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# GENERATIVE ARTIFICIAL INTELLIGENCE IN MEDICAL ACADEMIC WRITING: FROM TEXT PRODUCTION TO KNOWLEDGE PRODUCTION

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*Generative artificial intelligence (GenAI) is transforming not only academic writing but also the epistemic practices through which biomedical knowledge is produced, validated and communicated. In medicine, where research quality directly influences clinical decision-making, education and public health, understanding these transformations has important implications for research governance and quality of life. This study examines how artificial intelligence is conceptualised in contemporary biomedical literature, with particular attention to the relationship between text production, knowledge production and epistemic responsibility.*

*A sequential mixed-methods design combined bibliometric mapping with narrative analysis. A corpus of 322 PubMed-indexed publications (2015–2026) was analysed using VOSviewer to identify dominant conceptual structures, while representative publications from the corpus were synthesised to interpret the relationships emerging from the bibliometric network.*

*The findings reveal a stable conceptual structure centred on artificial intelligence, academic writing, authorship, research integrity and publishing. Beyond supporting scientific writing, the literature increasingly positions AI within broader research workflows, including literature synthesis, methodological support and scientific communication. At the same time, epistemic responsibility, methodological judgement and knowledge validation remain consistently attributed to human researchers, reinforcing the need for transparent governance and responsible human–AI collaboration.*

*The study argues that the principal transformation introduced by GenAI concerns the transition from AI-assisted text production to AI-assisted knowledge production. By integrating bibliometric and narrative evidence, it offers an epistemic perspective on AI that contributes to ongoing debates on higher education, biomedical research and the responsible use of artificial intelligence in ways that ultimately influence research quality and quality of life.*

***Keywords****: generative artificial intelligence; medical academic writing; knowledge production; epistemic governance; research integrity; quality of life.*

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## INTRODUCTION AND THEORETICAL FRAMEWORK

### Medical academic language as an epistemic practice

Medical academic writing can be understood as an epistemic practice through which biomedical knowledge is produced, validated, communicated and ultimately translated into clinical practice. Its defining characteristics − terminological precision, methodological transparency, standardisation and evidence-based argumentation − are not merely linguistic conventions but institutional mechanisms that confer scientific credibility and enable the accumulation of reliable knowledge. Consequently, medical academic discourse should be understood as an integral component of the biomedical knowledge-production process rather than simply as a vehicle for communicating research findings. This perspective provides the conceptual basis for examining how the integration of artificial intelligence may transform not only scientific writing but also the epistemic conditions under which medical knowledge is generated and validated.

### From text production to knowledge production

The integration of generative artificial intelligence into research represents more than the adoption of a new technological tool; it reflects a structural transformation in the organisation of academic knowledge production. Contemporary AI systems are capable not only of generating coherent scientific prose but also of supporting literature synthesis, thematic analysis, data organisation and other research activities that traditionally required human cognitive effort. As a result, AI increasingly participates in knowledge-producing processes rather than merely facilitating scientific communication.

This evolution creates a fundamental distinction between text production and knowledge production. While AI can contribute to the generation and organisation of scientific content, it cannot assume responsibility for interpretation, methodological judgement or scientific accountability. Accordingly, major publishers and research institutions consistently maintain that authorship and epistemic responsibility remain inseparable from human agency (Elsevier 2026; Nature Portfolio 2025; Springer Nature Group 2026). Rather than representing a contradiction, these editorial policies reflect an attempt to preserve the integrity of biomedical knowledge production while recognising the growing methodological role of AI.

### Human–AI collaboration, AI literacy and epistemic governance

As AI becomes increasingly integrated into knowledge-producing processes, the central challenge shifts from technological adoption to the development of appropriate epistemic capacities. Recent literature therefore emphasises the concept

of "AI literacy", understood not simply as the ability to use AI systems, but as a set of competencies enabling researchers to critically evaluate AI-generated outputs, recognise model limitations, formulate effective prompts and ensure methodological transparency (Miao and Cukurova 2024; Zhou and Fang 2025). Emerging educational frameworks, such as GenAI-TPACK, similarly argue that technological skills must be integrated with pedagogical, methodological and ethical competencies (Belkina *et al.* 2025).

At the institutional level, these individual competencies require complementary governance mechanisms. Editorial policies consistently emphasise transparency regarding AI use, the non-transferability of authorship and the continued responsibility of human researchers for interpretation and scientific judgement (Elsevier 2026; European Commission 2024). The recognised limitations of AI-detection tools (Pellegrina and Helmy 2025) further reinforce that responsible AI integration depends less on technological control than on cultivating a research culture grounded in critical reflection, methodological transparency and epistemic responsibility (Rughiniș *et al.* 2025).

## Epistemic risks and methodological implications

The integration of AI into knowledge-producing processes also introduces important epistemic risks. Because Large Language Models are trained on large-scale datasets that reflect existing social and scientific inequalities, they may reproduce biases in argumentation, reference selection and the representation of knowledge, thereby limiting epistemic diversity and reinforcing dominant perspectives (UNESCO 2023). These concerns have stimulated growing interest in concepts such as algorithmic justice, which emphasise the need for reflexive practices capable of identifying and mitigating algorithmically generated distortions (Peña-García *et al.* 2026). Furthermore, inequalities in access to AI technologies − including the digital divide and data poverty − may influence participation in knowledge production and widen existing disparities in research capacity (Miao and Holmes 2023).

Beyond these risks, AI is increasingly becoming a methodological component of scientific research. Contemporary LLMs support literature synthesis, thematic analysis and quantitative data processing, extending their influence beyond manuscript preparation to the analytical stages of research itself (Bennis and Mouwafaq 2025; Cevik and Abu-Zidan 2025; Gitman *et al.* 2025; Shor *et al.* 2026). These epistemic and methodological challenges acquire particular significance in medicine, where AI-assisted outputs may directly influence evidence synthesis, scientific communication and, ultimately, clinical decision-making. Although AI can improve the clarity and accessibility of academic writing, persistent concerns regarding hallucinations, output variability and algorithmic bias (Emsley 2023; Cohen and Moher 2025; Thomas *et al.* 2026; Sun *et al.* 2024) reinforce the need for continuous human oversight and critical evaluation.

