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REVIEW

Artificial Intelligence in Military Medicine: Clinical, Operational, and Educational Applications

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Abstract: (1) Introduction: Artificial intelligence (AI) is transforming healthcare and has particular relevance in military medicine, where austere environments, uncertainty, and time-critical decisions are common; (2) Methods: A literature review was conducted in PubMed/MEDLINE, Scopus, and Web of Science, covering studies published between 2000 and 2026. Relevant articles on AI in military medicine were identified and grouped into three domains: clinical, operational, and educational; (3) Results: Forty-one studies were included. In the clinical domain, AI supports decision-making, trauma care, medical imaging, and mental health, including early detection of post-traumatic stress disorder (PTSD). Operational applications include physiological monitoring, triage optimization, and medical evacuation. In education, AI enhances medical simulation and adaptive learning. Key limitations include poor data quality and availability, algorithmic bias, and limited validation in real operational settings; (4) Conclusions: AI can substantially improve military medical practice by increasing diagnostic accuracy, supporting rapid decisions, and improving operational efficiency. However, implementation requires rigorous clinical validation, transparent and reliable systems, and careful attention to ethical and organizational issues. AI should be used as a complementary tool that supports, rather than replaces, clinical judgment.

Keywords: artificial intelligence; military medicine; clinical decision support; combat trauma; operational medicine; medical evacuation; mental health; post-traumatic stress disorder (PTSD); simulation-based training; machine learning.

INTRODUCTION

Artificial intelligence (AI) has become a central driver in the transformation of modern healthcare systems, offering new opportunities to improve diagnosis, treatment, and patient management. In the context of military medicine, these technologies are of particular relevance because of the unique features of the operational environment, including austere conditions, limited resources, high levels of uncertainty, and the need for rapid critical clinical decision-making [1–3].

Military medicine differs substantially from civilian medicine because of the complexity of the scenarios in which it is practiced. Military medical personnel are required to manage severe trauma, perform triage in combat settings, and make rapid decisions in the absence of standard medical infrastructure. In this context, AI provides tools capable of supporting clinicians through rapid data analysis, model-based prediction, and real-time decision support [4–6].

One of the major areas of AI application in military medicine is clinical decision support. AI-based systems can integrate large volumes of clinical and physiological data to guide therapeutic decisions, particularly in resource-limited environments where expert medical support is not always available [4,6]. In addition, predictive models developed using machine learning are increasingly being applied to

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anticipate patient outcomes, including the need for massive transfusion or the risk of death [7].

At the same time, AI plays an essential role in operational medicine. Continuous monitoring of physiological parameters through wearable sensors allows for the early detection of clinical deterioration, including internal hemorrhage, before overt symptoms become evident [8,9]. Furthermore, intelligent medical evacuation systems and triage algorithms can optimize resource allocation and improve the efficiency of interventions during large-scale combat operations [10,11].

Another area of major impact is military mental health. AI is being used for the early detection of psychiatric disorders, including PTSD, through the analysis of behavioral and physiological data. Machine learning models may support diagnosis, monitoring, and intervention, providing additional assistance to medical personnel in the management of these complex conditions [12–14].

In addition, AI is profoundly reshaping military medical education. The integration of digital simulations, virtual patients, and adaptive learning technologies enables the development of clinical competencies in a controlled and safe environment. These tools help prepare medical personnel for real combat situations, reduce training risks, and improve professional performance [15,16].

Nevertheless, the implementation of AI in military medicine is not without challenges. Limitations related to data quality, algorithmic bias, lack of validation under real-world conditions, and ethical concerns associated with the use of AI in critical settings raise important questions regarding safety and accountability in decision-making [5,6,17]. Moreover, integrating these technologies into complex military infrastructures requires solutions that are robust from both technical and organizational perspectives.

The aim of this article is to systematically examine the applications of artificial intelligence in military medicine across three main domains: clinical, operational, and educational. In addition, the benefits, limitations, and future directions of research are discussed, with particular emphasis on the safe and effective integration of AI into military medical practice.

