Quality in Sport. 2026;51:68548. eISSN 2450-3118.

https://doi.org/10.12775/QS.2026.51.68548

Quality in Sport. eISSN 2450-3118

Journal Home Page https://apcz.umk.pl/QS/index

WIŚNIEWSKI, Karol Paweł, WITKOWSKI, Paweł, BACHURSKI, Patryk, CHMIEL, Gabriela, PIERZGA, Elisabetta, MIĘDLAR, Maja, MUDA, Martyna, PACEK, Szymon, ZARAŃSKI, Bartosz and KALINOWSKI, Paweł. The Role of Artificial Intelligence and Machine Learning in Modern Medicine: A Literature Review. Quality in Sport. 2026;51:68548. eISSN 2450-3118. https://doi.org/10.12775/QS.2026.51.68548

The journal has been awarded 20 points in the parametric evaluation by the Ministry of Higher Education and Science of Poland. This is according to the Annex to the announcement of the Minister of Higher Education and Science dated 05.01.2024, No. 32553. The journal has a Unique Identifier: 201398. Scientific disciplines assigned: Economics and Finance (Field of Social Sciences); Management and Quality Sciences (Field of Social Sciences).
Punkty Ministerialne z 2019 - aktualny rok 20 punktów. Załącznik do komunikatu Ministra Szkolnictwa Wyższego i Nauki z dnia 05.01.2024 Lp. 32553. Posiada Unikatowy Identyfikator Czasopisma: 201398. Przypisane dyscypliny naukowe: Ekonomia i finanse (Dziedzina nauk społecznych); Nauki o zarządzaniu i jakości (Dziedzina nauk społecznych).

The authors declare that there is no conflict of interest regarding the publication of this paper.
Received: 24.01.2026. Revised: 05.02.2026. Accepted: 06.02.2026. Published: 20.02.2026.

The Role of Artificial Intelligence and Machine Learning in Modern Medicine: A Literature Review

WIŚNIEWSKI Karol Paweł, PIERZGA Elisabetta, BACHURSKI Patryk, CHMIEL Gabriela, KALINOWSKI Paweł, MIĘDLAR Maja, MUDA Martyna, PACEK Szymon, PIERZGA Elisabetta, WITKOWSKI Paweł, ZARAŃSKI Bartosz

Karol Paweł Wiśniewski, ORCID https://orcid.org/0009-0004-6561-5070
E-mail: kar@lwisniewski.cc
Uniwersytet Rzeszowski: Rzeszów, Subcarpathia, PL

Patryk Bachurski, ORCID https://orcid.org/0009-0004-2021-7589
E-mail: bachurskip@gmail.com
Uniwersytet Rzeszowski: Rzeszów, Subcarpathia, PL

Gabriela Chmiel, ORCID https://orcid.org/0009-0009-8416-3598
E-mail: gabriela.chmiel2001@gmail.com
Uniwersytet Rzeszowski: Rzeszów, Subcarpathia, PL

Paweł Kalinowski, ORCID https://orcid.org/0009-0003-1907-7868
E-mail: pawelwojciechkalinowskijunior@gmail.com
Uniwersytet Rzeszowski: Rzeszów, Subcarpathia, PL

Maja Mię dlar, ORCID https://orcid.org/0009-0004-8612-8861
E-mail: maja.miedlar@gmail.com
Uniwersytet Rzeszowski: Rzeszów, Subcarpathia, PL

Martyna Muda, ORCID https://orcid.org/0009-0008-1303-0985
E-mail: mudamartyna@gmail.com
Uniwersytet Rzeszowski: Rzeszów, Subcarpathia, PL

Szymon Pacek, ORCID https://orcid.org/0009-0003-6605-6074
E-mail: pacekszymon9@gmail.com
Uniwersytet Rzeszowski: Rzeszów, Subcarpathia, PL

Elisabetta Pierzga, ORCID https://orcid.org/0009-0003-1674-9462
E-mail: ep121966@stud.ur.edu.pl
Uniwersytet Rzeszowski: Rzeszów, Subcarpathia, PL

