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THE USE OF ARTIFICIAL INTELLIGENCE IN DIAGNOSIS BY MEDICAL IMAGES BASED ON THE DICOM STANDARD: A REVIEW

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Abstract: INTRODUCTION: *Digital Imaging and Communications in Medicine* is a standard used in the storage, transmission and processing of medical images, making it possible to create large databases that can be used to develop neural networks. Artificial intelligence can be used to interpret and analyze medical images, aiding in diagnosis and facilitating clinical practice. **OBJECTIVE:** To analyze and evaluate how the use of the Digital Imaging and Communications in Medicine standard is being used in association with artificial intelligence techniques in medical images to assist in diagnosis and improve clinical practice. **METHODS:** This study carried out a literature review by searching the PUBMED and SCIELO databases, using the descriptors "DICOM", "artificial intelligence" and "medical imaging" for articles from the last 5 years, available in English and Portuguese. **RESULTS:** As a result, a table was presented with the 13 articles studied, structured according to the objective of the technology, the area of medicine impacted, the precision of artificial intelligence and the limitations of the methods researched. However, despite the good results achieved, there is still a need for greater accuracy in use, in addition to the need to expand the database. **CONCLUSION:** It is concluded that the constant advances in the development of technologies such as artificial intelligence for image interpretation and analysis bring very positive impacts. Furthermore, it must be noted that this innovation does not aim to replace the radiologist, but rather to improve the acquisition, quality, detection of lesions in images and standardize reports to increase the efficiency of their work. However, there needs to be an increase in databases so that the artificial intelligence developed becomes more effective and reliable for use in everyday life.

Keywords: Artificial Intelligence, Computer Diagnosis, Radiology.

INTRODUCTION

Digital Imaging and Communications in Medicine (DICOM) is a widely used standard for storing, sharing and processing medical images and related information, allowing interoperability between systems and equipment (BIDGOOD. et al., 1997). The adoption of this standard by health services has allowed broad advances in the communication and fluidity of image diagnoses and currently, with the evolution of diagnostic technologies, DICOM allows the use of images as a database for the creation of computerized diagnostic aid systems. This way, Artificial Intelligence (AI) plays an important role in the interpretation and analysis of these images in the DICOM standard, being able to accelerate image acquisition, improve image reconstruction and quality, optimize the radiation dose, assist in detection and characterization of injuries, speed up exam screening and standardize reports (BOEKEN et al., 2023; KASINATHAN; JAYAKUMAR, 2022).

With the expansion of the number of medical subspecialties, an exponential increase in the number of exams performed has been observed, increasing the challenges and workload for radiologists. Furthermore, exams have provided increasingly specific information regarding not only the diagnosis, but the patient's prognosis. In this sense, the creation of new AI using image exam databases allows for better accuracy, consistency in interpretation and support for therapeutic decisions (SANTOS et al., 2019). Therefore, this literature review aims to evaluate the use of artificial intelligence in medical images in the DICOM standard to assist in medical diagnosis.

METHOD

A literature review was carried out, using the PUBMED and SCIELO databases. The inclusion criteria were articles in the field of medicine, which discuss the application of medical images in the DICOM standard to assist doctors in the diagnostic process. Systematic reviews, works on the development of databases for medical images in the DICOM standard, as well as works that debate the use of AI to aid in invasive and surgical procedures were excluded. The descriptors used were "DICOM", "artificial intelligence" and "medical imaging", in addition to the Boolean "AND". The search was carried out using articles in English and Portuguese, which were published from 2018 onwards.

RESULTS

After fully reading the 13 articles, the analyzed results were structured in Table 1 according to the following criteria: the objective of the technology, the area of medicine impacted, the accuracy of the AI and the limitations of the methods researched. Thus, it is clear that the 7 areas of medicine impacted by the use of AI in diagnosing diseases are Oncology, Infectious Diseases, Dermatology, Cardiology, Neurology, Radiology and Orthopedics. However, although the technologies are promising, there are still questions to be better substantiated, such as the accuracy of the AI, which varied from 52% to 98% between studies, and the limitation of the sampling and database used to train and test the AI.