Consequently, examining medical academic discourse through the lens of AI-assisted knowledge production provides an appropriate conceptual foundation for the bibliometric and narrative analyses presented in the following sections.

## METHODOLOGY

### Research design

This study employed an exploratory sequential mixed-methods design integrating bibliometric mapping with qualitative narrative analysis to investigate how generative artificial intelligence is conceptualised in contemporary medical academic writing. The bibliometric analysis was used to identify the dominant conceptual structure of the literature, while the subsequent narrative analysis provided an in-depth interpretation of the themes emerging from this conceptual map. This sequential design enabled the qualitative analysis to be guided by the bibliometric findings rather than conducted independently.

### Data source and search strategy

The corpus was constructed using the PubMed/MEDLINE database because of its comprehensive coverage of biomedical literature and its use of controlled MeSH vocabulary. The search was performed on 03.05.2026 using a strategy combining three conceptual domains: (1) artificial intelligence, (2) academic and medical writing, and (3) authorship, publication ethics and research integrity. The complete search query was:

> (“Artificial Intelligence”[MeSH Terms] OR “Generative AI”[Title/Abstract] OR “generative artificial intelligence”[Title/Abstract] OR “large language model*”[Title/Abstract] OR “LLM”[Title/Abstract] OR “ChatGPT”[Title/Abstract]) AND (“Writing”[MeSH Terms] OR “academic writing”[Title/Abstract] OR “scientific writing”[Title/Abstract] OR “medical writing”[Title/Abstract] OR “manuscript writing”[Title/Abstract] OR “scholarly writing”[Title/Abstract] OR “research writing”[Title/Abstract]) AND (“Authorship”[MeSH Terms] OR “Publishing”[MeSH Terms] OR “Research Integrity”[Title/Abstract] OR “academic integrity”[Title/Abstract] OR “publication ethics”[Title/Abstract] OR “scientific integrity”[Title/Abstract] OR “plagiarism”[Title/Abstract] OR “transparency”[Title/Abstract]).

The initial search retrieved 345 records. After restricting the publication period to 2015–2026 and applying predefined relevance criteria, the final corpus comprised 322 publications. Eligible records addressed AI or generative AI within academic or biomedical contexts and discussed scientific writing, publishing, authorship or research integrity. Studies focused exclusively on technical or

clinical applications without relevance to academic discourse, together with duplicate records, were excluded.

### Bibliometric and narrative analysis

Two complementary datasets were generated from the same PubMed search. A PubMed (.pub) export was used for bibliometric mapping in VOSviewer, employing keyword co-occurrence analysis (all keywords, full counting, minimum occurrence = 5), resulting in a network of 65 keywords. The bibliometric map identified the principal conceptual clusters and their semantic relationships within the corpus.

A second dataset, generated through the PubMed Summary export, contained the titles, keywords and abstracts of all retrieved publications. Rather than selecting articles independently, the qualitative corpus was derived directly from the bibliometric analysis. The central concepts emerging from each bibliometric cluster were traced within article titles, keywords and abstracts, allowing the identification of representative publications for narrative interpretation. The narrative analysis examined how AI was conceptualised across these publications with particular attention to authorship, epistemic responsibility, research integrity, education, governance and methodological transformation.

### Integration of findings and methodological limitations

The final stage integrated the bibliometric and narrative findings to examine the correspondence between the conceptual structure of the literature and its dominant discursive patterns. This sequential integration enhanced the interpretative depth of the analysis while improving methodological transparency and reproducibility. The study is limited by its reliance on a single bibliographic database, the use of titles, keywords and abstracts as the primary qualitative material, and the rapidly evolving nature of the field.

## RESULTS

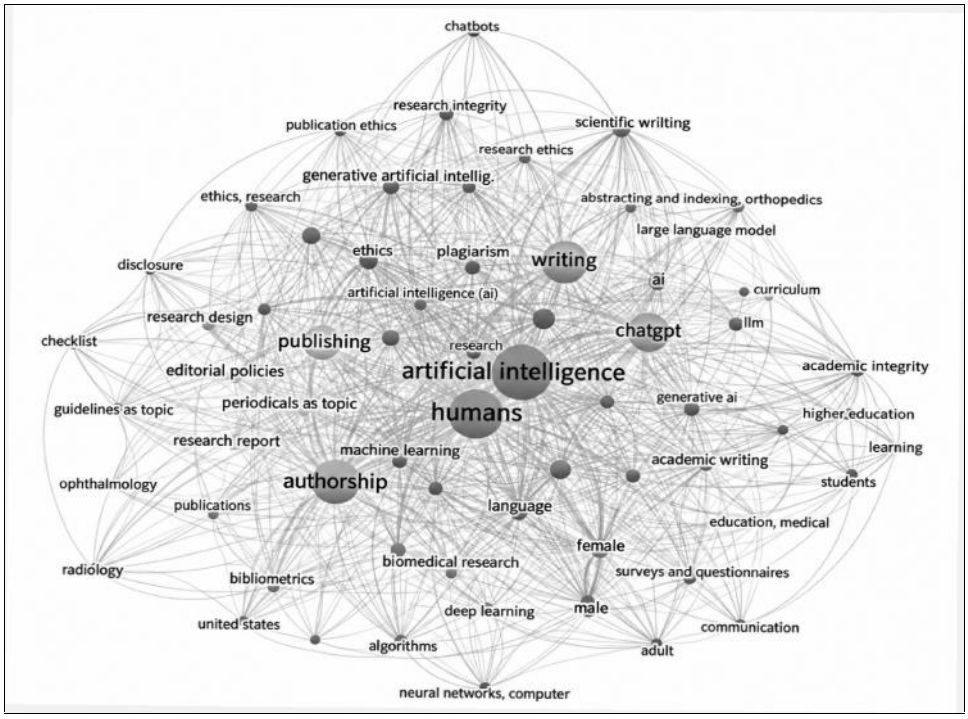
The temporal distribution of the analysed corpus further illustrates the rapid emergence of this research field. Between 2015 and 2018, only two publications per year met the inclusion criteria, followed by four publications in 2019 and eight publications annually between 2020 and 2022. A marked increase occurred from 2023 onwards, with 74 publications identified in both 2023 and 2024, 72 in 2025 and 66 publications indexed for 2026 at the time of data collection. This abrupt expansion coincides with the widespread adoption of generative AI systems in academic practice and indicates that the conceptual structures identified in this study largely reflect the contemporary phase of AI integration into biomedical research and scientific publishing.