Paweł Witkowski, ORCID https://orcid.org/0009-0002-1083-8424
E-mail: pw121975@stud.ur.edu.pl
Uniwersytet Rzeszowski: Rzeszów, Subcarpathia, PL

Bartosz Zarański, ORCID https://orcid.org/0009-0002-5952-694X
E-mail: zarbar7823@gmail.com
Uniwersytet Rzeszowski: Rzeszów, Subcarpathia, PL

Corresponding author: Karol Wiśniewski, kar@lwisniewski.cc

Abstract

Artificial Intelligence (AI) and Machine Learning (ML) are rapidly transforming modern medicine by helping in processing great volumes of clinical data with exceptional speed and accuracy. As medical knowledge expands and guidelines change, AI tools support the management of information overload and improve clinical workflows.

The aim of this article is to review concrete examples of AI and ML applications across various medical specialties, focusing of their ability to accelerate processes and enhance diagnostic accuracy.

In radiology, AI models demonstrate better performance in chest imaging and comparable accuracy in mammography compared to doctors, while reducing the impact of human factors such as fatigue. In cancer care, AI allows for multi-omics integration, precise pathological evaluation (e.g. GastroMIL model) and prognostic forecasting. Dermatological studies reveal that AI algorithms can outperform dermatologists in classifying skin leisons (72,1% vs 65,78% accuracy). In cardiology, AI enhances risk stratification beyond traditional scales and demonstrates higher sensitivity in ECG interpretation compared to healthcare professionals.

Through real-time monitoring of hemodynamic stability and postoperative pain management, anesthesiology has integrated AI into clinical practice to improve accuracy of detection of hypotension by 40%. Preoperatively, AI provides assistance to assess risk and offers assistance to the perioperative team during the surgical procedure. AI also improves medical record documentation and decreases the administrative burden of documentation on the physician. AI systems currently augment our clinical intelligence by overcoming limitations in human cognition such as fatigue and algorithmically processing large volume datasets on a daily basis to improve diagnostic accuracy, treatment personalization and efficiency of healthcare.

KEYWORDS: Artificial Intelligence, Machine Learning, Clinical Decision Support Systems, Diagnostic Accuracy, Deep Learning in Medicine

INTRODUCTION:

AI (Artificial intelligence) and ML (Machine learning) are constantly becoming an increasingly important component of modern human life and functioning within our current global reality [1]. The vast volume of knowledge and data that have become accessible via the Internet can now be processed and analyzed with unprecedented speed and accuracy. This capability significantly improves the process of searching for and validating reliable information, leading to the formulation of more appropriate decisions, both in private and professional life.

Medicine, as a dynamic and rapidly-evolving field of science is confronted with a continuous stream of novel research findings and as a result, constantly shifting clinical guidelines. This makes this domain a great beneficent of the advanced analytical power provided by AI and ML tools, as they are able to process and learn from vast repositories of complex clinical data, such as large-scale diagnostic imaging results. Their level of comprehensive pattern recognition and data synthesis is often practically unachievable for human analysis alone. This makes the AIM (Artificial Intelligence in Medicine) an exceptionally capable tool for constant enhancements of diagnostic accuracy, increase in clinical workflow efficiency, and the development of highly individualized and personalized treatment options for patients [2].

The primary goal of this article is to review concrete examples of successful application of AI and ML technologies in medicine to accelerate and/or enhance the precision associated with making clinical diagnoses.

HISTORICAL OVERWIEW:

The earliest computer systems designed to emulate human brain function in decision-making emerged in the 1950s. These systems operated primarly on the basis of sequential „if… then…" logic instuctions. [2].

However, it was not untill the 1970s that the systems which used AI in medical applications appeared. The first one was INTERNIST-1, which was designed to make a diagnosis based on patient symptoms, utilizing a search algorithm. It became the cornerstone of future interest in AI, as it had shown a great potential in making diagnosis easier, faster and more reliable.