MATERIALS AND METHODS

Study Design

The present study was conducted as a review aimed at synthesizing the existing literature on the applications of artificial intelligence in military medicine. The analysis focused on three principal domains: clinical, operational, and educational applications. This approach was chosen because of the heterogeneity of the available literature, which includes original studies, systematic reviews, experimental investigations, and expert perspectives. The methodology allows for an integrative analysis of emerging technologies and their implementation in the complex contexts specific to military healthcare systems.

Search Strategy

A systematic literature search was performed in the following electronic databases: PubMed/MEDLINE, Scopus, and Web of Science. The search strategy included relevant keywords and MeSH terms such as “artificial intelligence,” “machine learning,” “military medicine,” “combat casualty care,” “battlefield,” “decision support systems,” and “military training.” Boolean operators (AND, OR) were used to refine the search queries, and the strategy was adapted to each database in order to ensure an optimal balance between sensitivity and specificity.

Eligibility Criteria

Inclusion criteria: peer-reviewed scientific articles; studies addressing applications of artificial intelligence in military medicine or related operational contexts; publications covering clinical, operational, or educational domains; articles published in English; and studies published between 2000 and 2026. Exclusion criteria: studies not directly relevant to military medicine; publications without full-text availability; and duplicate studies or publications based on overlapping datasets.

Study Selection Process

Study selection was conducted in several successive stages. Initially, titles and abstracts were screened to identify potentially relevant publications. Eligible articles were then reviewed in full text according to the predefined criteria. Duplicate and redundant publications were removed, resulting in a final sample of 41 studies included in the analysis. The selection process was carried out manually based on thematic relevance and methodological quality.

Data Extraction and Synthesis

Data were systematically extracted from each included study. The following information was collected: authors and year of publication, study type, domain of application (clinical, operational, or educational), type of AI technology used, and the main findings and conclusions. The extracted data were synthesized qualitatively and organized into a summary table (Table 1), facilitating comparison across studies and the identification of major research directions.

Thematic Classification

The included studies were grouped into three principal domains: clinical applications (e.g., decision support, trauma management, diagnostic imaging, and mental health), operational applications (e.g., physiological monitoring, medical evacuation, and battlefield decision-making), and educational applications (e.g., simulation, AI-assisted training programs, and competency development technologies). This thematic classification enabled a coherent structure for the analysis and facilitated the organization of the Results and Discussion sections.

Methodological Limitations

The design of this study entails certain limitations, including the risk of selection bias and the inability to perform a quantitative synthesis. Furthermore, the included studies showed considerable methodological heterogeneity in terms of design, sample size, and validation context. In addition, many AI applications in military medicine are still in experimental or early implementation stages, with limited validation under real operational conditions. These factors may influence the generalizability of the findings.

RESULTS

1. Clinical Applications of Artificial Intelligence

Clinical Decision Support Systems

Artificial intelligence has become an essential tool in the development of clinical decision support systems (CDSS), owing to its ability to analyze large volumes of data and provide rapid, accurate recommendations in critical situations. In military medicine, where decisions often must be made under uncertainty and with limited resources, these systems contribute to greater diagnostic accuracy and more effective therapeutic interventions [4,6].

Machine learning-based models can integrate clinical, physiological, and contextual data to support medical decisions in real time. For example, AI-based decision support systems are being used for patient triage and intervention prioritization in austere environments, reducing reliance on limited local expertise [4]. However, the effectiveness of such systems is strongly influenced by data quality and their ability to generalize across contexts, both of which remain major challenges [6].

Trauma and Combat Medicine

Trauma management represents one of the most important challenges in military medicine, and AI offers innovative solutions to improve clinical outcomes. Predictive algorithms can anticipate patient deterioration and the need for critical interventions, such as massive transfusion, thereby enabling earlier and more personalized treatment [7].

In addition, the development of automated systems for battlefield trauma management demonstrates the potential of AI to support medical teams in highly complex situations. Automated trauma systems can integrate real-time data to guide therapeutic decisions and improve intervention coordination [18].

