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Artificial intelligence in obstetrics and gynecology practice, research and scientific writing

Inteligencia artificial en la práctica de la ginecobstetricia, la investigación y redacción científica

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Artificial intelligence in medicine

Artificial intelligence (AI) has revolutionized the world, including the scientific world and the practice of gynecology and obstetrics, its research and publication.

Human learning is based on exposure to repeated positive or negative situations. Similar stimuli coupled with prior knowledge and experience guide decision making, with logical and hierarchical thinking that, transcribed into AI algorithms, machines can interpret and execute much faster[1]. In 1936, Alan Turing introduced the concept of algorithm, laying the foundation of computer science[2]. In 1950, he proposed the Turing test of human-machine verbal communication to evaluate the ability of machines to impersonate humans.

IBM (International Business Machines Corporation) points out that AI in medicine uses machine learning models to search for medical information data and find knowledge that helps to improve health outcomes and patient experience. It is already an integral part of medical care in the analysis of images obtained by devices with AI mechanisms because, when faced with a patient, it helps the physician in the processing of the diagnosis and management with treatments, medications and/or referral to other specialties[3]. A study has evaluated the new GPT-4 AI in the diagnosis of complex medical cases and compared the percentage of correct diagnoses with that of medical journal readers. GPT-4 correctly diagnosed 57% of cases and outperformed 99.98% of human readers who correctly diagnosed 36% of online responses. However, the authors suggest that, prior to clinical application, improvements need to be incorporated, validated, and ethical considerations must be evaluated[4].

A survey of 1,081 physicians by the American Medical Association (AMA) found that 65% of them are enthusiastic about artificial intelligence and its role in healthcare, especially in reducing administrative burdens (documentation, prior authorization, patient messaging, history summaries, predicting demand and needs) and supporting diagnosis and workflow. But they are concerned about the impact on the patient-physician relationship, patient and data privacy, their liability for AI errors and malpractice insurance coverage. Thirty-five percent of physicians surveyed indicated that clinical evidence was the most useful resource[5].

Artificial intelligence in gynecology

In gynecology, AI algorithms help to perform anamnesis and clinical examinations according to the patient's complaints and suggest and improve the interpretation of ultrasound images, mammograms, Papanicolaou tests, magnetic resonance imaging, guiding the early detection of inflammatory and infectious gynecological diseases, cervical, breast or ovarian cancer, and providing personalized recommendations and advice, the drugs to use and the severity and prognosis of the clinical process. At any time of the day or night, it provides us with the probability of quickly and efficiently obtaining worldwide, regional, national and local literature on medical and/or surgical management of the condition and preventive measures for such disease and its associated morbidities. It helps to monitor vital signs in emergency or intensive care and allows to organize the continuity of diagnosis or management through hospital shifts with on-call teams.

It is important to keep in mind that AI has not yet surpassed the human mind, and the medical management of a patient will always be in accordance with the evidence -which usually comes from other latitudes where there are resources for research- and the professional experience of the physician in the specialty. But it can help to reduce misjudgments, medical errors, the costs generated, and is an advantage in the doctor-patient/family relationship.

The utility of AI in gynecology extends to fertility management -selection of oocytes, sperm, and embryos to optimize pregnancy rates with assisted fertilization[6,7]-, family planning, the use of telemedicine in cases of limited medical access and accelerating research in obstetrics and gynecology by identifying patterns, risk factors, and therapeutic approaches. And at the current stage of genes and proteins, the complexity of molecular biology can be reduced with the use of AI in understanding many diseases such as gynecologic cancer and the limited outcomes in its management[8].

In gynecologic surgery, AI can provide surgeons with detailed information about the patient's anatomy before interventions and plan surgical procedures by considering preoperative data, medical images, and electronic medical records to adopt the best route and approach for surgery. It will allow to improve clinical decisions, precision, surgical time - in particular in laparoscopic and robotic surgeries -, being able to predict outcomes and personalize patient recovery and rehabilitation. The da Vinci Xi® system, the latest version of the da Vinci®35 surgical robotic system, enables 3D vision with up to 10x magnification and eliminates physiological tremor, providing a clearer image, a more precise, convenient and remote operation in interventions of benign and malignant pathologies in gynecology[9].