Other, following pioneering systems which utilized AI are MYCIN, which assisted in providing the list of potential bacterial pathogens and selecting the appropriate antibiotic and its dose for patients diagnosed with infectious diseases based on their symptoms and DXplain, which was a redefined and more advanced version of INTERNIST-1, capable of providing information on approximately 500 diseases.

The next milestone, which effectively became the father of currently utilized AI systems, was the creation of IMB's Watson in 2007. Watson utilized Natural Language Processing, making it capable of processing data from various sources and analyzing its context. As a result, its reasoning was not restricted to preprogrammed rules. The system could comprehensively analyze entire electronic medical records, not just the entered symptoms, while simultaneously scanning data from latest digital sources of medical knowledge. This breakthrough provided new possibilities for evidence-based clinical decision making. Furthermore, the output could incorporate not only the diagnosis, but also suggestions regarding the most appropriate course of further medical treatment. [2,3]

CURRENT APPLICATIONS:

The AI systems currently utilized in medicine operate mainly on principles similar to those of the Watson. They use different types of ML algorithms which are applied to analyze vast databases containing, for example, the latest Evidence Based Medicine findings or patient records with physician-confirmed diagnoses. ML alhorithms utilize these databases to train the model, generate pattern recognition, extrapolation, elaboration strategies and allow the model to learn through experience.

This process results in the creation of a mathematical algorithm capable of analyzing new clinical cases and formulating probable diagnoses or the most appropriate medical management in real time. The generated data can assist physicians in both the process of conservative treatment through the direct presentation of the findings, and in interventional treatment, where the data is utilized directly by robots participating in surgical procedures. [4,5]

AI APPLICATIONS IN RADIOLOGY:

In radiology, AI is primarily used to support radiologists in interpreting diagnostic imaging. It is most commonly utilized for analysis of magnetic resonance imaging (MRI) and computed tomography (CT) scans, mainly focusing on the nervous system and the chest. The most frequent clinical use cases in these tests include diagnosing neoplasms (tumors), trauma, Alzheimer's disease and other neurodegenerative conditions, myocardial infraction or coronary artery disease, pneumonia, or hemorrhage. [6,7]

Regarding chest imaging studies, when comparing the precision and recall of an AI model's diagnosis with the average precision and recall achieved across four practicing radiologists with 4, 7, 25 and 28 years of experience, the AI model achieved a significantly higher performance. The AI model reached an F1 score of 0,435, compared to the average radiologist score of 0,387 [8].

In the assessment of mammography, AI obtained slightly higher accuracy results than the average performance of 101 radiologists. The efficacy of detection of leisions by AI, measured using the Area Under the ROC Curve (AUC), reached a score of 0,840, whereas the average score of the radiologists was 0,814. Although the AI achieved a higer AUC than 61,4% of the radiologists, the difference proved to be statistically insignificant [9].

It is important to note, however, that the presented examples of AI's effectiveness would be more pronounced in real-world clinical applications. This is because, in standard clinical practise, radiologists often have a very limited amont of time, frequently restricted to a few seconds, to evaluate an image. They are also often subject to fatigue or distraction from other duties. Unlike human, AI algorithms are not susceptible to factors such as fatigue, emotional distraction, or the subjective biases resulting from prior experience. [10]

AI APPLICATIONS IN CANCER CARE:

AI in cancer care can be utilized in detection, diagnosis, staging, grading, therapy, discovery of therapeutic targets and prognosis. In the detection process, AI can support the physician in making appropriate decisions regarding successive diagnostic steps. This is particularly relevant when a patient presents with non-specific symptoms that might not immediately suggest the risk of malignancy. Initial risk assessment for the presence of a tumor primarily relies on imaging studies, where, as previously mentioned, AI is used to reduce the physician's workload, consequently increasing the accuracy and time to initial diagnosis.

