

Artificial Intelligence Across the Academic Research Workflow: A Review

Dr. Uma Pandalai, MD, PhD

Managing Editor, Research Signpost LLC, United Arab Emirates. ORCID: [0009-0000-3433-9801](https://orcid.org/0009-0000-3433-9801)

*Corresponding Author: Dr. Uma Pandalai, MD, PhD

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Citation: Dr. Uma Pandalai, MD, PhD. (2026). Artificial intelligence across the academic research workflow: A review. UKR Journal of Medicine and Medical Research, 2(5), 63-70.	<i>Artificial intelligence (AI) has rapidly evolved from specialised computational technology into an increasingly accessible component of academic and biomedical research. Contemporary AI systems, including machine-learning applications, generative artificial intelligence and large language models, can support multiple stages of the research lifecycle, from identifying research questions and discovering literature to data analysis, manuscript preparation, peer review and scholarly dissemination. These capabilities offer potential gains in efficiency, accessibility, productivity and communication, but also introduce substantial concerns related to accuracy, hallucination, bias, privacy, intellectual property, reproducibility, research integrity and accountability. This review examines the expanding role of AI across the academic research workflow, with particular attention to health and biomedical research. AI applications are considered according to major stages of research, including research conception, literature discovery, study design, data management, analysis, manuscript preparation, reference management, peer review and dissemination. Evidence indicates that AI can augment repetitive and language-intensive tasks, but performance remains variable and human verification is essential. Recent evaluations have demonstrated limitations in AI-generated references, literature retrieval and interpretation, while emerging guidance from international organisations and editorial bodies emphasises transparency, human oversight, confidentiality and responsible governance. The appropriate role of AI is therefore better conceptualised as research augmentation rather than replacement of scholarly judgement. Responsible integration requires AI literacy, verification procedures, transparent disclosure, protection of confidential information and clearly defined human accountability. Future research should establish validated frameworks for evaluating AI-assisted research quality, reproducibility, equity and ethical performance.</i> Keywords: Artificial Intelligence, Generative Artificial Intelligence, Biomedical Research, Research, Scholarly Communication.

Introduction

Artificial intelligence (AI) is increasingly embedded in scientific and academic environments. Although AI has been used in research for decades through statistical learning, pattern recognition, natural-language processing and computational modelling, the widespread availability of generative artificial intelligence (GenAI) and large language models (LLMs) has substantially expanded its accessibility. Tools capable of generating and transforming text, code, images, summaries and other forms of content can now be accessed by researchers without advanced programming expertise. This has created opportunities to

integrate AI into routine academic activities as well as technically complex research workflows.¹⁻⁴

The emergence of publicly accessible LLMs has particularly affected scholarly communication. AI systems can assist with drafting, editing, summarising, translating and organising scientific material.^{5,6} However, the apparent fluency of generated text does not guarantee factual accuracy. Studies evaluating LLM-generated scientific references have identified substantial hallucination and retrieval problems, demonstrating that

plausible language can coexist with incorrect or fabricated information.^{^7}

AI's influence extends beyond manuscript writing. Research-focused applications can assist with literature discovery, title and abstract screening, data extraction, coding, statistical workflows, image analysis, visualisation and research dissemination.^{^8–11} Large-scale analyses indicate that AI use and potential benefits are becoming widespread across scientific disciplines, although the distribution of expertise and infrastructure remains uneven.^{^12}

The expansion of AI throughout research also raises questions about scientific judgement. If AI systems increasingly perform tasks previously regarded as intellectually demanding, researchers may become vulnerable to automation bias, cognitive offloading or an “illusion of understanding” in which efficient generation of outputs is mistaken for genuine understanding of the underlying evidence.^{^13} The challenge is therefore not simply whether AI can perform a particular research task, but how its use changes the quality, transparency, reproducibility and accountability of the research process.

This review examines AI across the academic research workflow, focusing on health and biomedical research. It considers potential applications, benefits, limitations and ethical risks and proposes a human-centred framework for responsible AI-assisted research.

Artificial Intelligence in the Research Workflow

The academic research process can be conceptualised as a sequence of interconnected stages rather than a single activity. AI can potentially contribute at nearly every stage.

Research Conception and Question Development

The initial research stage involves identifying knowledge gaps, refining research questions, developing hypotheses and determining the relevance of a proposed topic. LLMs can support brainstorming by generating alternative formulations of research questions, identifying possible concepts and suggesting terminology for literature searches.^{^5,14}

Such assistance can be particularly useful during early exploration of unfamiliar research areas. AI can help researchers identify related concepts or disciplines that might otherwise be overlooked. However, AI-generated suggestions are not equivalent to evidence of a knowledge gap. A model may reproduce frequently discussed topics while overlooking less visible literature, emerging findings or contradictory evidence. Researchers should therefore use AI for ideation while independently establishing the novelty, feasibility and scientific importance of the proposed research question.