Artificial intelligence in obstetrics

The application of AI in obstetrics is still limited. The main advantages seem to be better overall diagnostic performance and reduction of procedure time and inter- and intraoperative variability. There is a lack of evidence-based guidelines or guidance to enhance the strength of artificial systems and decrease their limitations. The diagnostic performance of ultrasound fetal biometry is generally dependent on operator experience. AI in prenatal ultrasound would reduce diagnostic errors or misinterpretations in noninvasive screening for fetal aneuploidies and malformations and facilitate assessment of the fetal brain, facial structures, fetal heart rate monitoring, and pulmonary maturity[10]. Algorithms will be very important in the prediction of complications such as late onset preeclampsia, preterm labor and preterm birth, short cervical length, gestational diabetes, placenta accreta spectrum, mode of labor, delivery[11,12], and to determine who might have postpartum hemorrhage.

The cesarean section epidemic is not stabilizing. In June 2021, WHO published that the percentage of cesarean sections continued to increase worldwide, then representing 1 in 5 (21%) of deliveries. It is estimated that by 2030 the percentage would reach 29%, nearly one-third of all deliveries. WHO pointed out that cesarean section is an essential life-saving procedure, but it puts women and babies at risk for short- and long-term health problems[13]. A non-systematic review found that the highest cesarean section rates were found in Latin America and the Caribbean (42.2%), with a rate in Brazil of 40%-45% in the public sector and 80%-95% in the private sector[14]. In Peru, according to the ENDES Survey between 2017 and 2022 the percentage of cesar-

ean sections increased from 34.2% to 36.6%[15]. Knowing the immediate and long-term complications of cesarean section in the mother and newborn, AI could help us to establish personalized needs and limitations before this surgical intervention is accomplished and thus converse with the mother and family members of the convenience and personalized limitations of performing such surgery.

Artificial intelligence in fetal medicine and surgery

A complete understanding of fetal physiology and the establishment of accurate predictive monitoring before and during delivery has yet to be achieved[16]. AI can analyze ultrasound images, MRI, and other imaging tests to identify abnormalities and problems in the fetus. Likewise, it can detect in amniotic fluid samples possible genetic problems or fetal malformations, and with these genetic and clinical data personalize treatments according to the conditions or diseases detected in the fetus, to give accurate and relevant information to parents quickly and efficiently about genetic or other risks.

With respect to surgeons specialized in fetal surgery, AI will help to plan interventions in greater detail according to the anatomy and conditions of the fetus and the maternal uterus before the intervention, allowing to reduce risks and better inform the family. Currently, the fetoscope has to deal with the low quality of its images due to the liquid and 'dirty' environment inside the uterus and placenta, as well as the thin diameter of the fetoscope optics and the low amount of ambient light. The AI algorithm calculates the relative position of the fetoscope tip with respect to the placenta by registering the local vascular structure and locally guides the robot over the placental surface with sufficient accuracy. Surgeon-controlled robots can perform more precise movements than human hands and avoid potential complications[17].

Artificial intelligence in medical education and writing

Examples of AI in medical writing are the Siri or Google voice processors or the chatbot ChatGPT program from OpenAI®, which communicates by written interactions and produces simple texts in response to questions and learns quickly from previously produced requests and answers[18]. The GPT (generative pre-training transformer) is a model for processing large amounts of text data that attempts to understand language modeling and the relationship between words to produce clearer answers. ChatGPT has an advantage over its predecessors by incorporating comments according to the specifics of the user and the rating or feedback that the person gives to these answers. But it cannot generate some kind of intellectual reasoning or mental model and does not identify the original source of the information. The Google Bard chatbot produces texts with references but does not verify whether the source is primary or secondary, which must be complemented by the person.

ChatGPT is a tool for researchers when writing a scientific article. Thus, Altmäe et al. with the help of the program obtained the text of each section of a scientific article in 15 minutes. However, they conclude that the respective supervision by the authors is required, since some statements generated were not necessarily true[19]. As a consequence, aspects such as ethics, integrity, data accuracy, reliability and intellectual property rights are still under debate between those who consider it a useful tool and those who consider it a threat to the integrity of authorship[20].