AI can also be applied at the next stage: pathological evaluation of the biopsy material under a microscope. Firstly, AI can automatically convert unstained whole-slide images into images stained with hematoxylin and eosin (H&E), which is considered the "standard stain" and used in almost all clinical settings. Secondly, AI can evaluate and describe these slides. One example of this ability is the GastroMIL model, which is specialized in describing pathological changes in patients with gastric cancer, achieving and accuracy of 0.92, a result comparable to that of human experts. Artificial intelligence algorithms can also be used to integrate data grom genomics, transcriptomics, proteomics, and metabolomics to identify cancer driver genes, discover new therapeutic targets and predict the patient's response to various drugs. Last but not least, AI algorithms can assist with prognostic forecasting, replacing limited linear models, predicting overall survival and disease-free survival. [11, 12]

AI APPLICATIONS IN DERMATOLOGY:

In dermatology, AI is utilized primarily for evaluation of skin lesions.

In a dermatological study focused on the identification of skin cancers- including both the most commonly occurring and types and those with the highest mortality rates- AI achieved higher scores for correct diagnosis than human dermatologists. In the first part of the study,

AI demonstrated an accuracy of 72.1 ± 0.9%, compared to 65.78% achieved by dermatologists.

In the second part, AI's effectiveness was 55.4% ± 1.7%, slightly higher than the dermatologists' score of 54.15%. [13]

AI APPLICATIONS IN CARDIOLOGY:

In cardiology, AI systems are primarily applied for risk assessment and diagnostic purposes. Current methods for risk stratification include scales, such as the CHA2DS2-VASc score, which were developed based on large, yet often limited, number of patients. There is also a lack of unambiguous data regarding the accuracy of these scales, particularly within certain demographics, such as African Americans. In case of AI, it is able to utilize much larger patient populations for model training, as well as the ability to calibrate risk-prediction equations in real-time. This allows for the inclusion of a significantly greater number of variables, therefore enhancing the accuracy of risk assessment for a specific patient [14].

For diagnostic purposes, AI can be used to evaluate electrocardiograms (ECG). In the case of certain conditions, such as paroxysmal atrial fibrillation (AF), where irregularities are not constantly present, monitoring is required over long periods of time. The manual evaluation of such a prolonged recording would be laborious and time-consuming. Therefore, AI algorithms are utilized to extract only the abnormal sections of the recording, significantly reducing the physician's workload [15].

Moreover, AI can also be utilized to evaluate and interpret the entire ECG tracing. In a study comparing the effectiveness of ECG interpretation by an AI model and by healthcare professionals, the AI model achieved 93.5% sensitivity and 87.0% specificity. In contrast, the healthcare professionals had 84.6% sensitivity and 73.2% specificity, which proved to be a statistically significant difference in the effectiveness of correct ECG interpretation in favor of the AI model [16].

AI APPLICATIONS IN ANAESTHESIOLOGY:

In anaesthesiology, AI is primarily used in association with surgical procedures. Intraoperatively, AI supports anesthesiologists in detecting hypotension and hypoxemia, and helps with maintenance of hemodynamic stability [17]. Systems equipped with artificial intelligence algorithms can be used to control the rate of anesthetic administration. Based on data such as heart rate, oxygen saturation, ECG and other parameters routinely collected during surgery by the anesthesiology team, AI can maintain the depth of anesthesia more tightly and reduce intraoperative hemodynamic fluctuations and, therefore, recovery times. According to research, AI can be up to 40% more effective than standard treatment algorithms in detecting hypotension [18].

In postoperative care, AI models are applied to pain prediction and management, including prediction of acute and chronic postoperative pain and persistent opioid use, often with AUROCs over or equal to 0.8 and identification of modifiable risk factors, carifying phenotypic pain trajectories and linking them to personalized multimodal analgesia strategies and supporting perioperative pain assessment (e.g., using physiological or behavioral signals) and forecasting adverse effects of pain medications. In these applications, AI clearly outperforms simple rule-based decisiona, and its use results in a reduction in pain scores, opioid use, or adverse events, [19,20].

