще вважається проблемою в глобальному масштабі. Розробка засобів ранньої діагностики є постійною проблемою через складність різних механізмів захворювання та основних симптомів. Штучний інтелект може революціонізувати різні аспекти охорони здоров'я, включно з діагностикою.

Машинне навчання є однією з підгалузей штучного інтелекту. Це технологія, яка дозволяє комп'ютерам вчитися з даних та покращувати свою продуктивність у певних завданнях без необхідності явного програмування. Машинне навчання може допомогти в прийнятті рішень, керувати робочим процесом і автоматизувати завдання своєчасно та ефективно.

Штучний інтелект все ще перебуває на ранніх етапах повного використання для медичної діагностики. Однак з'являється більше даних щодо застосування штучного інтелекту для діагностики різних захворювань, наприклад раку. У Великобританії було опубліковано дослідження, в якому автори вводять великий набір даних мамографії в систему штучного інтелекту для діагностики раку молочної залози.