



Article

Challenges of using artificial intelligence in health diagnoses: an integrative review

Desafios do uso da inteligência artificial nos diagnósticos de saúde: uma revisão integrativa

Desafíos del uso de la inteligencia artificial en diagnósticos de salud: una revisión integradora

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Abstract

Objective: To understand the role of AI in modern healthcare diagnostics and define boundaries for its application. **Methodology:** Integrative literature review. Studies were searched in the LILACS, MEDLINE, and SCIELO databases, selecting scientific articles without temporal or language restrictions. **Results:** Artificial intelligence impacts medicine at three levels: it optimizes image interpretation for physicians, enhances workflow by reducing potential errors for healthcare systems, and empowers patients to process their own data to promote health. However, attention is required regarding the generated data, as it may trigger cascading errors and expose sensitive information of healthcare system users. **Conclusion:** Assigning AI, the responsibility of choices and functions performed by humans is inherently dangerous, despite its undeniable contribution to diagnostic processes. Robust research is suggested to fully understand the impact of this new technological era provided by AI in healthcare.

Keywords: Artificial Intelligence; Healthcare System; Diagnostic Procedures.

Resumo

Objetivo: compreender a participação da IA nos diagnósticos da saúde moderna e definir limites para sua aplicação. **Metodologia:** Revisão integrativa da literatura. A busca dos estudos se deu nas bases de dados LILACS, MEDLINE e SCIELO e foram selecionados artigos científicos, sem recorte

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temporal e de idioma. **Resultados:** A inteligência artificial impacta a medicina em três níveis: otimiza a interpretação de imagens para os médicos, aprimora o fluxo de trabalho reduzindo potenciais erros para os sistemas de saúde e capacita os pacientes a processarem seus próprios dados para promover a saúde. Contudo, é necessária atenção aos dados gerados, pois podem desencadear erros em cascata e expor informações sensíveis dos usuários do sistema de saúde. **Conclusão:** Atribuir à IA a responsabilidade de escolhas e funções desempenhadas por humanos é intrinsecamente perigoso, apesar de sua contribuição inegável nos processos diagnósticos. Sugere-se a realização de pesquisas robustas para compreender plenamente o impacto dessa nova era tecnológica proporcionada pela IA na área da saúde.

Palavras-chave: Inteligência Artificial; Sistema de Saúde; Procedimentos Diagnósticos.

Resumen

Objetivo: Comprender la participación de la IA en los diagnósticos de la salud moderna y definir límites para su aplicación. **Metodología:** Revisión integrativa de la literatura. Los estudios se buscaron en las bases de datos LILACS, MEDLINE y SCIELO, seleccionando artículos científicos sin restricciones temporales ni lingüísticas. **Resultados:** La inteligencia artificial impacta la medicina en tres niveles: optimiza la interpretación de imágenes para los médicos, mejora el flujo de trabajo al reducir errores potenciales para los sistemas de salud y capacita a los pacientes para procesar sus propios datos y promover la salud. Sin embargo, se requiere atención respecto a los datos generados, ya que pueden desencadenar errores en cascada y exponer información sensible de los usuarios del sistema de salud. **Conclusión:** Asignar a la IA la responsabilidad de decisiones y funciones realizadas por humanos es intrínsecamente peligroso, apesar de su contribución innegable a los procesos de diagnóstico. Se sugiere realizar investigaciones sólidas para comprender completamente el impacto de esta nueva era tecnológica proporcionada por la IA en la salud.

Palabras clave: Inteligencia Artificial; Sistema de Salud; Procedimientos Diagnósticos.

Introduction

The Encyclopedia of Conscientiology conceptualizes Artificial Intelligence (AI) as a subfield of computer science dedicated to researching and proposing computational devices capable of simulating certain aspects of the human intellect, such as the capacity for reasoning, perception, decision-making and problem-solving. AI involves various stages or skills, such as identifying patterns and images, understanding open and spoken writing, following decision-making algorithms proposed by experts, being able not only to process data, but to integrate "reasoning", to improve itself by solving problems and carrying out activities⁽¹⁾.

The genesis of the concept of AI comes from Alan Turing, in 1950, when he proposed a test (now called TT in his honor) that compared the performance of a computer and a person in solving a problem, demonstrating how the machine in question could reveal itself to have great potential⁽²⁾. The term Artificial Intelligence was coined at a conference at Dartmouth College in 1956 by McCarthy⁽³⁾ and collaborators, and its application in health began with Shortlife's article in 1963⁽⁴⁾.