Literature Discovery and Evidence Retrieval

Literature discovery is one of the most promising areas for AI integration. Traditional bibliographic databases rely heavily on keyword-based searching, whereas AI-assisted

systems can use semantic relationships to identify conceptually related publications. Citation-network analysis and recommendation systems can help researchers navigate large bodies of literature.

AI has also been investigated for automated screening of titles and abstracts in systematic reviews. Evidence suggests that machine-learning approaches can reduce screening workload, although performance varies according to the desired balance between recall and precision.^{^15,16}

Generative LLMs can summarise papers and explain concepts in accessible language. Nevertheless, they should not replace bibliographic databases as the authoritative source for evidence retrieval. A 2024 evaluation of LLM-generated references found very low precision and recall for systematic-review retrieval tasks and substantial hallucination rates, reinforcing the need to verify every citation independently.^{^7}

Thus, AI-assisted literature discovery should be regarded as a complementary layer above established databases rather than as a substitute for systematic searching.

Study Design and Protocol Development

AI may assist researchers in selecting methodological approaches, drafting protocols, identifying potential variables and developing data-collection instruments. For researchers entering unfamiliar methodological areas, conversational systems can function as interactive educational tools.

However, methodological recommendations require particular caution. AI systems can produce apparently coherent but inappropriate methodological suggestions because they do not necessarily understand the contextual constraints of a specific research project. The final choice of design, population, outcome measures, analytical strategy and eligibility criteria should remain a human scholarly decision supported by appropriate methodological literature.

Data Collection and Management

AI-based systems can support transcription, classification, document processing, extraction of structured information and organisation of large datasets. Natural-language processing can help researchers handle substantial volumes of unstructured text.

In biomedical research, AI can also assist with image interpretation and computational analysis. Such applications may extend beyond administrative automation into genuine scientific discovery. AI-based methods have become increasingly accessible to researchers in fields such

as cancer research and biomedical imaging, where they can identify patterns within complex datasets.^{^17}

The use of AI with research data nevertheless introduces privacy and governance considerations. Confidential clinical information, unpublished datasets, proprietary information and identifiable participant data should not be entered into external AI systems unless appropriate safeguards, contractual arrangements and institutional policies are in place.

Data Analysis and Coding

AI-assisted programming has become increasingly common. LLMs can generate code, explain programming errors, translate between programming languages and suggest statistical procedures. This may reduce barriers for researchers who require computational support but do not have extensive programming experience.

AI can also facilitate exploratory analysis and visualisation. However, generated code can contain logical or statistical errors. A program that executes successfully is not necessarily analytically correct. Researchers must therefore inspect generated code, verify assumptions and reproduce results independently.

The distinction between computational correctness and scientific validity is important. AI may correctly execute an inappropriate analysis if the researcher provides an incorrect instruction. Human statistical reasoning remains essential.

Manuscript Preparation

Scientific writing is currently one of the most visible applications of GenAI. AI systems can help organise material, improve grammar, simplify complex sentences, translate text and generate preliminary drafts.^{^5,6,18}

For researchers working in a second language, language-editing assistance may improve accessibility and reduce linguistic barriers. AI can also help researchers convert technical findings into summaries for different audiences.

However, AI-generated text may contain factual errors, unsupported claims or fabricated citations. It may also obscure the distinction between the researcher's interpretation and automatically generated language. Scientific prose should therefore be treated as a representation of evidence, not simply as a linguistic product.

The researcher remains responsible for the accuracy and originality of the manuscript. Current ICMJE recommendations explicitly state that humans remain responsible for reviewing AI-assisted content, appropriate citation and avoidance of plagiarism.^{^19}

Reference Management and Citation Support

AI-assisted reference tools can help identify related literature, recommend citations and organise references. These functions can reduce administrative workload.

The principal limitation is reliability. LLMs may generate references that appear authentic but do not exist or contain incorrect bibliographic details.^{^7,20} Therefore, references generated or suggested by AI should be verified against authoritative databases such as PubMed, Scopus, Web of Science, Embase or the publisher's original record.

AI should assist with reference discovery and organisation, but bibliographic verification should remain a human-controlled step.

Peer Review and Editorial Processes

AI has potential applications in manuscript triage, language checking, plagiarism detection, statistical screening and reviewer assistance. AI could potentially reduce some administrative burdens associated with scholarly publishing.

However, peer review involves confidential information and professional judgement. Uploading a manuscript to an external AI service may create confidentiality risks if the service's data practices do not adequately protect unpublished material.^{^19,21}

There are also concerns about bias. Automated systems could reproduce biases present in their training data or create new forms of algorithmic filtering. Human editorial oversight is therefore essential.