## The conceptual architecture of AI in medical academic writing

The bibliometric analysis revealed a dense and highly interconnected conceptual network centred on the terms *"artificial intelligence"*, "humans", *"ChatGPT"*, *"writing"*, *"authorship"* and *"publishing"* (*Figure 1*). Rather than representing isolated thematic domains, these concepts form an integrated structure in which technological innovation is closely connected with scientific communication, editorial governance, education and research integrity. The prominence and central positioning of these nodes indicate that the contemporary biomedical literature conceptualises AI not primarily as a technical innovation, but as a phenomenon that reshapes the processes through which scientific knowledge is produced, validated and communicated.

*Figure 1*

**Mapping the Conceptual Landscape of AI in Academic Medical Writing: A Keyword Co-occurrence Network**




Five interconnected conceptual clusters emerged from the analysis, corresponding to (1) AI-assisted writing and education, (2) authorship and research infrastructure, (3) publishing and editorial governance, (4) research ethics and

integrity, and (5) writing, large language models and curriculum development. Rather than functioning as independent thematic areas, these clusters are linked through a small number of highly connected concepts, including *"artificial intelligence"*, *"writing"*, *"authorship"* and *"publishing"*, which act as bridges between technological, educational, methodological and ethical dimensions of the discourse.

This overall configuration suggests that current biomedical discussions extend well beyond the technical performance of generative AI. Instead, the literature increasingly frames AI as a catalyst for broader transformations affecting scientific authorship, editorial regulation, educational practices and research governance. From the perspective adopted in this study, these findings support the interpretation of medical academic writing as an epistemic practice in which the production of scientific texts cannot be separated from the production and validation of biomedical knowledge. Because these processes ultimately shape the evidence base supporting medical education, research and clinical decision-making, their transformation also has indirect implications for the quality of healthcare and, consequently, for quality of life.

*Table no. 1* summarises the most influential keywords in the co-occurrence network, together with their occurrence frequency, total link strength and cluster allocation. While *Figure 1* illustrates the overall conceptual architecture of the field, *Table no. 1* provides the quantitative characteristics of the principal nodes supporting the subsequent interpretation.

*Table no. 1*

**Principal keywords, occurrence frequency, total link strength and cluster allocation in the VOSviewer co-occurrence network**

| Keyword | Occurrences | Total Link Strength | Cluster |
|---|---|---|---|
| Humans | 221 | 758 | Red–AI, medical education and biomedical research |
| Artificial intelligence | 235 | 740 | Red–AI, medical education and biomedical research |
| Authorship | 135 | 446 | Blue–Authorship and research methodology |
| Writing | 105 | 402 | Purple–Writing, LLMs and curriculum |
| Publishing | 96 | 391 | Yellow–Publishing and editorial governance |
| ChatGPT | 57 | 201 | Red–AI, medical education and biomedical research |
| Periodicals as topic | 46 | 213 | Yellow–Publishing and editorial governance |
| Machine learning | 40 | 130 | Blue–Authorship and research methodology |

| | | | |
|---|---|---|---|
| Natural language processing | 35 | 116 | Blue–Authorship and research methodology |
| Large language models | 32 | 134 | Purple–Writing, LLMs and curriculum |
| Editorial policies | 29 | 138 | Yellow–Publishing and editorial governance |
| Plagiarism | 29 | 114 | Green–Ethics and research integrity |
| Language | 28 | 108 | Purple–Writing, LLMs and curriculum |
| Female | 27 | 104 | Red–AI, medical education and biomedical research |
| Ethics | 26 | 103 | Green–Ethics and research integrity |
| Research report | 26 | 96 | Yellow–Publishing and editorial governance |
| Generative artificial intelligence | 23 | 88 | Green–Ethics and research integrity |
| Scientific writing | 22 | 88 | Green–Ethics and research integrity |
| Peer review, research | 21 | 92 | Yellow–Publishing and editorial governance |

*Table no. 1* complements the network visualisation by providing the quantitative characteristics of the principal concepts identified in the bibliometric analysis. While *Figure 1* illustrates the overall conceptual architecture of the field, the table highlights the relative prominence and connectivity of the most influential keywords through their occurrence frequency and total link strength. Together, these indicators identify the concepts that organise the intellectual structure of the literature and provide the basis for the subsequent narrative interpretation.

The network is dominated by the terms *"artificial intelligence"* (235 occurrences; Total Link Strength = 740) and *"humans"* (221 occurrences; Total Link Strength = 758), which represent the two most strongly connected nodes in the corpus. Their comparable levels of connectivity indicate that, although AI occupies the conceptual centre of the literature, discussions remain firmly anchored in human responsibility and decision-making. This finding supports the argument developed throughout the study that the growing use of AI does not diminish the central role of human judgement in the production and validation of biomedical knowledge.