AI is also being applied to battlefield triage, where algorithms can prioritize patients according to injury severity and survival probability. This approach is essential in large-scale combat operations, where medical resources are limited and timely intervention is critical [6].

Medical Imaging and AI-Assisted Diagnosis

Applications of AI in medical imaging have developed rapidly and are increasingly used for the automated interpretation of radiographs and other imaging studies. In military medicine, these technologies are especially valuable in field hospitals, where access to specialists is often limited [19].

Deep learning algorithms can rapidly detect abnormalities on chest radiographs and other medical images, thereby contributing to the early diagnosis of critical conditions. The use of AI in military radiology may reduce diagnostic time and improve accuracy, particularly in settings with high patient volumes. [20].

Mental Health and Post-Traumatic Stress Disorder (PTSD)

Mental health is a fundamental component of military medicine, and AI provides innovative tools for diagnosis, monitoring, and intervention. Machine learning models can analyze behavioral and physiological data to identify early signs of PTSD and other psychiatric disorders [12].

In addition, AI-based digital systems may support continuous patient monitoring and facilitate personalized interventions. Recent studies suggest that AI can contribute to improved diagnosis and optimized treatment in military mental health settings [14]. The integration of AI into military behavioral health may enable the development of more effective prevention and intervention strategies, thereby reducing the psychological burden associated with exposure to conflict [21].

2. Operational Applications of Artificial Intelligence

Field Operational Medicine

In military operations, AI plays a crucial role in supporting real-time medical decision-making. Intelligent systems can integrate data from multiple sources, including physiological sensors and tactical information, to provide a comprehensive picture of both the patient’s condition and the operational environment [22].

These technologies contribute to reducing response time and increasing the efficiency of medical interventions, and they are particularly valuable in environments where access to medical infrastructure is limited [3].

Intelligent Systems for Medical Evacuation (MEDEVAC)

Medical evacuation is a critical component of military medicine, and AI may help optimize this process through intelligent decision support systems. These systems can analyze patient parameters, environmental conditions, and resource availability in real time in order to determine the most effective evacuation strategy [10,11].

By integrating AI, the MEDEVAC process can become more efficient and safer, reducing transport times and improving patients’ chances of survival [10].

Physiological Monitoring and Intelligent Sensors

Wearable sensors and continuous monitoring systems represent another important AI application in military medicine. These technologies allow the collection and analysis of physiological data in real time, facilitating the early detection of patient deterioration [8].

For example, compensatory reserve measurements can identify hemorrhage before overt clinical signs appear, offering a major advantage in trauma management [9]. In addition, continuous health monitoring contributes to the assessment of operational readiness (“combat readiness”) [23].

Autonomous Systems and Combat Support

AI is also being used in the development of autonomous systems capable of supporting medical activities in conflict zones. These systems may include robotic platforms or algorithms able to provide real-time recommendations, thereby reducing the exposure of medical personnel to risk [24].

The integration of such technologies into military operations may improve efficiency and strengthen response capabilities in critical situations.

3. Educational and Training Applications

Integration of AI into Military Medical Education

Military medical education is undergoing rapid transformation through the integration of artificial intelligence. The inclusion of AI in medical curricula supports the development of digital competencies and prepares personnel for the use of emerging technologies [24].

There is also an increasing need for AI-related training among healthcare professionals so that these technologies can be used effectively and responsibly in clinical practice [14].

Medical Simulation and Virtual Learning

Medical simulation is an essential tool in military training, and AI contributes to the development of more realistic and interactive learning environments. The use of virtual patients and AI-based simulations allows medical personnel to train in scenarios that closely resemble real conditions, without placing actual patients at risk [16].

Gamification and virtual reality technologies are also being used to enhance learner engagement and performance, thereby facilitating the acquisition of competencies required for trauma management [25].

Technology-Assisted Procedural Training

AI and related technologies are also being applied to procedural training, including the use of medical devices and intervention techniques. For example, training in portable ultrasound and emergency device utilization can be enhanced through intelligent systems and automated feedback [26–28].