AI APPLICATIONS IN SURGERY:

Preoperatively, AI assists surgeons in risk stratification, procedural planning, and complication and mortality prediction, generally with AUROCs over or equal to 0.8, which exceeds human scores by 0,04-0,09 [21]. In metabolic bariatric surgery, AI models predict a spectrum of short and long term complications, readmissions, leaks, VTE, hemorrhage, and weight loss trajectories, again often with clinically significant AUROCs [22]. In thoracic and spine surgery, AI tools augment preoperative imaging, staging, and risk prediction, supporting decisions about operative approach and perioperative management, with improved predictive performance over classical risk models but limited prospective clinical evaluation [23, 24]. In microsurgical planning, AI aids perforator mapping and flap design, offering individualized risk stratification and potentially reducing operative time and complications, based largely on feasibility and accuracy studies [25].

AI in surgery can also be utilized intraoperatively. Computer vision and deep learning systems recognize surgical phases, instruments, hand motions, and critical structures in laparoscopic, general, neurosurgical, and ophthalmic procedures with AUCs of 0.85–0.95 and accuracies often 80–99% in test datasets, supporting phase based guidance, workflow anticipation, and skill assessment [26 ,27, 28]. In general surgery 18% reductions in intraoperative errors and approximately 30 minute reductions in operative time was observed for complex cases when AI assistance was used (e.g., real time guidance, error detection, robotic support) versus standard practice [29]. AI enhanced robotic systems in minimally invasive and complex surgery achieve higher precision, fewer complications, and improved recovery metrics in selected studies, but most evidence is drawn from small series or early trials [23,30].

Postoperative usecases of AI in surgery include assisting with detecting early complications (e.g., sepsis, leak, deterioration) in GI and abdominal surgery, outperforming standard scores in early detection, but with limited prospective deployment data [31,32].

AI APPLICATIONS IN MEDICAL ADMINISTRATION

AI in medical administration can be utilized to streamline hospital discharge records. Patient discharge records are time-consuming, require appropriate preparation and consideration from a medical, legal and administrative standpoint. This leads to significant variability in documentation, which can complicate the analysis of a patient's medical history when they receive treatment across different healthcare units. The solution to mentioned problems may be to utilize AI, which would substantially simplify the standardization of the medical record structure, reduce the burden of paperwork on physicians, and enhance the ease of analyzing documentation. [33]

SUMMARY

The integration of Artificial Intelligence (AI) and Machine Learning (ML) into clinical practice represents a shift from traditional, rule-based medical process to data-driven, adaptive intelligence. From the early logic-based systems of the 1950s and the pioneering INTERNIST-1 to the sophisticated Deep Learning algorithms of today, AI has evolved into an irreplaceable component of modern healthcare.

The evidence reviewed in this article has shown that AI is not merely a theoretical concept but rather, it is a practical tool that provides actual improvements in performance in different specialties. In the diagnostic fields of radiology, dermatology, and cardiology, AI algorithms frequently match or exceed human experts in pattern recognition tasks, offering higher sensitivity and specificity while remaining unaffected by cognitive fatigue and distraction. In addition, AI is helping to improve patient safety in the interventional areas of surgery and anesthesiology through the improvement of hemodynamic monitoring and the reduction of intraoperative errors, as well as shortening the time necessary to complete procedures. Furthermore, the application of AI in oncology enables a level of personalized care through the integration of genomics and pathology, that was previously impossible.

AI also helps address many critical administrative issues arising out of the need to develop and implement documentation and standardized medical records by streamlining documentation and standardizing medical records, therefore allowing physicians to dedicate more time to direct patient care. Although the role of human oversight cannot be completely replaced by AI, given its ability to analyze large amounts of complex data and provide real-time, evidence-based recommendations, AI can complement a physician's clinical expertise by assisting in producing more accurate diagnoses and more effective treatments. As AI healthcare technology continues to mature, it will be well-positioned to evolve from a supportive role in helping to enhance clinical effectiveness to becoming the primary source of support for the entire clinical decision-making process.

Supplementary Materials

Not applicable.

Author Contributions

Conceptualization – Karol Paweł Wiśniewski, Paweł Witkowski
Formal analysis – Paweł Witkowski, Martyna Muda
Investigation – Martyna Muda, Szymon Pacek
Data curation – Gabriela Chmiel, Patryk Bachurski, Szymon Pacek
Writing –rough preparation –Karol Paweł Wiśniewski, Elisabetta Pierzga, Patryk Bachurski
Writing –review and editing – Karol Paweł Wiśniewski, Maja Międlar, Gabriela Chmiel
Visualization – Bartosz Zarański, Paweł Kalinowski
All authors have read and agreed with published version of the manuscript.

