

Artificial intelligence use in scientific journals

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Artificial Intelligence Chatbots – sound like something from a science-fiction movie, you know the one; cyborg assassin is sent back to 1984 from the year 2029 by militant self-aware computers to kill the revolutionary leader's mother before he is born and can save humans from extinction. I will not speculate as to whether this scenario is prophetic or merely entertainment, but recent developments in Artificial Intelligence (AI) technology have generated a global storm of debate, excitement and concern from all sectors, including scientific writing and its publication.

Artificial (adj.) – made or produced by human beings rather than occurring naturally.

Intelligence (n.) – the ability to acquire and apply knowledge and skills. From Latin; *intelligere*, 'understand' from *inter* 'between' and *legere* 'choose'

Artificial intelligence (AI) – the theory and development of computer systems to perform tasks requiring human intelligence such as visual perception, speech recognition, language translation and decision-making.

AI tools collect and store information using progressive learning algorithms to continuously adapt and acquire skills. Since mathematician Alan Turing explored the possibilities of using machines to solve problems in 1950 (1) and computer scientist Professor John McCarthy coined the term in 1956, examples of the application of AI in science, technology, engineering, and mathematics (STEM) disciplines are commonplace. AI technology is applied in healthcare (2), from tumour imaging and diagnosis (e.g.; PathAI), surgical robotics and treatment recommendations to administrative tasks such as patient care, telehealth, patient engagement and instruction. Creative expression is not immune to the lure of AI technology either, highly detailed, unique graphics can be generated to create art. Most recently the Sony World Photography Award was refused by the winning entry's artist, Boris Eldagsen in his wish generate discussion about the future of photography (3).

AI tools called 'Chatbots' are the shiny new tech on the block. This software uses artificial intelligence and natural language processing (NLP) to simulate spoken and written conversations with human users and are continuously learning using algorithms. The technology is widely available in navigation and mapping applications (Google Maps), virtual assistants (Apple's Siri, Amazon's Alexa), online customer services and writing and language tools (Grammarly Inc and openAI ChatGPT).

ChatGPT (Generative Pre-trained Transformer) is the most widely publicised of the AI language models and available free to users since 2022. Developed by openAI and partnered with Microsoft, this technology can write software code, construct blogs, business plans, speeches and essays, poetry and song lyrics in seconds. It does not access a database of facts but provides responses based upon patterns of information seen in the training data and its learnings from digital data sources, including Wikipedia, news articles and journals, PubMed, books and web texts. Until very recently ChatGPT only had limited information on world events up until 2021, however the new versions have updated its browsing capabilities substantially. ChatGPT presents its answers as "facts", even though these data sources also contain misinformation, fabrications, deep fakes and opinions (4). However, Sallam (5) concluded that ChatGPT could in fact be a reliable source of information to challenge Covid-19 vaccine conspiracies but would not go so far as to its use as an alternative to traditional sources of information like that of the World Health Organisation (WHO). So based on its ability to continuously learn and gather data ChatGPT could, with some 'governance' counteract the misinformation pandemic.

In addition to questions on the validity of its source data, there are concerns over ethics, law, privacy and security, human rights abuses and cybercrime, even the vulnerability of attack on ChatGPT itself. Whilst ChatGPT cites security measures such as encryption, secure data handling practices and privacy policies for the software, by its very nature is not confidential. There is no human oversight to its decisions and has the potential for Orwellian-level mass surveillance. It logs every conversation and any personal or sensitive information data entered in its search function and uses it as training data to improve its AI language models. OpenAI even states (6) that it cannot delete specific prompts from your history, ever.

Many sectors including educational institutions are banning or implementing restrictions on their use or developing guidance for use and its safety in an environment of digital online learning, where cultural, gender, racial and socioeconomic biases and inequities already exist. It is argued that these tools encourage plagiarism and cheating and risk the fundamentals of the learning process itself (7), that of the skills humans develop to acquire and assimilate information, form opinions, discuss and apply learnings and problem-solve.