DISCUSSION

According to the review, the main area of medicine impacted by diagnostic tools is oncology, with 38% of articles used to help diagnose cancer. This result is in harmony with previous reviews, confirming the impact of artificial intelligence not only on early

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	Author	Year	Purpose of Technology	Area of medicine	Image in DICOM standard	Accuracy	Limitations
1	Ahamned Muneer, K et al.	2019	Identify and categorize glioma tumor into 4 grades	Oncology	RM	+97%	Small data sample
2	Burge, T.A et al.	2023	Perform automatic segmentation of CT images in cerebral vascular emergencies	Neurology	TC	+52%	Small database used in AI training
3	Caffery, Liam J et al.	2021	Diagnose or predict the risk of dermatological diseases with the help of AI in DICOM standard images	Dermatology	Sequential dermoscopic photographs and images	NR	- Optical, regulatory, lega barriers and barriers with professionals in the field - Lack of imaging standards and data in dermatology
4	Chou, P.-H. et al.	2022	Identify vertebral fractures at the thoracic and lumbar level	Orthopedics	RX	93%	Limited sample, low performance for new patients (20-49), inability to diagnose cancer.
5	Dembrower K et al.	2020	Predict breast cancer risk and improve tumor detection	Oncology	Mammogram	+98%	30% of cancers may not be detected during mammographic screening and are diagnosed clinically the exams.
6	Hraps, 1. et al.	2022	Pre-detect mutation of the isocitrate dehydrogenase enzyme in gliomas	Oncology	RM	76%	Small sampling and low accuracy
7	Jonske, F. et al.	2022	Automatically systematize and categorize imaging exams used in diagnostics and clinical trials	Radiology	RX, TC, RM, USG, RX/ANG	92.71%	The low standardization of metadata present in DICOM standard images
8	Kasinathan, G. and Jayakumar, S.	2022	Detect and stage lung cancer	Oncology	TC	97.1%	It cannot be applied on a large scale and there are concerns about the security of image transfer
9	Kim, C.K. et al.	2022	Detect the presence, severity and progression of COVID-19	Infectology	chest x-ray	95%	Small sampling
10	Kusunose, K et al.	2020	Identify cardiac views to aid in diagnosis and predict heart ejection fraction (EF)	Cardiology	Echocardiography	98.1%	Restricted samples of FE and uncertainty on unlabeled samples when creating the clinical prediction model and a limited data sample.
11	Lewandrowskl, Kai-Uwe et al.	2020	Identify the intensity and severity of common pathologies of the vortobral spine, in addition to generating automatic image reports	Radiology	RM	NR	Variability in pathology indicators, differing from those used by radiologists
12	Li, Cheng-Chung et al.	2021	Demarcate and interpret brain tumors and provide therapeutic strategies	Oncology	RM	75.64%	Lack of studies and images needed to train AI to produce the best possible results
13	Zhu, Ziwei et al.	2021	Produce a more accurate, faster and cheaper system for detecting COVID-19	Infectology	TC	95.8%	Small database used in AI training

Table 1: Comparison between selected studies. Source: Own authorship.

Caption: MRI: Magnetic Resonance Imaging; CT: Computed Tomography; RX: Radiography; NR: Not Reported; USG: Ultrasonography; CXR/ANG: X-ray/Angiography.

Source: Own authorship.

diagnosis, but also on identifying important data such as staging, the presence of mutations and patient survival (SANTOS et al., 2019).

However, 84.6% of studies confirm that one of the main challenges is related to databases due to numerical limitations or image standards. This is because insufficient databases can result in mistaken or inconclusive diagnoses when the methods are applied on a larger scale (CHOU et al., 2022). Furthermore, the levels of accuracy obtained by studies become imprecise, as such numbers may change when technologies are applied to a larger sample (KIM et al., 2022).

CONCLUSIONS

Therefore, the possibilities for using medical images in the DICOM standard by AI have been the source of study for several studies in order, mainly, to assist doctors in faster and more reliable diagnoses, and improve the workflow in clinics and hospitals. Despite discussions about the introduction of these technologies into everyday medicine, it is understood that the impact will not be the replacement of the radiologist, but rather advances in diagnoses, research and image storage.

However, despite the great potential brought by computer diagnostic devices, especially in oncology, caution is necessary to ensure high levels of accuracy and precision before incorporating such technologies into healthcare services. Therefore, some inconsistencies such as data security issues, the inability to diagnose certain pathologies and, mainly, database limitations must still be overcome. Therefore, it is suggested that future studies expand the databases used by the technologies in order to maximize the possibilities of diagnoses and minimize inaccurate diagnoses so that the adoption of the technologies can be achieved and, thus, improve the capacity and agility of the systems. health.

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