Scholarly Dissemination

AI can facilitate the transformation of scientific findings into graphical abstracts, plain-language summaries, presentations, educational material and social-media content. These applications may help researchers communicate findings to non-specialist audiences.

The principal risk is oversimplification or distortion. A complex scientific finding can lose important qualifications when transformed into short-form content. AI-assisted dissemination should therefore preserve uncertainty, limitations and context.

Potential Benefits of AI-Assisted Research

AI's potential value can be considered across several dimensions.

Efficiency and Productivity

AI can automate repetitive activities such as document classification, transcription, language editing and preliminary screening. Large-scale analyses indicate that AI use is already widespread across scientific research and that potential benefits have expanded alongside adoption.^{^12}

Accessibility

AI can reduce linguistic and technical barriers. Translation, language editing, code assistance and explanatory functions may allow researchers to interact more easily with unfamiliar methodological or linguistic domains.

Literature Navigation

AI-supported semantic search and recommendation can help researchers navigate large evidence bases. This is particularly relevant in rapidly expanding biomedical fields.

Computational Assistance

AI-assisted coding can lower the technical barrier to data analysis, although generated code still requires expert validation.

Scientific Communication

AI can help researchers adapt findings for multiple audiences without requiring every communication product to be created independently.

These benefits should be interpreted as potential efficiencies rather than evidence that AI necessarily improves scientific validity. Productivity gains are valuable only when they do not compromise research quality.

Risks and Limitations

Hallucination and Factual Inaccuracy

One of the most important limitations of generative AI is the production of plausible but incorrect information. In scientific research, this can lead to fabricated references, incorrect methodological claims or inaccurate interpretation of findings.^{^7,20}

Bias

AI systems may reproduce biases present in their training data. Bias can influence literature discovery, summarisation, classification and interpretation. Unequal access to computational infrastructure may also create geographic and institutional disparities in AI-enabled research.^{^22}

Automation Bias and Cognitive Offloading

Researchers may accept AI-generated outputs because they are fluent, confident or convenient. This can reduce active verification and critical reasoning. The risk is not simply that AI makes mistakes, but that researchers may become less likely to notice them.^{^13}

Privacy and Confidentiality

Research data may contain sensitive participant information, unpublished findings, intellectual property or commercially valuable information. Uploading such data to third-party AI

systems can create risks involving data retention, secondary use and unauthorised disclosure.^{^23}

Reproducibility

AI outputs can vary according to model version, system configuration, prompts and surrounding context. This creates challenges for reproducibility when AI has materially influenced a research process.

Researchers should therefore document substantive AI use, including the tool, version where available, purpose and relevant methodological details.

Intellectual Property and Copyright

AI-generated content raises questions about copyright, ownership and the provenance of training material. Researchers remain responsible for ensuring that generated content does not improperly reproduce copyrighted material or misappropriate another author's work.^{^19}

Research Integrity

Undisclosed AI use, fabricated references, inappropriate paraphrasing and uncritical acceptance of generated content may undermine research integrity.

AI should therefore not be considered a shortcut around scholarly responsibility.

Ethical and Governance Considerations

Responsible AI-assisted research requires governance across the entire workflow.

WHO's current guidance on AI-related health research emphasises that AI-enabled research can introduce novel ethical challenges and that oversight should address issues including fairness, data governance, human rights, inequity and accountability.^{^24} WHO's earlier guidance similarly places ethics and human rights at the centre of AI development and use in health.^{^25}

UNESCO's guidance on GenAI in education and research advocates a human-centred approach, highlighting privacy, equity, human agency and institutional preparedness.^{^26}

Within scholarly publishing, ICMJE recommends that AI systems should not be listed as authors because they cannot assume responsibility for the work. Authors remain accountable for the accuracy, integrity and originality of submitted material.^{^19} WAME similarly recommends transparency regarding AI use and stresses responsibility for accuracy, originality, confidentiality and data security.^{^21}

These principles suggest several practical requirements:

1. **Human accountability:** A named researcher must remain responsible for scientific claims.
2. **Verification:** AI-generated information should be independently checked.

3. **Transparency:** Substantive AI assistance should be disclosed according to journal policy.
4. **Confidentiality:** Sensitive research material should not be entered into systems without appropriate safeguards.
5. **Citation integrity:** AI-generated references must be independently verified.
6. **Bias assessment:** Researchers should consider whether AI assistance could systematically distort evidence discovery or interpretation.
7. **Documentation:** Important AI-assisted procedures should be recorded sufficiently to support transparency and reproducibility.

A Human-in-the-Loop Framework for AI-Assisted Research

A useful framework is to conceptualise AI as an **augmentation layer** within the research workflow rather than as an autonomous researcher.

Researcher-defined objective

↓

AI-assisted task

↓

AI-generated output

↓

Human verification

↓

Evidence validation

↓

Scientific interpretation

↓

Human research decision

This framework places the researcher at both the beginning and end of every substantive AI-assisted process.