Funding

The article did not receive any funding.

Institutional Review Board Statement

Not applicable.

Informed Consent Statement

Not applicable.

Data Availability Statement

The authors confirm that the data supporting this study are available in the article's references.

Acknowledgements

Not applicable.

Conflicts of Interest

The authors declare there are no conflicts of interest

References

[1] Aslitdinova, M. . (2025). HOW ARTIFICIAL INTELLIGENCE HELPS US IN OUR DAILY LIFE. International Journal of Artificial Intelligence, 1(4), 538–542. Retrieved from https://inlibrary.uz/index.php/ijai/article/view/98893

[2] Vivek Kaul, Sarah Enslin, Seth A. Gross, History of artificial intelligence in medicine,Gastrointestinal Endoscopy, Volume 92, Issue 4, 2020, Pages 807-812, ISSN 0016-5107, https://doi.org/10.1016/j.gie.2020.06.040. (https://www.sciencedirect.com/science/article/pii/S0016510720344667)

[3] Hirani, R.; Noruzi, K.; Khuram, H.; Hussaini, A.S.; Aifuwa, E.I.; Ely, K.E.; Lewis, J.M.; Gabr, A.E.; Smiley, A.; Tiwari, R.K.; et al. Artificial Intelligence and Healthcare: A Journey through History, Present Innovations, and Future Possibilities. *Life* **2024**, *14*, 557. https://doi.org/10.3390/life14050557

[4] Bellini V, Cascella M, Cutugno F, Russo M, Lanza R, Compagnone C, Bignami EG. Understanding basic principles of Artificial Intelligence: a practical guide for intensivists. Acta Biomed. 2022 Oct 26;93(5):e2022297. doi: 10.23750/abm.v93i5.13626. PMID: 36300214; PMCID: PMC9686179.

[5] Hamet P, Tremblay J. Artificial intelligence in medicine. Metabolism. 2017 Apr;69S:S36-S40. doi: 10.1016/j.metabol.2017.01.011. Epub 2017 Jan 11. PMID: 28126242.

[6] Kelly BS, Judge C, Bollard SM, Clifford SM, Healy GM, Aziz A, Mathur P, Islam S, Yeom KW, Lawlor A, Killeen RP. Radiology artificial intelligence: a systematic review and evaluation of methods (RAISE). Eur Radiol. 2022 Nov;32(11):7998-8007. doi: 10.1007/s00330-022-08784-6. Epub 2022 Apr 14. Erratum in: Eur Radiol. 2022 Nov;32(11):8054. doi: 10.1007/s00330-022-08832-1. PMID: 35420305; PMCID: PMC9668941.

[7] Rockall AG, Shelmerdine SC, Chen M. AI and ML in radiology: Making progress. Clin Radiol. 2023 Feb;78(2):81-82. doi: 10.1016/j.crad.2022.10.010. PMID: 36639174.

[8] Rajpurkar P, Irvin J, Zhu K, Yang B, Mehta H, Duan T, Ding D, Bagul A, Langlotz C, Shpanskaya K, Lungren MP, Ng AY. CheXNet: Radiologist-Level Pneumonia Detection on Chest X-Rays with Deep Learning. arXiv [preprint] 2017 Nov 14; arXiv:1711.05225v3. Available from: https://arxiv.org/abs/1711.05225v3

[9] Rodriguez-Ruiz A, Lång K, Gubern-Merida A, Broeders M, Gennaro G, Clauser P, Helbich TH, Chevalier M, Tan T, Mertelmeier T, Wallis MG, Andersson I, Zackrisson S, Mann RM, Sechopoulos I. Stand-Alone Artificial Intelligence for Breast Cancer Detection in Mammography: Comparison With 101 Radiologists. J Natl Cancer Inst. 2019 Sep 1;111(9):916-922. doi: 10.1093/jnci/djy222. PMID: 30834436; PMCID: PMC6748773.