These approaches contribute to improved professional competence and reduced clinical error, and they are particularly relevant to the preparation of military medical personnel.

To synthesize the reviewed literature, the included studies were organized according to their domain of application, the type of AI technology employed, and the main reported findings. This structure highlights the principal directions of AI development in military medicine (Table 1).

Table 1: Summary of Included Studies on Artificial Intelligence Applications in Military Medicine (n = 41)

Reference	Domain	Subdomain	Type of AI application / technology	Main findings	Relevance to military medicine
Leone R.M. [1]	General	Military medicine	Conceptual AI analysis	AI transforms military medical practice	General strategic framework
Adirim T. [2]	General	Military health system	AI integration	Modernization of the Military Health System	Institutional implementation
Lurin I. [3]	Operational	Civilian/military medicine	Comparative analysis	AI useful in austere environments	Civil-military transfer
Umlauf L. [4]	Clinical	Decision support	AI-based CDSS	Supports decisions in resource-limited settings	Useful in field hospitals
Schwab J.H. [5]	Clinical	Decision support	AI medical decision support	Data quality concerns	Need for validation
Mathais Q. [6]	Clinical/ Operational	Triage	AI algorithms	Potential and limitations in the field	Combat triage
Lammers D. [7]	Clinical	Trauma	Predictive machine learning	Predicts transfusion/death	Early intervention
Convertino V.A. [8]	Operational	Monitoring	Compensatory reserve	Early hemorrhage detection	Field advantage
Cosic K. [9]	Mental/ Operational	War psychology	AI emotion analysis	Stress-war correlations	Mental monitoring
Krygier J. [10]	Operational	MEDEVAC	Intelligent system	Evacuation optimization	Increased survival
Lubkowski P. [11]	Operational	MEDEVAC	Evacuation DSS	Optimal resource selection	Logistics management
Bertl M. [12]	Clinical	PTSD	AI review	AI for PTSD screening	Mental health
Pellegrin G. [13]	Clinical	PTSD	Machine learning	PTSD pattern detection	Early diagnosis
Callcut R.A. [14]	Clinical	Imaging	AI radiography	Improved accuracy	Rapid diagnosis
Peacock J.G. [15]	Educational	Medical training	Digital transformation	Educational modernization	Military curriculum
Stathakarou N. [16]	Educational	Simulation	Gamification	Improved performance	Trauma training
Cruz-Gonzalez P. [17]	Clinical	Mental health	Systematic review	Benefits and risks of AI	Responsible use
Baker J.B. [18]	Clinical	Trauma	Automated system	Real-time trauma management	Decision support
Cloran F.J. [19]	Clinical	Radiology	AI imaging	Rapid diagnosis	Useful in theaters
Ozmen, M.M. [20]	Clinical/ Operational	Surgery	AI + robotics	Surgical digitalization	Future autonomy
Shore H.J. [21]	Clinical	Mental health	Digital technology	PTSD monitoring	Reduced psychological burden
Russell B.C. [22]	Operational	Sensors	AI-enabled sensors	Real-time data	Decision support
de Vries H.J. [23]	Operational	Readiness	Real-time monitoring	Assessment of soldier status	Preventive medicine