ChatGPT is a tempting and seductive tool in scientific writing, offering to assist researchers and scientists write articles, summarise information from literature searches, construct introductory background and discussions, provide language translation, reference material and create reader-friendly text. But what does this mean for authorship? Is the work created by the author or by AI? What amount of critical thinking and evidential arguments were considered? Did the authors ask the right questions of the AI? And were these questions posed in unconsciously biased way? Concerns voiced by scientific authors, editors and publishers include; copyright, bias, plagiarism, lack of originality, inaccurate content, image manipulation, erroneous or outdated data and incorrect citation. The argued benefits include; enhanced research equity, cost and time saving, improved literacy and translation (8) making AI an attractive option in a 'publish or perish' academic environment.

I am reassured by these levels of discussions taking place and there are numerous published discussions and experimental examples to found (9) on the use of ChatGPT in scientific literature. On a search of the terms; 'ChatGPT and 'scientific publications' in PubMed, I retrieved 53 articles published so far in 2023, including 15 editorials, and in range of disciplines.

Salvagno (10) surmised that authors must ensure any output from AI models be reviewed by experts in the field to ensure accuracy and credibility of the content before any decision-making or application in patient care (for example). Further emphasis that AI cannot generate new ideas, but only organise, compare and discuss ideas from other available sources, resulted in an erratum released shortly after the publication of this paper, removing ChatGPT as a co-author. Publisher; Springer Nature changed its authorship policies to exclude language models as a co-author, citing that ChatGPT did not satisfy authorship criteria to be accountable and responsible for the work published. This follows on from advisory groups, publishing companies and other scientific journals releasing principles, guidelines and position statements on the use of AI tools in research publications.

The New Zealand Journal of Medical Laboratory Science adheres to the Committee on Publication Ethics (COPE) (11) and the World Association of Medical Editors (WAME) (12) recommendations and is currently putting together our own policy. At time of print, the main policy points are summarised in Figure 1.

1. Chat GPT and other AI language models cannot be named as a credited author - they cannot take responsibility for submitted work, nor are they a legal entity and therefore cannot assert presence of absence of any conflict of interest, copyright or licence agreements.
2. If use is allowed, then its use must be stated in the Methods and Materials section of the Abstract and the paper, together with full technical specifications (version and release date, source and manufacturer details) – writing, production of images, graphical content, collection of data must be disclosed and how the AI tool was used and where in the content of the manuscript.
3. Authors are responsible for all work performed by the AI language model including; accuracy, absence of plagiarism and verified sources of information.
4. The Journal strongly advises against the use of AI language models for generating references. AI Language models are not to be used as sources of trusted information, reference citations must be thoroughly checked for accuracy, researched and reviewed by all authors contributing to the work as experts in their respective fields.
5. The Journal will seek access to the appropriate tools for the detection of content generated or altered by AI.

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Figure 1. Summary of NZ J Med Lab Sci main policy points

Publishers need to be proactive or they may always be playing catch up and damage control against the tech-savvy or less ethical user. Software development giants are amongst experts calling for caution and even halts to AI training and development until clear guidelines and safety measures can be put in place. An open letter from the Future of Life Institute and signed by key figures in Artificial intelligence, issued a warning of potential risks to society and humanity. Introducing and ratifying any regulation is difficult and moving into law is at glacial speed. Not only does it require full engagement by developers, the evolving nature of language AI itself must be clearly defined, understood and quantified. Regulation also relies on the ability to audit and the practicalities of policing any introduced requirements.

Scientific writers and researchers must in the meantime, continue to engage in constructive discussions with peers. Users, experts and software developers, organisations and governments must carefully consider the implications and take responsibility in the development of clear, sensible and adaptable guidelines for AI use. We must behave transparently, and ethically with humanity at the centre of any decision-making. There will be no; “I’ll be back” from AI, it is here to stay.