[10] Gore JC. Artificial intelligence in medical imaging. Magn Reson Imaging. 2020 May;68:A1-A4. doi: 10.1016/j.mri.2019.12.006. Epub 2019 Dec 16. PMID: 31857130.

[11] Zhang, C., Xu, J., Tang, R. *et al.* Novel research and future prospects of artificial intelligence in cancer diagnosis and treatment.*J Hematol Oncol* **16**, 114 (2023). https://doi.org/10.1186/s13045-023-01514-5

[12] Lin PC, Tsai YS, Yeh YM, Shen MR. Cutting-Edge AI Technologies Meet Precision Medicine to Improve Cancer Care. Biomolecules. 2022 Aug 17;12(8):1133. doi: 10.3390/biom12081133. PMID: 36009026; PMCID: PMC9405970.

[13] Esteva A, Kuprel B, Novoa RA, Ko J, Swetter SM, Blau HM, Thrun S. Dermatologist-level classification of skin cancer with deep neural networks. Nature. 2017 Feb 2;542(7639):115-118. doi: 10.1038/nature21056. Epub 2017 Jan 25. Erratum in: Nature. 2017 Jun 28;546(7660):686. doi: 10.1038/nature22985. PMID: 28117445; PMCID: PMC8382232.

[14] Krittanawong, C, Zhang, H, Wang, Z. et al. Artificial Intelligence in Precision Cardiovascular Medicine. JACC. 2017 May, 69 (21) 2657–2664. https://doi.org/10.1016/j.jacc.2017.03.571

[15] Daydulo, Y.D., Thamineni, B.L. & Dawud, A.A. Cardiac arrhythmia detection using deep learning approach and time frequency representation of ECG signals. *BMC Med Inform Decis Mak* **23**, 232 (2023). https://doi.org/10.1186/s12911-023-02326-w

[16] T Kisova, R Herman, H P Meyers, A Demolder, M Martonak, T Palus, A Rafajdus, A Iring, S Smith, E Barbato, Real-world insights from an AI-ECG decision support platform: AI vs. blinded HCP STEMI ECG interpretation, *European Heart Journal*, Volume 46, Issue Supplement_1, November 2025, ehaf784.1708, https://doi.org/10.1093/eurheartj/ehaf784.1708

[17] Shimada, K., R. Inokuchi, T. Ohigashi, M. Iwagami, M. Tanaka, M. Gosho, and N. Tamiya. 2024. "Artificial intelligence-assisted interventions for perioperative anesthetic management: a systematic review and meta-analysis." BMC Anesthesiology 24. https://doi.org/10.1186/s12871-024-02699-z

[18] Magalhães, M. E. A., C. V. L. d. Silva, H. M. Oliveira, A. B. R. d. Lima, M. T. S. Flores, I. F. Leite, G. A. d. Silva, et al. 2024. "The Use of Artificial Intelligence in Patient Triage in Emergency Departments: an Integrative Review." Revista de Gestão Social e Ambiental. https://doi.org/10.24857/rgsa.v18n12-052

[19] Carneiro, R. A. A. G., and L. A. G. Pereira. 2025. "Depth of Anesthesia Monitoring and Artificial Intelligence." Current Anesthesiology Reports 15. https://doi.org/10.1007/s40140-024-00655-8

[20] Biesheuvel, L., D. Dongelmans, and P. Elbers. 2024. "Artificial intelligence to advance acute and intensive care medicine." Current Opinion in Critical Care 30: 246 - 250. https://doi.org/10.1097/MCC.0000000000001150

[21] Agrawal, H., N. Gupta, H. Tanwar, and N. Panesar. 2025. "Artificial intelligence in gastrointestinal surgery: A minireview of predictive models and clinical applications." Artificial Intelligence in Gastroenterology. https://doi.org/10.35712/aig.v6.i1.108198

[22] Pantelis, A. G., P. Epiphaniou, and D. Lapatsanis. 2025. "Machine learning and artificial intelligence for predicting short and long-term complications following metabolic bariatric

surgery - a systematic review." Artificial Intelligence Surgery. https://doi.org/10.20517/ais.2024.104