Spirnak J.R. [24]	Educational	Curriculum	AI training	Need for AI education	Personnel preparation
Stathakarou N. [25]	Educational	Simulation	Game-based learning	Increased engagement	Efficient learning
Monti J.D. [26]	Educational	Procedures	eFAST training	Improved competencies	Rapid diagnosis
Gendron B. [27]	Educational	Procedures	Device training	Improved performance	Emergency maneuvers
Meadows R.M. [28]	Clinical/ Educational	Ultrasound	Portable ultrasound	Pneumothorax detection	Useful in the field
Rakhilin N. [29]	Operational	Operational medicine	AI integration	Implementation challenges	Human factors
Favorov O. [30]	Operational	Wearable sensors	Wearable sensors	Detects motor deficits	Soldier monitoring
Savell S.C. [31]	Clinical	POCUS ultrasound	Rapid diagnosis	Field utility	Rapid assessment
Bornemann P. [32]	Clinical	Ultrasound	Portable devices	High acceptance	Useful in the field
Vučemilović A. [33]	Clinical	Clinical decision	Decision strategy	Lessons from conflict	Military context
Esfandiari E. [34]	Educational	AI acceptance	Perception study	Moderate acceptance	Need for training
Riggenbach Z.W. [35]	General	Military AI	Overview	Introduction of AI at the front	Education and strategy
Cole R. [36]	General	Medical warfare	AI warfare	Preparation of the medical system	Adaptation to the future
Patel N.C. [37]	Operational	Health system	AI defence	AI optimizes the system	Public policy relevance
Bhakar R. [38]	Educational	Surgical education	AI training	Improves training	Surgical competencies
McConnon A.D. [39]	Clinical	Mental health	AI behavioral health	Psychological monitoring	PTSD prevention
Meyer N. [40]	General	Military medicine	Review of AI applications	Multiple AI applications	Domain synthesis
Caffery S.J. [41]	Educational	Simulation	Medical simulations	Realistic training	Military preparedness

Abbreviations: AI = artificial intelligence; PTSD = post-traumatic stress disorder; MEDEVAC = medical evacuation; CDSS = clinical decision support system; eFAST = extended Focused Assessment with Sonography for Trauma.

DISCUSSION

1. Synergy Between Clinical and Operational Applications

A central finding of this review is the interdependence between the clinical and operational applications of AI. Clinical decision support systems developed to optimize diagnosis and treatment become even more valuable when integrated into the broader military operational ecosystem. In settings where medical decisions are influenced by tactical and logistical factors, AI enables an integrated approach in which clinical data are correlated with information about the environment and available resources [3,4,22].

For example, algorithms used for patient triage or for predicting trauma outcomes do not function in isolation; rather, they are incorporated into more complex systems involving medical evacuation and resource allocation. This integration supports global optimization of interventions and may improve survival rates in combat scenarios [7,10,11].

The Role of AI in Emergency Medicine and Military Trauma

The findings reviewed here indicate that military trauma care is one of the most promising fields for AI application. Machine learning-based predictive models allow earlier identification of patients who require critical interventions, such as massive transfusion or urgent surgery [7].

At the same time, the development of automated trauma management systems and triage algorithms for large-scale combat operations suggests a clear trend toward partial automation of decision-making processes [6,18]. However, these advances also raise important questions regarding algorithm reliability under real-world conditions and the need for validation across diverse operational settings.

Importance of Continuous Monitoring and Real-Time Data

Another major finding is the importance of continuous physiological monitoring in military medicine. Wearable sensors and AI-based monitoring systems enable real-time data collection and provide a dynamic picture of patient status [8,23]. These technologies have the potential to shift military medicine from a reactive model to a proactive one, in which clinical deterioration may be anticipated and prevented. For instance, the early detection of hemorrhage through compensatory reserve analysis illustrates how AI may contribute to earlier intervention and reduced mortality [9]. However, reliance on continuous data streams also raises concerns about data security, infrastructure stability, and system interoperability, all of which are critical in military contexts.

AI and the Transformation of Military Mental Health

The integration of AI into military mental health represents a significant advance, especially given the high prevalence of PTSD. Machine learning models can support early identification of symptoms and longitudinal monitoring, thereby creating opportunities for more personalized interventions [12,14].

However, the application of AI in this field is accompanied by specific challenges, including the complexity of psychological data and the risk of misinterpretation. In addition, acceptance by both patients and healthcare professionals remains a key determinant of successful implementation [21].

Impact of AI on Military Medical Education

The results suggest that AI has a major impact on military medical education and training by supporting the transition to more modern learning methods. Medical simulations, virtual patients, and gamification technologies make it possible to develop competencies in controlled environments while increasing the preparedness of medical personnel [16,25].