In the field of medicine, AI stands out for its analytical capacity to deal with large volumes of data, following algorithms designed by experts, and offers quick solutions to various medical challenges⁽⁵⁾. It is important to understand that, for decades, efforts have been directed towards the development of computerized systems for medical diagnosis, as exemplified by Bleish who, approximately 50 years ago, proposed a system capable of clarifying actions to restore a patient's hydroelectrolytic balance based on data analysis⁽⁶⁾.

Currently, there are at least four main areas where AI is being implemented in healthcare: a) computer-aided detection; b) computer-aided diagnosis; c) quantitative analysis tools and d) clinical decision support; all of which have the potential to drastically change current radiological practice⁽⁷⁾. This shows that the application of Artificial Intelligence in healthcare is not a mere utopia, but a reality that has come a long way in a short space of time, compared to other hospital technologies used by humanity.

Faced with the growing need for quick and efficient responses in the ultra-fast age, contemporary society is still trying to adapt and evolve with these new technological dependencies, since the use of AI is also subject to risks in terms of information accuracy. In the health area, it is also susceptible to biased errors, such as hiding important details of the patient's medical diagnosis, requiring manual checking to avoid disrupting the patient's health-disease process⁽⁸⁾.

In this context, it is necessary to reflect on whether Artificial Intelligence is in fact promoting consistent advances in modern health diagnostics and to what extent there should be caution about its free use. To this end, it is important to carry out studies that make it possible to understand the appropriate and cautious use of this technology, allowing secure knowledge to avoid misuse of available data and interference in the right to comprehensive health of users of medical services.

Against this backdrop, this study aims to identify in the available literature how AI participates in modern health diagnostics and to what extent its use should be limited;

Method

This is an integrative literature review on the use of AI in modern health diagnostics. The research was carried out in six stages: 1) formulation of the guiding question; 2) definition of the search descriptors; 3) definition of the inclusion and exclusion criteria; 4) literature search; 5) critical analysis of the selected studies; 6) presentation and discussion of the results obtained⁽⁹⁾. The review was conducted based on the question: "how does Artificial Intelligence participate in modern health diagnostics and to what extent should its use be limited?". The literature search took place from January 2023 to March 2023, on the Virtual Health Library (VHL) portal and on the LILACS, MEDLINE and SCIELO databases. The descriptors were selected from the Health Sciences Descriptors (DeCS) and Medical Subject Headings (MeSH): Artificial Intelligence; Diagnosis; which were combined using the Boolean operator "AND". The inclusion criteria adopted were all scientific articles published in full, open access, in Portuguese, English and Spanish that answered the guiding question.

A total of 15 articles were found in the LILACS, MEDLINE and SCIELO databases. Eight articles were discarded due to their unavailability in full and two for being duplicates. The total number of articles eligible for the review was five.

Results and Discussion

The final sample consisted of five studies published between 2013 and 2023 according to the proposed inclusion criteria. In the results, it was possible to understand that Artificial Intelligence impacts medical diagnoses on three levels: it optimizes image interpretation for doctors, improves workflow by reducing potential errors for health systems, and empowers patients to process their own data to promote health. However, attention needs to be paid to the data generated, as it can trigger cascading errors and expose sensitive information about health system users, infringing on their data

protection rights. Box 1 shows the studies analyzed according to title, year, authors, objective, result and conclusion of the publication.

Box 1. Articles selected for review

Title	Year	Author	Objective	Results	Conclusion
Artificial intelligence and medicine.	2017	Lobo LC.	Analyzing the quality of medical education related to professionals' knowledge of artificial intelligence present in health diagnostics.	The sComputerized clinical decision support systems, which process patient data, have indicated diagnoses with a high level of accuracy.	Concern about the quality of medical education in AI emphasizes knowledge of the pathophysiology of organic processes and the development of skills in listening, examining and guiding a patient, along with Artificial Intelligence.
Artificial Intelligence applied to the optimization of diagnostic imaging.	2013	Santos, NM; Campos CFS.	To verify the presence of artificial intelligence (AI) applied to radiology as a means of optimizing diagnostic imaging and to awaken professionals in the field to the evolution of technology.	AI has accelerated imaging diagnoses, especially in comparative diagnoses, eliminating diagnostic doubts.	Health professionals must develop in this area of Artificial Intelligence, given that its application can bring great benefits to humanity.