A second group of highly connected concepts comprises *"authorship"*, *"writing"* and *"publishing"*, all characterised by high occurrence frequencies and extensive links with other nodes. Rather than representing independent themes, these concepts define the institutional environment within which AI is debated, reflecting concerns related to scientific communication, responsibility and research governance. Their prominence confirms that the current literature conceptualises AI not simply as a writing technology but as a phenomenon affecting the broader ecosystem of biomedical knowledge production.

The remaining clusters further refine this conceptual structure. The green cluster links *"ethics"*, *"scientific writing"*, *"plagiarism"* and *"generative artificial*

*intelligence"*, highlighting concerns regarding research integrity and responsible AI use. The yellow cluster groups concepts related to editorial governance, including *"editorial policies"*, *"periodicals as topic"*, *"peer review"* and *"research reports"*, indicating the progressive institutionalisation of AI regulation. Finally, the blue cluster connects *"authorship"* with methodological concepts such as *"machine learning"* and *"natural language processing"*, reflecting the growing integration of AI into biomedical research workflows.

Taken together, the quantitative characteristics presented in Table 1 reinforce the interpretation of *Figure 1* by demonstrating that the contemporary biomedical literature is organised around four interconnected dimensions: AI-enabled knowledge production, research integrity, editorial governance and methodological transformation. This integrated conceptual structure provides the analytical framework for the narrative synthesis presented in the following sections.

## From AI-assisted writing to knowledge production

The bibliometric structure indicates that contemporary biomedical literature increasingly conceptualises artificial intelligence beyond its role as a writing assistant. While terms directly related to text generation, such as *"ChatGPT"*, *"writing"* and *"large language models"*, occupy central positions within the network, they are consistently interconnected with concepts including *"authorship"*, *"publishing"*, *"education"*, *"research"*, *"ethics"* and *"integrity"*. Rather than describing isolated applications of AI, this configuration suggests that scientific attention has progressively shifted towards the broader implications of AI for the organisation, validation and governance of biomedical knowledge.

This transition is particularly evident in the strong semantic connections linking technological terms with concepts associated with authorship and scientific responsibility. The close proximity of *"ChatGPT"* to nodes such as *"authorship"*, *"publishing"*, *"academic writing"* and *"research integrity"* indicates that the principal concern of the literature is no longer whether AI can generate scientific text, but how AI-assisted contributions should be integrated into established mechanisms of scientific accountability. Editorial policies, publication standards and discussions surrounding responsible AI use therefore emerge as integral components of the same conceptual network rather than as independent regulatory issues.

A complementary perspective emerges from the educational dimension of the map. The association of *"higher education"*, *"curriculum"*, *"students"*, *"learning"* and *"communication"* with the technological core of the network demonstrates that AI is increasingly framed as a catalyst for transforming academic competencies rather than merely improving writing efficiency. This finding is consistent with the growing emphasis on AI literacy, human–AI collaboration and methodological transparency identified in the theoretical framework, suggesting

that educational adaptation has become an essential component of responsible AI integration within biomedical research.

Taken together, these findings indicate that contemporary biomedical discourse increasingly distinguishes between text production and knowledge production. Although generative AI is widely recognised as capable of supporting drafting, literature synthesis and analytical tasks, the conceptual structure of the literature consistently preserves human responsibility for interpretation, methodological judgement and epistemic validation. From the perspective adopted in this study, this distinction represents one of the defining characteristics of the current transformation of medical academic writing. Because biomedical publications constitute the primary evidentiary basis for medical education, clinical guidelines and healthcare decision-making, the observed shift extends beyond scientific communication and has indirect implications for the quality of evidence that ultimately supports healthcare systems and quality of life.

## Narrative interpretation of the bibliometric structure

The narrative analysis was conducted to deepen the interpretation of the conceptual structures identified through bibliometric mapping. Rather than constituting an independent qualitative review, the analysis examined how the dominant concepts emerging from the bibliometric clusters were articulated within the titles, keywords and abstracts of the publications included in the corpus. This sequential interpretation allowed the bibliometric configuration to be contextualised within the broader discourse on medical academic writing, scientific responsibility and AI-assisted knowledge production.

## From AI-assisted writing to knowledge production

The bibliometric analysis identified *"artificial intelligence"*, *"ChatGPT"*, *"writing"*, *"academic writing"*, *"research"*, *"authorship"* and *"publishing"* as the principal concepts structuring the contemporary biomedical discourse. Their centrality suggested that the literature no longer approaches generative AI solely as a writing technology but increasingly associates it with broader questions concerning scientific knowledge production. The narrative analysis explains this conceptual configuration by examining how these dominant concepts are articulated within the representative publications selected from the corpus.

Across the analysed publications, a consistent pattern emerges in which generative AI is initially introduced as a tool for improving academic writing through language refinement, drafting assistance and literature summarisation. Cheng *et al.* (2025) propose principles for the ethical use of AI in academic writing, recognising its potential to improve research efficiency while simultaneously highlighting risks related to plagiarism, hallucinations and fabricated references. Similarly, Kacena *et al.* (2024) demonstrate that AI-assisted

preparation of review articles substantially reduces writing time but requires extensive factual verification because AI-generated manuscripts contain inaccurate references and higher similarity indices. Rather than questioning the usefulness of AI for drafting scientific texts, these studies consistently argue that linguistic efficiency cannot substitute scientific validation.

The same transition is evident in broader reviews of AI applications in medicine and education. Sallam (2023) identifies writing support, literature review, data analysis and personalised education among the principal benefits of ChatGPT while simultaneously reporting persistent concerns regarding transparency, bias, plagiarism, lack of originality and inaccurate citations. Dave *et al.* (2023) similarly describe AI as a valuable resource for medical writing and research planning but emphasise the ethical and legal challenges associated with its use. Kim (2023) extends this perspective by showing that large language models increasingly support summarisation, translation, programming and scholarly communication, while requiring continuous professional oversight to ensure scientific accuracy and originality. Collectively, these studies demonstrate that contemporary biomedical literature conceptualises AI as extending beyond manuscript preparation towards activities directly involved in organising and processing scientific knowledge.