The distinction is important because AI can produce an output without possessing scientific responsibility for that output. A researcher must determine whether the output is accurate, relevant, ethical and appropriate for the research question.

Table 1. Artificial Intelligence Across the Academic Research Workflow

Research stage	Potential AI applications	Potential benefits	Principal risks
Research conception	Brainstorming, question refinement	Idea generation	Bias, superficiality
Literature discovery	Semantic search, citation recommendation	Faster navigation	Retrieval bias, omissions
Screening	Automated prioritisation	Reduced workload	False exclusions
Data extraction	Text extraction, classification	Efficiency	Extraction errors
Data analysis	Coding, statistical assistance	Computational support	Incorrect analysis
Manuscript preparation	Drafting, editing, translation	Language support	Hallucination, plagiarism
References	Citation discovery	Organisation	Fabricated citations
Peer review	Screening, reviewer assistance	Administrative efficiency	Confidentiality, bias
Dissemination	Summaries, graphical content	Wider communication	Oversimplification

Implications for Researchers

AI literacy should become an important component of contemporary research training. Researchers do not necessarily need to become AI developers, but they should understand the capabilities and limitations of the tools they use.

Training should include:

- understanding how generative AI differs from conventional databases;
- recognising hallucinated information;
- verifying references;
- protecting confidential information;
- evaluating bias;
- documenting AI use;
- understanding journal disclosure requirements;
- critically evaluating AI-generated analyses and code.

Institutions should complement individual responsibility with clear policies. Policies should distinguish low-risk language editing from high-risk activities involving confidential data, research interpretation or automated decision-making.

The rapid evolution of AI makes rigid lists of permitted and prohibited tools difficult to maintain. Functional principles are likely to remain more durable than tool-specific rules.

Implications for Health and Biomedical Research

AI-assisted research has particular relevance to medicine and public health because biomedical research frequently involves sensitive data, complex methodological decisions and potential downstream effects on patient care.

The benefits of AI may include accelerated literature synthesis, computational analysis, data processing and dissemination. At the same time, errors can have consequences beyond publication quality. Incorrect evidence summaries may influence clinical research priorities, inaccurate statistical code may alter study conclusions and inappropriate handling of patient information may compromise privacy.

WHO's 2026 guidance specifically identifies AI-related health research as an area requiring strengthened ethics review and oversight, including attention to fairness, inequity, data governance, accountability and research capacity.²⁴

Accordingly, health researchers should apply a higher level of caution when AI is used in activities involving patient data, clinical interpretation or decisions that may influence health policy or practice.

Future Directions

Future research should move beyond descriptive discussions of AI and evaluate its real-world effects on research quality.

Several priorities emerge.

First, studies should compare AI-assisted and conventional workflows using measurable outcomes such as accuracy, reproducibility, time, cost and error rates.

Second, evaluation should distinguish different AI functions. An AI system used for grammar correction presents a substantially different risk profile from one used to identify eligible studies, generate statistical code or interpret biomedical findings.

Third, researchers should investigate long-term effects on scientific reasoning and expertise. Productivity improvements may not necessarily translate into improved knowledge if increased output is accompanied by reduced critical engagement.

Fourth, AI evaluation should include equity. The concentration of AI expertise and infrastructure in particular countries and institutions may influence who benefits from AI-enabled research.²²

Finally, research institutions and journals should develop interoperable approaches to AI disclosure and documentation. Researchers need clear expectations regarding when and how AI use should be reported.

Limitations of This Review

This article is a narrative review rather than a systematic or scoping review. It therefore does not claim to provide an exhaustive or quantitatively synthesised account of all literature concerning AI in academic research. The rapidly evolving nature of AI also means that individual tools, capabilities and policies may change after publication. The review focuses primarily on health and biomedical research and may not capture developments unique to other academic disciplines.

Conclusion

Artificial intelligence is becoming increasingly integrated into academic research, extending from research conception and literature discovery to data analysis, manuscript preparation, peer review and dissemination. Its potential benefits include increased efficiency, accessibility, computational assistance and improved communication. However, these benefits are accompanied by substantial risks involving hallucination, bias, privacy, confidentiality, reproducibility, intellectual property and research integrity.

The appropriate role of AI in academic research should therefore be understood as **augmentation rather than replacement**. AI can assist researchers with tasks, but scientific responsibility, interpretation, verification and accountability must remain human responsibilities. A responsible research ecosystem requires AI literacy, transparent disclosure, independent verification, appropriate data governance and institutional oversight.

As AI capabilities continue to develop, the central question should not simply be whether AI can perform a research task. The more important question is whether its use improves the reliability, transparency, equity and integrity of scientific knowledge. Human-centred governance and rigorous verification will remain essential to ensuring that increasing computational capability translates into trustworthy research.

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