Can AI generate a fraudulent scientific article? To answer this inevitable question, Májovský et al. conducted a study using ChatGPT to generate a spurious article with fabricated data from the field of neurosurgery. Thus, the AI created a fallacious article in its various sections, with approximately two thousand words and seventeen bibliographic references that was convincing and resembled a genuine article with regard to term usage and sentence structure. Reviewed by experts familiar with the study, they rated the article as highly competent, innovative, and of adequate statistical methods. However, they stated that, although the fraudulent article appeared correct, expert readers can identify inaccuracies and semantic errors after careful evaluation, which raises the difficulty of detection without such expertise[21].

It is inevitable that AI will influence scientific writing, and it is a challenge that editors must face, since its easy accessibility and operability will influence articles destined for scientific publication. Thus, software for detecting texts writ-

ten by AI is being promoted and will surely be improved over time, such as Originality.ai, GLTR, AI Text Classifier, Writer, Crossplag, Content at scale and Copyleaks. Also, for researchers, there are software that paraphrase AI-derived content, such as RewriteGuru, QuillBot, Plagiarism-checker, and Spinbot[22,23].

These tools can help authors of scientific articles minimize risk in authorship contribution, scientific integrity, and plagiarism, and will enable editors to detect the percentage of AI-produced content. It is essential that editors of scientific journals state in their guidelines how to properly use these tools and clearly express the approach that should be given as a complement to the scientific writing done by authors, as high impact indexed journals already do.

Regarding the AI authorship controversy, why do journals such as Nature and Science state that AI chatbots cannot author articles published in their journals? According to Ju Yoen Lee of Hanyang University School of Law, Seoul, Korea, it is not just that AI is not human, but that current AI does not meet the condition of content responsibility. This implies that advanced AI, in the future, might indeed meet the criteria for authorship. Thus, the emphasis would be that the authorship constraint deals with current AI. To the question Does AI not have the ability to give consent to disseminate its content and therefore cannot be considered an author? Lee believes that this is a copyright perspective. But, from a perspective of research ethics, if AI generates content with significant contributions, it would be reasonable to consider its authorship[24].

A PubMed search of AI contributions in obstetrics and gynecology journals found 579 citations and 66 publications covering all subdomains of obstetrics and gynecology: obstetrics (41%), gynecology (3%), assisted reproductive medicine (33%), early pregnancy (2%), and fetal medicine (21%). Both machine learning (39/66) and knowledge-based (25/66) methods were represented. Machine learning used imaging, numerical and clinical datasets. It was observed that there is a trend of increasing publications related to AI in obstetrics and gynecology in the last two decades. Most of these publications (82%) remained outside the scope of the usual obstetrics and gynecology journals, reporting preliminary work in AI, but without clinical validation[25].

Artificial intelligence and ethics

The WHO wrote in June 2021[26] that expectations were high that AI would improve medicine and health care delivery worldwide, provided that ethics and human rights were central to its conception, deployment, and use. It said that countries with better economies could improve health and drug research, the speed and accuracy of disease diagnosis, the development of health needs, and support public health surveillance and interventions. And in resource-poor countries, it could facilitate access to health services, particularly for rural communities. But, it highlighted potential ethical issues on health and safety in the person, possible biases of algorithms and risks to cybersecurity and the environment. Therefore, vigilance with existing laws and new laws and policies that consider ethical concerns and human rights with new AI technology was of importance.

For more than a decade, Nature's 10 has highlighted in December the influence of 10 people in the world of science. In 2023 it has included for the first time a non-person, the ChatGPT, in recognition of this AI designed to mimic human language in the development and progress of science[27]. This robot answers questions and carries on a conversation, assists in writing academic papers, summarizes scientific articles, and prepares papers as an aid to research. The editors of Nature point out the need for transparency in the handling of this powerful tool. They point out that the complexity of large language models makes it difficult to understand why they produce what they produce. The generative artificial intelligence revolution is unstoppable[28].

In reference to the above and in accordance with the International Committee of Medical Journal Editors (ICJME), the RPGO will request from the first issue of 2024 that authors declare whether AI has been used in the preparation of the article submitted for publication. GPTs and ChatGPT will not be included as authors or co-authors - since they do not assume responsibility for their contents and cannot affirm the presence or absence of conflicts of interest -, nor will they be cited in the bibliographic references. And we will continue to look for similarity in the articles to be published, due to the possibility of plagiarism, sometimes inadvertent and/or solvable with paraphrasing.

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