Taken together, the narrative findings provide a qualitative explanation for the conceptual relationships observed in the bibliometric network. The close association between *"writing"*, *"research"*, *"authorship"*, *"publishing"* and *"artificial intelligence"* reflects a broader shift from AI-assisted text production towards AI-assisted knowledge production. Importantly, however, the analysed publications consistently preserve a clear distinction between these two processes. While AI is increasingly accepted as a component of scholarly workflows, epistemic responsibility − including methodological judgement, critical interpretation and accountability for scientific claims − remains firmly assigned to human researchers. This convergence between the bibliometric and narrative findings supports the central argument of the present study that the principal transformation introduced by generative AI concerns not simply how biomedical texts are written, but how biomedical knowledge is increasingly produced, validated and communicated.

## Epistemic responsibility and governance

The bibliometric analysis identified *"authorship"*, *"publishing"*, *"editorial policies"*, *"research integrity"*, *"ethics"* and *"plagiarism"* among the most strongly interconnected concepts within the network, indicating that the governance of AI-assisted scientific writing constitutes one of the principal dimensions of the contemporary biomedical discourse. The narrative analysis provides a qualitative explanation for this conceptual configuration by examining representative publications selected from the analysed corpus, which consistently

address the relationship between AI use, scientific responsibility and institutional regulation.

The first group of publications focuses on the question of authorship and epistemic responsibility. Goto and Katanoda (2023), Fulton (2023), Kleebayoon and Wiwanitkit (2023), and Teixeira da Silva (2023a) converge in arguing that generative AI cannot fulfil the intellectual accountability required of scientific authors because it lacks the capacity to assume responsibility for methodological decisions, interpretation and scientific claims. Rather than debating the technical capabilities of large language models, these publications redefine authorship as an expression of epistemic accountability that remains inseparable from human judgement. This shared position explains the strong bibliometric association between *"authorship"*, *"artificial intelligence"* and *"research integrity"*, demonstrating that the principal concern of the literature lies not in text generation itself but in preserving the credibility of scientific knowledge.

A second group of studies extends this discussion from individual responsibility towards institutional governance. Analyses of journal policies and editorial guidance by Inam *et al.* (2024), Huang *et al.* (2025), Perkins and Roe (2024), Leung *et al.* (2023) and Ahn (2024) reveal an increasing convergence across biomedical publishing regarding disclosure requirements, transparency, editorial oversight and the responsible use of generative AI. Rather than restricting technological innovation, these publications describe governance frameworks designed to integrate AI into scholarly workflows while preserving traceability, reproducibility and scientific trust. The emergence of these recommendations provides a qualitative explanation for the close bibliometric relationships linking *"publishing"*, *"editorial policies"*, *"ethics"* and *"research integrity"* within the conceptual network.

Collectively, the analysed publications demonstrate that governance has evolved from a peripheral ethical concern into a central component of AI-assisted biomedical research. The convergence between bibliometric and narrative findings indicates that contemporary biomedical literature conceptualises epistemic governance not as an external regulatory mechanism but as an integral condition for responsible knowledge production. Human accountability, methodological transparency and editorial oversight therefore emerge as complementary safeguards intended to preserve the reliability of biomedical evidence as AI becomes increasingly embedded within academic writing and research practices. Because these governance mechanisms ultimately contribute to maintaining the quality and trustworthiness of biomedical knowledge, they also have indirect implications for evidence-based clinical decision-making and, consequently, for healthcare quality and quality of life.

## AI as methodological infrastructure

The bibliometric analysis identified *"machine learning"*, *"algorithms"*, *"bibliometrics"*, *"research design"*, *"biomedical research"* and *"large language models"* as closely interconnected concepts within the network. Their association with writing, research and artificial intelligence suggests that contemporary biomedical literature increasingly conceptualises AI as extending beyond manuscript preparation towards methodological processes involved in knowledge generation. The narrative analysis explains this conceptual configuration through representative publications selected from the analysed corpus.

The first group of studies documents the expanding methodological capabilities of generative AI. Bennis and Mouwafaq (2025) and Cevik and Abu-Zidan (2025) demonstrate that large language models can support qualitative thematic analysis with levels of agreement approaching conventional human coding under clearly defined methodological conditions. Similarly, Gitman *et al.* (2025) show that ChatGPT can improve search strategies for systematic reviews through keyword generation and error detection, while Shor *et al.* (2026) describe the integration of AI into literature review workflows. Collectively, these publications indicate that AI is increasingly incorporated into analytical stages traditionally associated with human researchers rather than being confined to language generation alone.

A second group of publications expands this methodological perspective towards the broader research infrastructure. Pividori and Greene (2024) propose an AI-assisted publishing infrastructure designed to support scholarly authoring, whereas Markey et al. (2025) demonstrate the application of large language models in preparing clinical trial documentation. Kim (2023) further highlights the integration of AI into scholarly communication, programming and research support, while Matsui (2025) documents measurable changes in the vocabulary of biomedical publications following the widespread adoption of ChatGPT. Rather than describing isolated technological applications, these studies collectively portray AI as an increasingly embedded component of the organisational infrastructure supporting biomedical research.

This methodological transformation is accompanied by the development of dedicated reporting standards and quality frameworks. The CONSORT-AI and SPIRIT-AI extensions (Liu *et al.* 2020; Cruz Rivera *et al.* 2020), together with broader reporting recommendations (Ibrahim et al. 2021), establish methodological guidance for research involving artificial intelligence, emphasising transparency, reproducibility and human oversight. The emergence of these standards demonstrates that the growing methodological role of AI is being matched by efforts to preserve scientific rigour through appropriate reporting and governance mechanisms.

