

EDITORIAL

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Cite as:

Araujo-Bachon WJ. Artificial intelligence and its use in oncology. Onkoresearch. 2025;3(1):3-5. doi: 10.69482/onkoresearch.v3i1.42

Received: 13/03/2023

Approved:

26/03/2025

Author's contributions:

WA analyzed the data and wrote the manuscript Artificial Intelligence and its use in oncology.

Financing: None

Conflicts of interest:

The author declares no conflicts of interest.

Correspondence:

William J. Araujo-Banchon Cal. Zaragoza Nro. 178 Mayorazgo ,Ate E-mail: dr.willyaraujo@gmail.com

Artificial intelligence and its use in oncology Inteligencia artificial y su uso en oncología

William J. Araujo-Banchon ^{1,a}

- ¹ Estudios Cimedical. Lima, Peru.
- ^a MD.

The Diccionario de la lengua española defines artificial intelligence (AI) as the *"scientific discipline concerned with creating computer programs that perform operations comparable to those carried out by the human mind, such as learning or logical reasoning"* ⁽¹⁾. When speaking of AI, the first image that often comes to mind is that of a robot; however, AI goes far beyond this ⁽²⁾ as we increasingly rely on technology to perform our daily activities. The (AI). By late 2022 and early 2023, the term AI had moved beyond the confines of scientific circles and entered the everyday vocabulary of the general public. The launch of the chatbot ChatGPT, developed by the company OpenAI, triggered this widespread exposure ⁽³⁾.

The application of AI in medicine dates back to the 1970s ⁽⁴⁾, but it was not until 2021 that the World Health Organization (WHO) formally recognized AI as a tool with great potential in medicine and public health ⁽⁵⁾. In the field of oncology, one of the pioneering events in the use of AI is attributed to IBM Watson for Oncology, which in 2012 used machine learning (a branch of AI) to analyze clinical information and provide personalized treatment recommendations for cancer patients ⁽⁶⁾. It is worth noting that in healthcare, the most frequently used AI processes include training machines using datasets to automate predictions in other contexts (machine learning) and employing neural networks to identify image patterns (deep learning) ⁽⁷⁾.

The use of AI in oncology is currently experiencing significant growth. A PubMed literature search using the strategy (((artificial intelligence[MeSH Terms]) OR (machine learning[MeSH Terms])) OR (deep learning[MeSH Terms])) AND cancer[MeSH Terms], revealed a continuous increase in scientific publications since 2017. Between 2017 and 2022, 13,649 articles were indexed under these MeSH terms, while between 2023 and 2024, 9,559 articles were found—representing 70% of the volume published in the previous six years. In the past two years, machine learning—based studies have focused on tumor biomarkers, prognosis research, and early cancer detection (Figure 1), while deep learning—based publications have primarily targeted early cancer detection, mammography, magnetic resonance imaging, and tumor biomarker analysis (Figure 2).

In the area of diagnostic imaging, AI applications have demonstrated diagnostic accuracy in breast cancer detection via mammography that is equal to or greater than that of human experts ⁽⁸⁾, as well as high segmentation precision in brain tumor classification via MRI ⁽⁹⁾. Additionally, AI has shown comparable accuracy to that of dermatologists in diagnosing various types of skin cancer ⁽¹⁰⁾. Notably, one study applied AI to fundus photographs for the diagnosis of diabetic retinopathy ⁽¹¹⁾, which was later recognized by Google Health as the first scientific publication in the health field to apply deep learning ⁽¹²⁾.

With regard to tumor prognosis and progression, machine learning models have been developed to predict survival in patients with ovarian cancer ⁽¹³⁾, while deep learning models applied to histological image analysis have shown promising results in predicting survival across several cancer types ⁽¹⁴⁾. The performance of these AI-based





Figure 1. MeSH terms used at least 10 times between 2023–2024 and related to Machine Learning techniques (in red) in oncology.

approaches was comparable or superior to traditional diagnostic methods ⁽¹⁴⁾. In the field of biomarker discovery, AI facilitates the processing of large-scale omics data, enabling the identification of biomarkers that optimize cancer management ⁽¹⁵⁾.

as an epidemiologist, I have had the opportunity to use AI to enhance critical appraisal of clinical trials assessing the efficacy and safety of oncology drugs. Many clinical trials do not provide enough information for the reader to support sample size calculations that meets the study's primary objective. AI-based tools, such as the academic search engine *Consensus* ⁽¹⁶⁾ and its integration into chatbots like ChatGPT ⁽¹⁷⁾, support academic discussion

In the realm of clinical decision support, AI has also proventobeavaluabletool. From a professional perspective



Figure 2. MeSH terms used at least 10 times between 2023–2024 and related to Deep Learning techniques (in purple) in oncology.



and mathematical reasoning to help assess whether the number of events used to evaluate outcomes such as overall survival or progression-free survival is sufficient to draw robust conclusions about drug efficacy. However, it is crucial to emphasize that using AI in this context requires a solid theoretical foundation to identify and disregard so-called "hallucinations" generated by natural language models. AI must be understood as a support tool, not a substitute for clinical decision-making.

Finally, it is important to highlight the current ethical and regulatory challenges associated with AI use in medical practice and research. Algorithms used to process oncological patient data must be fair and should not introduce bias against specific patient groups ⁽¹⁸⁾. Moreover, AI systems should be transparent and interpretable by medical professionals ⁽⁵⁾. In this regard, organizations such as the WHO ⁽⁵⁾, UNESCO ^(19,20) and the European Union ⁽²⁰⁾ have made efforts to develop recommendations and regulatory frameworks to ensure the safe use of AI.

Al has come a long way in the field of oncology and may offer meaningful opportunities for improving cancer care. In this sense, this editorial was developed with the support of tools such as *Consensus* ⁽¹⁶⁾ and ChatGPT ⁽¹⁷⁾ with the aim of systematizing information from multiple bibliographic sources. While it is essential not to replace scientific and professional judgment, we are now entering an era in which AI will be a routine component of health professionals' daily practice. Therefore, it is imperative to understand how these tools function and to promote their responsible use, in alignment with the scientific integrity that every healthcare professional must uphold.

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