Radiomics: images are more than images, they are data.	2016	Gillies RJ et al.	To explore radiomics, its challenges and the transformative potential of the resulting data, with a view to improving clinical decision-making, especially in the treatment of cancer patients.	Radiomic data contains first, second and higher order statistics. This data is combined with other patient data and extracted with sophisticated bioinformatics tools to develop models that can potentially improve diagnostic, prognostic and predictive accuracy.	Radiomic analyses must be conducted with standard images, and it is conceivable that converting digital images into extractable data will eventually become routine practice.
The impact of artificial intelligence technology on diagnostic medicine.	2023	Moraes JJ et al.	Explorer the impact of AI on diagnostic medicine, addressing its applications in various areas of health.	The research reveals an overview of diagnostic accuracy, but also emerging issues such as the need for regulation and ethical guidelines.	Although there are challenges to overcome, multidisciplinary collaboration and the development of appropriate regulations can ensure that AI is a valuable tool for improving patients' health and well-being.

Source: authors.

Computerized diagnostic systems have been developed with the aim of improving the accuracy of examinations, consistency in the interpretation of medical images, prognostic evaluation and therapeutic decision support⁽¹⁰⁾. Artificial Intelligence has been highlighted in the specialties of radiology and imaging. In the case of cancer imaging diagnostics, AI's performance has shown that the information present is capable of going far beyond indicating whether a lesion is benign or malignant, and can infer the histological type of the tumor, the staging, the presence of mutations, the chance of response to treatment, recurrence and patient survival^(10,11).

In addition, the images used and entered into electronic medical records are stored as computer data, aiding in other similar diagnoses if cross-referenced with the data available on the web. In another area, such as the interpretation of laboratory tests and diagnostic tests, advanced algorithms can quickly analyze test results, identify trends and subtle patterns, allowing for a more accurate diagnosis and timely intervention⁽¹¹⁾.

Medical Artificial Intelligence is primarily concerned with building AI programs that perform diagnoses and make therapeutic recommendations. This assertion allows health professionals to direct their diagnostic and treatment efforts based on the individual characteristics of each patient, and

generates a greater chance of assertiveness due to the great cross-referencing of information⁽¹²⁾. It is clear that medicine is being impacted by AI on three levels: for doctors, through fast and accurate image interpretation; for healthcare systems, by improving workflow and potentially reducing medical errors; and for patients, by allowing them to process their own data to promote health⁽⁸⁾.

AI in health diagnostics is becoming not just a part of, but an essential element in medical informatics, and an important mechanism for trying to solve complex diagnoses in health care. Research involving AI and diagnostics aims to capture the clinical knowledge of professionals in order to improve the most appropriate clinical proposals and solutions.

In addition to the benefits of optimizing time and data that can come from anywhere on the planet, the automation of health diagnoses has the obstacle of losing the confidentiality of stored patient data. However, health systems such as the NHS (National Health System) in England point out that there are more benefits to be gained from sharing experiences than there are major problems associated with breaches of confidentiality⁽⁵⁾. In Brazil, the LGPD (General Data Protection Law) regulates the data provided by users of health systems, authorizing or not sharing it⁽¹³⁾. This law defends the idea that data should be protected because it is sensitive, and storage should be for a set period of time, limiting the improper sharing of each patient's personal data⁽¹²⁾.

Another problem that can be associated with AI is the large volume of information that depends on processing, making it possible to find incongruent data that is not available and with various human errors, leading to the possibility of even subtle differences in health diagnoses, enabling misdiagnosis that can damage the balance and harm the patient's right to comprehensive health. There is, however, a need to improve the relationship between professionals and the machine, paying attention to the fact that the diagnosis should be made not by the AI, but with its help.

Conclusion

Although Artificial Intelligence is making an exponential contribution to health services, particularly in terms of aiding diagnosis, it is necessary to exercise caution when using it. In addition, the type of information received by Artificial Intelligence must be well defined so that errors can be reduced. The results obtained by applying this technology will not always be conclusive in relation to the process of diagnosing an individual's health conditions, and it is crucial to ensure validation by professionals specialized in the respective areas who will be using it. The impact of Artificial Intelligence on medicine is undeniable. However, it is essential to impose limits on its use, especially with regard to ethical aspects and the exposure of sensitive data from users of health systems. The need to restrict the use of AI to certain specialties is fundamental on the premise that, despite its significant role in analyzing information, the final decision must be backed up by human expertise.

Giving AI the responsibility of making choices and taking on a role that, by nature, should be played by human beings is intrinsically dangerous. Human rationality is rooted in a set of social experiences and carries with it the sensitivity needed to deal with its fellow human beings. We need research that can intertwine and desensitize the multi-professional health environment to the correct use, and only then will man and machine find a balance for the best possible contributions to health diagnoses.

Conflict of interest

The authors declare that there is no conflict of interest.

Authors' contribution

Silva GG da contributed to the conception/design of the article. Silva HP contributed to data analysis and interpretation. Rodrigues MLA contributed to the critical review of the content and approval of the final version. All the authors contributed to writing the article.

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