Taken together, these publications provide a qualitative explanation for the bibliometric prominence of methodological concepts within the analysed corpus.

The strong conceptual associations between *"machine learning"*, *"research design"*, *"bibliometrics"*, *"algorithms"* and *"artificial intelligence"* reflect a broader transition in which AI becomes integrated into the methodological infrastructure of biomedical research rather than functioning solely as a writing technology. Importantly, however, the analysed literature consistently maintains that methodological design, scientific interpretation and epistemic validation remain fundamentally human responsibilities. This convergence between bibliometric and narrative findings further supports the central argument of the present study that the most significant transformation introduced by generative AI concerns the reconfiguration of knowledge-production processes rather than the automation of scientific language alone.

## Epistemic risks and implications for medicine

The bibliometric analysis identified strong conceptual associations between *"medical education"*, *"humans"*, *"ethics"*, *"research integrity"*, *"writing"* and *"artificial intelligence"*, suggesting that discussions surrounding AI increasingly extend beyond technological performance towards their implications for biomedical research and professional practice. The narrative analysis explains this configuration through representative publications examining the reliability, detectability and responsible use of generative AI within medical research and education.

A first group of studies examines the epistemic limitations of generative AI. Emsley (2023) argues that so-called AI "hallucinations" should be understood as fabrications and falsifications rather than harmless inaccuracies, while Sun et al. (2024) propose a comprehensive taxonomy of AI-generated errors extending beyond factual hallucinations to include reasoning, logical and mathematical distortions. Complementing these findings, Thomas *et al.* (2026) demonstrate that the performance of generative AI remains highly uneven across research tasks, emphasising the need for continuous human evaluation. Collectively, these publications indicate that the principal challenge lies not in occasional technical errors but in the variable reliability of AI-generated scientific information.

A second body of literature addresses the authenticity and detectability of AI-generated scientific content. Studies conducted across different medical specialties consistently show that researchers, reviewers and AI-detection systems frequently struggle to distinguish AI-generated texts from human writing (Else 2023; Silva *et al.* 2024; Doru *et al.* 2025; Al-Rawas *et al.* 2026; Fine *et al.* 2025; DeFoor and Sheean 2025). Together with analyses of plagiarism, paraphrasing and paper-mill practices (Caprioglio and Paglia 2023; Hassanipour *et al.* 2024; McGrath and Ahmed 2024; Quaia 2025), these findings demonstrate that maintaining scientific integrity increasingly depends on transparent reporting and critical human oversight rather than on AI-detection technologies alone.

The analysed publications further demonstrate that these challenges extend directly into medical education and specialty-specific research. Reviews from anaesthesiology, oncology, orthopaedics and other biomedical disciplines (Lee and Choi 2023; Sarma *et al.* 2024; Hakam *et al.* 2024; Lawrence *et al.* 2024) consistently recognise the educational and scientific benefits of AI while emphasising the necessity of preserving critical appraisal skills, methodological competence and professional judgement. Rather than portraying AI as replacing human expertise, these studies conceptualise it as a technology whose value depends on the quality of human supervision and its responsible integration into academic and clinical practice.

Taken together, these representative publications provide a qualitative explanation for the close bibliometric relationships linking ethics, medical education, research integrity and artificial intelligence. The convergence between the bibliometric and narrative findings indicates that contemporary biomedical literature increasingly conceptualises AI-related risks as epistemic challenges requiring new forms of methodological competence, institutional governance and critical scientific literacy. From the perspective adopted in this study, safeguarding the quality of biomedical knowledge represents the principal mechanism through which AI-assisted research may ultimately contribute to improving healthcare quality and, consequently, quality of life.

## DISCUSSION

### Beyond AI-assisted writing: from text production to knowledge production

Taken together, the bibliometric and narrative findings suggest that the most significant transformation introduced by generative artificial intelligence concerns not the automation of academic writing itself but the gradual reconfiguration of biomedical knowledge production. Although public and academic debates frequently focus on AI as a tool for drafting manuscripts, the analysed literature consistently positions large language models within broader research workflows that include literature synthesis, thematic analysis, methodological support, scientific communication and editorial processes. From this perspective, writing represents only the visible component of a more profound transformation affecting the production, organisation and validation of scientific knowledge.

The preparation of the present manuscript also involved the use of AI-assisted translation and language editing tools under continuous human supervision. Rather than contradicting the arguments developed throughout the study, this experience illustrates the distinction proposed between AI-assisted text production and human responsibility for knowledge production. All conceptual

development, methodological decisions, interpretation of findings and final scientific responsibility remained entirely under the control of the authors.

This distinction between text production and knowledge production provides a useful theoretical lens for interpreting the observed conceptual structure. The bibliometric prominence of concepts such as research, machine learning, bibliometrics, authorship, editorial policies and research integrity, together with the narrative evidence, indicates that contemporary biomedical literature increasingly conceptualises AI as participating in epistemic practices rather than merely linguistic ones. The analysed publications consistently distinguish between the generation of scientific text and the intellectual processes through which evidence is evaluated, interpreted and transformed into validated knowledge.

These findings extend previous discussions that have primarily examined AI from the perspective of writing assistance or publication ethics. Instead, the present study suggests that generative AI should be understood as contributing to a broader transformation of the biomedical research ecosystem. The central question therefore shifts from whether AI can write scientific texts to how its integration reshapes the practices through which biomedical knowledge is produced, evaluated and communicated.

## From authorship to epistemic governance

One of the most significant findings of this study is that contemporary debates surrounding AI authorship represent only the visible expression of a broader transformation affecting the governance of biomedical knowledge. While the earliest discussions focused primarily on whether generative AI could legitimately be recognised as an author, both the bibliometric structure and the narrative evidence indicate that the debate has progressively shifted towards questions of epistemic responsibility, transparency and institutional accountability. The issue is therefore no longer whether AI produces scientific text, but how responsibility for the knowledge embedded in that text should be distributed and governed.