The integration of AI into educational curricula also contributes to the development of digital competencies and prepares professionals to work with emerging technologies. Nevertheless, the implementation of such programs requires substantial resources and adaptation of existing educational systems [14,24].

Balancing Automation and Human Decision-Making

A critical issue highlighted in the literature is the need to maintain a balance between the automation enabled by AI and the decision-making role of the clinician. Although AI can offer valuable support, final decisions must remain under the responsibility of medical personnel, particularly in situations with major ethical implications [6,17].

Excessive reliance on algorithms may lead to reduced clinical autonomy and potential errors if systems fail or perform inadequately. Accordingly, AI should be understood as a complementary tool rather than a substitute for human expertise.

Limitations of the Literature and Implications for Research

The reviewed literature reveals important limitations, including a lack of prospective studies and limited validation under real combat conditions. Most studies have been conducted in controlled environments or on restricted datasets, which may reduce the applicability of their findings [6].

Furthermore, methodological variability and lack of standardized datasets hinder cross-study comparison and the development of generalizable models. These limitations underscore the need for future research assessing AI effectiveness under real operational conditions.

Practical Implications for Military Medicine

From a practical perspective, the implementation of AI in military medicine requires a multidisciplinary approach involving specialists in medicine, engineering, and data science. The development of regulatory frameworks and standardized protocols for the use of these technologies is also essential.

The adoption of AI may improve the resilience of military healthcare systems and strengthen their capacity to respond in crisis situations. However, successful implementation depends on effective integration into existing workflows and user acceptance.

Summary

Overall, this review highlights the transformative potential of AI in military medicine by offering innovative solutions to clinical, operational, and educational challenges. At the same time, realizing this potential requires careful attention to the associated limitations and risks, as well as the development of implementation strategies tailored to the specific characteristics of the military environment.

2. Benefits of Artificial Intelligence in Military Medicine

The integration of artificial intelligence into military medicine offers significant benefits across clinical, operational, and educational domains, contributing to improved efficiency and better medical outcomes under complex conditions.

Improved Clinical Decision-Making

One of the principal advantages of AI lies in its ability to support clinical decisions through the rapid analysis of large volumes of data. AI-based decision support systems can identify subtle patterns and generate real-time therapeutic recommendations, thereby reducing variability in decision-making and the risk of human error [4,6]. This is particularly important in military medicine, where decisions are frequently made under pressure and uncertainty.

Greater Operational Efficiency

AI contributes to the optimization of operational workflows by automating selected processes and facilitating the coordination of medical interventions. For example, intelligent medical evacuation systems and triage algorithms enable more efficient use of resources and shorter response times [10,11]. In addition, the integration of AI into operational medicine improves planning capacity and adaptability in dynamic situations [3].

Reduced Response Time

In emergency situations, the time to intervention is a critical determinant of patient survival. AI enables rapid analysis of data and the delivery of immediate recommendations, thereby reducing the time required for diagnosis and treatment [7]. This capability is essential in the context of severe trauma and battlefield interventions.

Continuous Monitoring and Early Detection

The use of wearable sensors and AI-based monitoring systems allows continuous assessment of the physiological status of military personnel. These technologies can identify early deterioration, including internal hemorrhage, before overt clinical signs appear [9]. As a result, AI may help prevent complications and support the timely initiation of treatment.

Optimization of Training and Competency Development

In the educational domain, AI facilitates the development of innovative training approaches such as medical simulations and virtual patients. These tools enable medical personnel to train in realistic settings without risk to actual patients and may improve professional performance [16,25]. In addition, AI-based adaptive learning allows greater personalization of the educational process.

3. Limitations, Risks, and Challenges

Despite its substantial benefits, the implementation of AI in military medicine is associated with multiple challenges that must be addressed to ensure its safe and effective use.

Technical Limitations

One of the principal obstacles is the quality and availability of data. AI models depend on large, well-annotated datasets, and the absence of such data may impair algorithm performance [6].

Moreover, algorithmic bias and limited generalizability across different operational environments may result in inaccurate outputs or suboptimal decisions.