[23] Leivaditis, V., A. Maniatopoulos, H. Lausberg, F. Mulita, A. Papatriantafyllou, E. Liolis, E. T. Beltsios, A. Adamou, N. Kontodimopoulos, and M. Dahm. 2025. "Artificial Intelligence in Thoracic Surgery: A Review Bridging Innovation and Clinical Practice for the Next Generation of Surgical Care." Journal of Clinical Medicine 14. https://doi.org/10.3390/jcm14082729

[24] Yahanda, A. T., K. Joseph, T. T. Bui, J. K. Greenberg, W. Z. Ray, J. I. Ogunlade, D. Hafez, N. A. Pallotta, B. J. Neuman, and C. A. Molina. 2024. "Current Applications and Future Implications of Artificial Intelligence in Spine Surgery and Research: A Narrative Review and Commentary." Global Spine Journal 15: 1445 - 1454. https://doi.org/10.1177/21925682241290752

[25] Shadid, O., I. Seth, R. Cuomo, W. Rozen, and G. Marcaccini. 2025. "Artificial Intelligence in Microsurgical Planning: A Five-Year Leap in Clinical Translation." Journal of Clinical Medicine 14. https://doi.org/10.3390/jcm14134574

[26] Ruiz, N. I., I. C. Salazar, L. X. N. Palacio, C. A. Agudelo, A. M. L. Parra, and J. C. F. Rodriguez. 2025. "Accuracy and Reliability of Artificial Intelligence in Surgical Decision-Making: A Literature Review." Cureus 17. https://doi.org/10.7759/cureus.95337

[27] Othman, D., and A. Kaleem. 2024. "The Intraoperative Role of Artificial Intelligence Within General Surgery: A Systematic Review." Cureus 16. https://doi.org/10.7759/cureus.73006

[28] Yangi, K., T. J. On, Y. Xu, A. S. Gholami, J. Hong, A. G. Reed, P. Puppalla, et al. 2025. "Artificial intelligence integration in surgery through hand and instrument tracking: a systematic literature review." Frontiers in Surgery 12. https://doi.org/10.3389/fsurg.2025.1528362

[29] Fuentes, S. M. S., L. A. F. Chávez, E. M. M. López, C. D. C. Cardona, and L. L. M. Goti. 2024. "The impact of artificial intelligence in general surgery: enhancing precision, efficiency,

and outcomes." International Journal of Research in Medical Sciences. https://doi.org/10.18203/2320-6012.ijrms20244129

[30] Osman, E. I. A., M. M. E. M. M. Ismail, M. A. H. Mukhtar, A. U. B. Ahmed, N. A. A. E. Mohamed, and A. A. A. Ibrahim. 2025. "Artificial Intelligence and Robotics in Minimally Invasive and Complex Surgical Procedures: A Systematic Review." Cureus 17. https://doi.org/10.7759/cureus.81339

[31] Kumar, S., R. Gupta, A. Bhalerao, S. Gupta, V. Tandon, and D. Govil. 2025. "Artificial Intelligence in Surgical Gastroenterology: From Predictive Models to Intraoperative Guidance." Apollo Medicine. https://doi.org/10.1177/09760016251369605

[32] Napitupulu, R. P., G. K. Ardli, M. R. Ramadhani, N. O. Dira, and A. K. Sari. 2025. "AI-Powered Innovations in Digestive Surgery: Current Evidence and Future Perspectives - A Systematic Literature." Indonesian Health Journal. https://doi.org/10.58344/ihj.v4i1.677

[33] Causio FA, DE Angelis L, Diedenhofen G, Talio A, Baglivo F; Workshop Participants. Perspectives on AI use in medicine: views of the Italian Society of Artificial Intelligence in Medicine. J Prev Med Hyg. 2024 Aug 31;65(2):E285-E289. doi: 10.15167/2421-4248/jpmh2024.65.2.3261. PMID: 39430984; PMCID: PMC11487733.