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EDITORIAL

Endocrinology and big data

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In recent years artificial intelligence (AI) and big data have been revolutionising biomedical research and even changing the way we understand health and disease. AI is a set of techniques and algorithms that allow machines to *learn* and perform tasks based on prior knowledge without the need for explicit programming.[1,2] These techniques can be adapted and improved as more data is received, which makes them particularly useful in today's age of big data.[2] This term refers to the enormous amount of digital information that is generated in today's world by various sources.[3] In fact, in the field of medicine, what is known as medical big data[3] has emerged as a consequence of the large amount of information that is generated through medical actions on patients.

One of the main advantages of big data and AI in the field of biomedical research is that they offer new methodologies that help researchers to process and analyse vast amounts of data more efficiently and accurately than with traditional methods.[4] AI can be applied to find unidentified correlations and reveal clinically relevant information that is hidden within the large volume of health data.[5] Furthermore, big data and methodologies in the AI spectrum will make it possible to explore the existing heterogeneity between medical specialties, blurring the boundaries between them.[2] Big data and AI can also help to accurately predict the course of diseases and the impact of treatments by developing predictive algorithms that can be useful for clinical decision making.[5]

However, there are some drawbacks associated with big data and AI. One drawback is the possible lack of transparency in the decision-making process of the algorithms, which limits their usefulness in the healthcare setting by generating mistrust in professionals and patients who do not understand how certain conclusions were reached.[5] Improving the explainability of models can lead to better outcomes in patient care.[5] In addition, the quality of the data used to train the models and model selection bias limits their potential, preventing them from being extrapolated.[6]

Furthermore, privacy and data security are important concerns as personal health information is one of the most private and legally protected forms of data.[7] Access to and use of the data by organisations must guarantee the protection of the information and discourage its alternative use. A strict legal framework is currently in place that must adapt to the rapid evolution of these AI systems.[7]

Despite the potential drawbacks, AI use in clinical practice and in research is becoming more and more common.[8] AI has the potential to accelerate the research process for different objectives: determining predictive factors of morbidity or mortality, determining the efficacy and safety of drugs based on the automated collection of variables, or weighing up the potential of surgery.[8]

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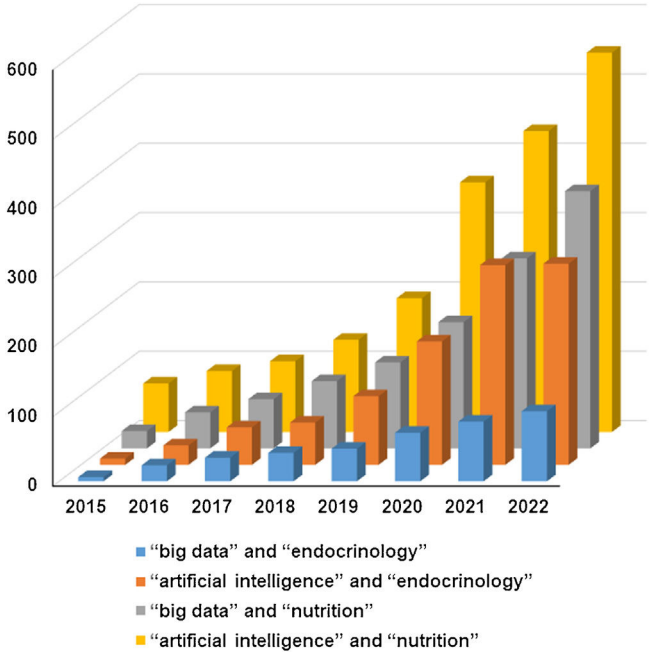

Figure 1 Number of documents found in the MEDLINE database with PubMed® from 2015 to 2022 on big data and artificial intelligence related to endocrinology and nutrition.

The endocrinology and nutrition specialty is no stranger to the use of big data and AI in both clinical practice and in research. An advanced search in the MEDLINE database with PubMed® combining the terms ëndocrinology AND nutritionẅith ärtificial intelligence AND big dataÿields a striking number of documents and, more importantly, notable growth in the number of annual publications in recent years (Fig. 1). Many of these studies have addressed the identification of patterns and relationships in large amounts of clinical data, the identification of images to increase diagnostic accuracy, the prediction of endocrine diseases, the search for predictive patterns in the evolution of the disease, risk estimation and personalisation of medical treatment.[9] Techniques have been used to explore interactions between different factors, such as genetics, lifestyle and the environment, and their impact on nutrition and health.

In Spain, the results of some studies carried out using AI techniques have been reported. Worthy of special mention are studies in the journal of the Sociedad Española de Endocrinología y Nutrición [Spanish Society of Endocrinology and Nutrition] (SEEN) that have used natural language processing (NLP) techniques on aspects of nutrition,[10] thyroid cancer[11] and hypothyroidism.[12] The use of new big data techniques and, specifically, NLP, allows researchers to evaluate vast amounts of information simply and quickly, as well as to read, process and organise the free text from electronic medical records and convert it into structured data. Data obtained in this way can include diagnostic, therapeutic or clinical course information from millions of patients in a verifiable and unbiased way, so unexpected relationships can be found and conclusions derived from real clinical practice can be drawn. However, it should be borne in mind that the reliability of the data obtained in this way depends on the sufficient quality of the information in the records with regard to the collection of relevant information and clinical judgements, as well as correct coding of the diagnoses.

It is very likely that big data and AI techniques and methods will be increasingly applied in our specialty. Predicting how far we could go in this field is a task that remains out of reach today. However, we could make an approximation using the methods offered by AI itself. Using a well-known free access program (https://chat.openai.com/chat), we asked the AI itself to describe what its future applications in the field of endocrinology might be. A summary of its response includes four aspects: a) diagnosis - AI could help endocrinologists diagnose hormonal diseases and predict their clinical course; b) health screening - monitoring of patients with hormonal disorders, identifying any changes in their hormone levels and alerting doctors when necessary; c) personalisation of treatment - developing personalised treatments taking the medical history, genetics and lifestyle of patients into account; and d) data analysis - processing large amounts of medical data, identifying patterns and trends that may be useful for prognostic assessments and developing new treatments. Finally, the same program offers us these applications for AI with the potential to change human nutrition in the future: a) personalised diet recommendations - AI can analyse personal data including medical history, eating habits and personal preferences to recommend a personalised diet tailored to individual needs; b) diagnosis of nutritional disorders by evaluating a patient's health and nutrition information; c) improvement of food quality and food safety, through the real-time control of food production and distribution; and d) optimisation of agricultural production, through cost reduction and improving efficiency by controlling climatic conditions and the use of advanced cultivation technologies.

To summarise, specialists in endocrinology and nutrition should be aware that new technologies are not only going to provide us with better therapeutic tools and more efficient diagnostic procedures, but they are also going to change our daily clinical practice and offer us the opportunity to make better decisions and improve our professional performance. The data from recent years indisputably demonstrate that big data and AI are emerging technologies with the potential to revolutionise many aspects of medical science and clinical practice, including gaining a better understanding of hormonal and nutritional disorders, as well as major improvements in patient assessment and optimisation of applied treatments, which also has undeniably important implications for society and healthcare.

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Conflicts of interest

JJD declares that he has no conflicts of interest in relation to this article. MB is an employee of Savana and declares that she has no additional conflicts of interest.

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