This shift reflects a broader redefinition of academic responsibility in the context of human–AI collaboration. The representative publications analysed in this study consistently reject the possibility of attributing authorship to AI systems, not because of technological limitations alone, but because authorship in biomedical research embodies accountability for methodological choices, interpretation of evidence and the scientific validity of conclusions. In this perspective, authorship functions less as a formal publishing criterion than as an institutional mechanism through which the scientific community safeguards the credibility of biomedical knowledge. The growing emphasis on disclosure, transparency and editorial oversight therefore illustrates an evolution from regulating AI-generated texts towards governing AI-assisted knowledge production.

Our findings further suggest that this emerging model of epistemic governance extends beyond editorial practice. As generative AI becomes integrated into literature reviews, data interpretation, methodological support and scientific communication, governance increasingly encompasses the entire research workflow rather than the final manuscript alone. This explains the close conceptual association observed between authorship, editorial policies, research integrity and methodological guidance within the bibliometric network. Rather than representing separate themes, these concepts constitute complementary dimensions of a common institutional response aimed at preserving scientific trust while accommodating technological innovation.

From this perspective, the governance of AI should not be understood primarily as a restrictive framework designed to limit technological use. Instead, the analysed literature suggests that governance functions as an enabling mechanism that allows AI to be incorporated responsibly into biomedical research while maintaining human accountability for scientific judgement. The central challenge is therefore not replacing human expertise but redefining the institutional conditions under which human and artificial intelligence can collaborate without compromising the integrity, reliability and societal value of biomedical knowledge.

## AI as an epistemic infrastructure for biomedical research and education

The findings suggest that the growing integration of generative AI into biomedical research extends beyond individual research tasks and contributes to the emergence of a new epistemic infrastructure for knowledge production. Rather than functioning as an isolated writing assistant, AI increasingly supports literature retrieval, evidence synthesis, qualitative coding, methodological planning, scientific communication and editorial workflows. This evolution indicates that AI is becoming embedded within the organisational architecture through which biomedical knowledge is generated, evaluated and disseminated.

Such a transformation has important implications for academic competence. Traditionally, scientific writing has been regarded as the final stage of the research process, reflecting knowledge that has already been produced through human reasoning and methodological inquiry. The analysed literature suggests a different configuration, in which AI participates throughout multiple stages of the research workflow. Consequently, the competence required of researchers shifts from the exclusive production of scientific text towards the critical supervision of AI-assisted knowledge production. Skills such as prompt design, evidence appraisal, methodological judgement and critical interpretation become increasingly central, complementing rather than replacing traditional scientific expertise.

This transition also reshapes higher education. The growing emphasis on AI literacy identified across the analysed publications reflects a broader educational

transformation in which universities are expected not only to teach the technical use of AI but also to cultivate the epistemic competences necessary for its responsible application. In this context, AI literacy should be understood as extending beyond operational proficiency to include the capacity to recognise model limitations, evaluate the reliability of generated content, identify algorithmic bias and preserve scientific integrity throughout the research process. Human–AI collaboration therefore becomes an educational objective in itself, requiring pedagogical approaches that strengthen critical reasoning rather than encouraging cognitive dependence on automated systems.

The findings further indicate that this transformation is accompanied by the progressive institutionalisation of methodological standards specifically designed for AI-assisted research. Reporting guidelines, editorial recommendations and emerging methodological frameworks demonstrate that the expansion of AI within biomedical research is occurring alongside the development of mechanisms intended to preserve transparency, reproducibility and scientific quality. Rather than slowing innovation, these frameworks facilitate the responsible integration of AI into research workflows by aligning technological capabilities with established principles of scientific rigour.

Taken together, these observations suggest that generative AI is reshaping not only how biomedical research is conducted but also what it means to be a competent researcher in the age of artificial intelligence. The central challenge is therefore educational as much as technological. Future researchers will require the ability to collaborate critically with AI systems while retaining responsibility for methodological decisions, scientific interpretation and the validation of knowledge. From this perspective, AI functions not merely as a technological innovation but as an emerging epistemic infrastructure that is redefining both research practice and academic training within biomedicine.

## Implications for higher education, biomedical research and quality of life

The findings of this study suggest that the integration of generative AI into academic writing should be understood within the broader transformation of higher education and biomedical research rather than as an isolated technological innovation. Because universities occupy a central position in the production, validation and dissemination of scientific knowledge, the ways in which AI is incorporated into academic practice inevitably influence not only research quality but also the capacity of higher education institutions to fulfil their social mission. The challenge therefore extends beyond adopting new digital tools towards redefining the institutional conditions under which trustworthy knowledge is produced and communicated.

Within biomedical research, these transformations have particular significance because scientific publications constitute the primary evidence base for clinical decision-making, healthcare policy and professional education. The reliability of AI-assisted research therefore affects much more than scientific communication; it influences the quality of evidence available to clinicians, educators and policymakers. From this perspective, maintaining methodological rigour, transparency and critical human oversight is not simply an academic requirement but a prerequisite for preserving the integrity of evidence-based medicine.

The educational implications are equally substantial. The transition towards AI-assisted knowledge production requires universities to move beyond teaching the operational use of artificial intelligence and towards cultivating epistemic competence, critical reasoning and responsible human–AI collaboration. Educational policies that emphasise AI literacy without simultaneously strengthening methodological judgement and scientific integrity risk producing graduates who are technically proficient but insufficiently prepared to evaluate the reliability and limitations of AI-generated knowledge. Consequently, the future role of higher education lies not only in facilitating technological adoption but also in preserving the intellectual capacities that enable scientific innovation to remain socially responsible.