Operational Challenges

The implementation of AI in military settings involves challenges related to infrastructure, connectivity, and interoperability. In conflict zones, access to stable networks and technological resources may be limited, thereby affecting the operation of AI-based systems [3]. In addition, integrating these technologies into existing systems often requires substantial adaptation.

Human Factors and Technology Acceptance

Adoption of AI depends largely on acceptance by medical personnel. Limited trust in algorithms, insufficient training, and resistance to change may restrict effective use of these technologies [29]. There is also a risk of overreliance on AI, which could reduce independent decision-making capacity.

Ethical and Medico-Legal Considerations

The use of AI in military medicine raises complex ethical issues, including accountability for decisions, algorithm transparency, and the protection of personal data. In military operations, these concerns are amplified by the potential consequences for patient safety and survival [19]. Furthermore, the use of AI in automated triage or other critical decisions requires clear ethical frameworks and appropriate regulatory oversight.

Even if AI-facilitated triage can reduce variability between users, it is difficult to use it in order to outperform humans due to ethical reasons regarding AI autonomy in medical setting decision making, but if it is supported by large datasets and appropriately trained, it can be used to enhance consistency and increase the productivity of humans already working on the specific task [6].

4. Future Research Directions

The continued development and implementation of AI in military medicine require sustained research and innovation efforts aimed at overcoming current limitations and maximizing the potential of these technologies.

Clinical Validation in Real-World Environments

A key priority is the validation of AI systems under real military operational conditions. Prospective studies and field evaluations are needed to demonstrate the safety and effectiveness of these technologies [6].

Development of Explainable AI

Greater algorithmic transparency is essential for the acceptance and use of AI in clinical practice. Explainable AI allows users to understand how recommendations are generated, thereby increasing trust in these systems [5].

Multimodal Data Integration

Future AI systems should integrate data from multiple sources, including clinical, imaging, and physiological data. Such a multimodal approach may improve predictive accuracy and decision relevance [25].

Development of Autonomous Systems

Advances in AI may lead to the development of autonomous systems capable of performing triage, monitoring, and even basic medical interventions in the absence of medical personnel. These technologies could have major implications for care delivery in conflict zones [24].

Personalization of Medical Training

AI also creates opportunities for the development of personalized educational programs adapted to the individual needs of learners. Such approaches may improve training efficiency and enhance the acquisition of competencies specific to military medicine [16].

CONCLUSION

Artificial intelligence is a transformative technology in military medicine, with broad applications across clinical, operational, and educational domains. Its ability to rapidly analyze complex data, support medical decisions, and optimize processes contributes substantially to improving the quality of care in military settings.

Clinical applications of AI, including decision support, trauma management, and AI-assisted diagnosis, demonstrate its potential to reduce mortality and improve patient outcomes. At the same time, AI in operational medicine may optimize resource utilization and enhance the efficiency of interventions in austere environments. In the educational field, AI is reshaping the training of medical personnel by providing innovative simulation- and adaptive learning-based solutions.

However, large-scale implementation remains constrained by technical, operational, and ethical challenges that require interdisciplinary approaches and appropriate regulation. The development of robust, transparent, and clinically validated systems is essential to ensure the safe and effective use of AI in military medicine.

Looking ahead, AI is unlikely to replace the military clinician; rather, it should be regarded as a complementary tool that expands decision-making capacity and improves the performance of military medical systems. The responsible integration of these technologies will play an essential role in the future development of military medicine and in strengthening the resilience of healthcare systems in conflict settings.

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Authors' contribution

Conceptualization, S.S.T, I.D.F. ; methodology, I.D.F., C.N.D. ; resources, B-V.V., C.N.D.; writing—original draft preparation, S.S.T, I.D.F., B-V.V.; writing—review and editing, I.T.I, S.I.D., A.E.M. ; supervision, S.I.D., A.E.M.. All authors have read and agreed to the published version of the manuscript.

Ethics approval and consent to participate

Not applicable.

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