Taken together, these findings suggest that the societal impact of generative AI depends less on the technology itself than on the institutional frameworks governing its use. When integrated through transparent governance, methodological rigour and critical education, AI has the potential to improve the efficiency, accessibility and dissemination of biomedical knowledge. Conversely, inadequate governance may amplify misinformation, methodological weaknesses and epistemic inequalities. The relationship between AI and quality of life is therefore indirect but fundamental: it is mediated through the quality of the scientific knowledge that informs healthcare, education and public decision-making. Understanding AI as a transformation of epistemic practices rather than merely a technological innovation provides a more comprehensive framework for guiding its responsible integration into higher education and biomedical research.

Ultimately, the quality of AI-assisted biomedical publications influences not only researchers but also clinicians, educators and policymakers who rely on scientific evidence when making decisions, often without direct knowledge of the technological processes involved in manuscript preparation.

## CONCLUSIONS

This study demonstrates that the integration of generative artificial intelligence into medical academic writing should be understood not simply as a technological innovation but as a transformation of the epistemic practices through

which biomedical knowledge is produced, validated and communicated. By combining bibliometric mapping with narrative analysis, the study shows that contemporary biomedical literature increasingly conceptualises AI beyond text generation, positioning it within broader research, educational and institutional processes.

The principal theoretical contribution of the study lies in distinguishing between AI-assisted text production and AI-assisted knowledge production. The findings suggest that the most significant changes introduced by generative AI occur not at the linguistic level alone but within the methodological, organisational and epistemic structures that support biomedical research. This perspective shifts the discussion from the capabilities of AI systems towards the institutional conditions required to preserve scientific integrity, transparency and human responsibility.

Methodologically, the study illustrates the value of integrating bibliometric mapping with narrative synthesis within a sequential mixed-methods design. Rather than treating quantitative and qualitative analyses as independent approaches, the narrative interpretation was explicitly grounded in the conceptual structures identified through bibliometric analysis. This strategy provides a transparent and reproducible framework for investigating rapidly evolving interdisciplinary fields characterised by complex conceptual development.

The findings also have important implications for higher education, biomedical research and healthcare. As AI becomes progressively embedded within research workflows, universities are required to cultivate not only AI literacy but also the epistemic competences necessary for responsible human–AI collaboration. Maintaining methodological rigour, critical judgement and transparent governance becomes essential for preserving the quality of scientific evidence that ultimately informs clinical practice, public health policies and medical education. In this way, the relationship between AI and quality of life is mediated through the quality, accessibility and trustworthiness of biomedical knowledge.

Ultimately, the future of generative AI in medicine will depend less on technological progress than on the capacity of academic institutions to integrate these tools within robust epistemic, educational and governance frameworks. The central challenge is therefore not whether AI should participate in biomedical knowledge production, but how this participation can remain aligned with scientific responsibility, human judgement and the social mission of universities. Understanding AI as a transformation of epistemic practice rather than merely a writing technology provides a broader conceptual framework for guiding its responsible integration into biomedical research, higher education and, ultimately, the improvement of quality of life.

### *AI Use Statement*

The initial version of this manuscript was translated from Romanian into English using the DeepL platform. DeepL is an AI-based language platform that relies on neural machine translation, using artificial neural networks trained on large multilingual corpora to generate context-aware and fluent translations. Its architecture enables the interpretation of entire sentences rather than word-by-word substitution, improving coherence and semantic accuracy in the translated text. Following editorial feedback indicating that the manuscript exceeded the journal's word limits, the text was reduced by approximately 30% through a section-by-section revision process supported by ChatGPT. The tool was used exclusively to assist in condensing the text while preserving the original meaning, structure and argumentative coherence. Subsequently, the revised manuscript was carefully checked against the initial version to ensure fidelity to the original content and arguments. All bibliographic references were verified and added manually by the author using Mendeley, in accordance with the cited sources and their corresponding ideas. The author retains full responsibility for the content, interpretation and integrity of the manuscript.

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*Inteligența artificială generativă (GenAI) transformă nu doar scrierea academică, ci și practicile epistemice prin care cunoașterea biomedicală este produsă, validată și comunicată. În medicină, unde calitatea cercetării influențează direct decizia clinică, educația și sănătatea publică, înțelegerea acestor transformări are implicații importante pentru guvernanța cercetării și calitatea vieții. Studiul examinează modul în care inteligența artificială este conceptualizată în literatura biomedicală contemporană, cu accent asupra relației dintre producerea textului, producerea cunoașterii și responsabilitatea epistemică. Un design secvențial cu metode mixte a combinat cartografierea bibliometrică cu analiza narativă. Un corpus de 322 de publicații indexate în PubMed (2015–2026) a fost analizat cu VOSviewer pentru identificarea structurilor conceptuale dominante, iar publicații reprezentative din corpus au fost sintetizate pentru interpretarea relațiilor evidențiate de rețeaua bibliometrică. Rezultatele indică o structură conceptuală stabilă, centrată pe inteligența artificială, scrierea academică, autorat, integritatea cercetării și publicare. Dincolo de sprijinirea redactării științifice, literatura situează tot mai frecvent IA în fluxuri de cercetare mai ample, incluzând sinteza literaturii, suportul metodologic și comunicarea științifică. În același timp, responsabilitatea epistemică, judecata metodologică și validarea cunoașterii rămân atribuite cercetătorilor umani, ceea ce susține necesitatea unei guvernanțe transparente și a unei colaborări responsabile om–IA. Studiul argumentează că transformarea principală introdusă de GenAI privește trecerea de la producerea textului asistată de IA la producerea cunoașterii asistată de IA. Prin integrarea dovezilor bibliometrice și narative, studiul propune o perspectivă epistemică asupra IA, relevantă pentru dezbaterile privind învățământul superior, cercetarea biomedicală și utilizarea responsabilă a inteligenței artificiale, cu efecte asupra calității cercetării și calității vieții.*

***Cuvinte-cheie:*** *inteligență artificială generativă; scriere academică medicală; producerea cunoașterii; guvernanță epistemică; integritatea cercetării; calitatea vieții.*

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