Review

Utility of ChatGPT-4 in Musculoskeletal Imaging: A Narrative Review

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Utility of ChatGPT-4 in Musculoskeletal Imaging: A Narrative Review

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Abstract: ***Background:*** With its impressive natural language processing and comprehension skills, ChatGPT-4 (Chat Generative Pre-Trained Transformer) is a technology that shows great promise for use in a number of medical fields. This article provides a thorough description of the possible uses of OpenAI's state-of-the-art language model, ChatGPT-4, in musculoskeletal imaging. ***Purpose for review:*** MSK Radiologists need to evolve about their knowledge and understanding of the roles of ChatGPT and its implications in daily practice. We aim to emphasize the advantages of ChatGPT-4 on the musculoskeletal imaging field and its potential to enhance radiologist working checklist review items, and the overall productivity of radiology reports. ***Recent findings:*** The fact of that specialists in radiology, rheumatology, orthopedic surgery, and other fields are conversant with ChatGPT. Furthermore, opinions are generally well, despite the fact that many people have reservations about the new technology, which is still developing [1].

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1. Introduction

Artificial intelligence (AI) is expanding quickly in many fields, including medicine, and does so without requiring human intellect. Diagnostics, such as tumor and fracture identification, are useful uses in orthopedic surgery. Clinicians should be aware of AI's limits, though, as preventing biases and avoidable errors requires the creation of strong reporting and validation systems [2]. There are various methods and application were assumed to be as artificial intelligence tools, some of them are ChatGPT and Bard could help in radiology knowledge, which showed while selecting the best chatbot, it's crucial to take into account its presumptions and the reliability of its responses [3]. In other hand, considering all the variables, including the residents' limited time, inexperience, and lack of understanding, using the Internet has been quite beneficial for on-call tasks. The most popular resource was "Radiopaedia", which the inhabitants selected because to its free availability, ease of use, lack of additional registration requirements, and attractive mobile viewing layout. Because ChatGPT currently lacks images that are essential for aspiring radiologists and because it lacks references or proof for the information it offers, its value as an artificial intelligence-assisted radiology educational resource is debatable [4]. Furthermore, while ChatGPT-3 answered questions from radiologists' daily clinical routine properly, only 37.9% of "true," recognizable references gave sufficient background information for 37.5% of the questions that were answered correctly. These findings serve as a clear reminder of ChatGPT-3's limitations [5]. Conversely, ChatGPT-4 may prove to be an invaluable interactive anatomy resource. By offering accurate guidance on anatomical terminology and thorough and well-organized descriptions of anatomy. It also aids in understanding therapeutic importance of a structure and its link. It's crucial to remember that it does acknowledge that AI should play an assistant role [6]. Generally, in a few of minutes or seconds, the AI technology can assist in identifying knowledge gaps, which can make a time significancy [7]. On the other hand, orthopedic evaluation assessments, the residents outperformed ChatGPT-3.5 and GPT-4 in several experimental studies by providing more accurate answers to questions. When it comes to providing answers to orthopedic resident evaluation examination queries, GPT-4 outperforms ChatGPT-3.5. In comparison to questions containing graphics, ChatGPT-3.5 and GPT-4 both fared better on text-only questions [8]. To our knowledge there was no study assessed the implementation of the artificial

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intelligence tools through the musculoskeletal radiology field. Thus far, we aimed to evolve the musculoskeletal Radiologists of understanding of the roles of ChatGPT and its implications in daily practice, as well as to emphasize the advantages of ChatGPT on the musculoskeletal imaging field and its potential to enhance radiologist working, and the overall productivity of radiology reports.

2. Methods

In December 2023, we will perform a thorough search of many databases, such as PubMed and Google Scholar, for this narrative review. We will focus our search by using keywords like "radiology," "musculoskletal imaging," "artificial intelligence," "machine learning," and "ChatGPT-4." The publications that addressed the goals of the study will be chosen. We will assess the article titles and abstracts before retrieving the whole contents. We have limited our evaluation to studies that discuss ChatGPT-4's use in musculoskeletal imaging, while also taking into account our own experiences with the program. We only look for English-language publications in our search. The articles cover a range of topics related to the use of ChatGPT-4 in MRI, CT, and X-ray of We will explore questions that were created with musculoskeletal imaging subjects in mind.

3. Role of ChatGPT-4 in Musculoskeletal Imaging

Enhancing diagnostic capabilities and decision-making processes in the realm of musculoskeletal imaging with the integration of ChatGPT-4 is a promising area of focus. The evaluation and treatment of numerous disorders affecting the musculoskeletal system depend heavily on musculoskeletal imaging. As an advanced language model, ChatGPT-4 has demonstrated promise in helping medical practitioners understand imaging results and offer insightful analysis of complicated cases. Additionally, the application of artificial intelligence for activities like board exam preparation and differential diagnosis has been investigated in the medical industry, using models such as ChatGPT [9]. The application of ChatGPT-4 in musculoskeletal imaging has the potential to revolutionize the field by offering insightful information, supporting decision-making processes, and enhancing diagnostic accuracy. The potential of AI models such as ChatGPT-4 to assist in analyzing clinical data and suggesting differential diagnoses could be especially valuable in this area. Healthcare practitioners can improve patient outcomes and practice enhancement by utilizing advanced language models such as ChatGPT-4 in conjunction with traditional imaging techniques.

4. A. Clinical Applications of ChatGPT-4

4.1. Writing The MRI Reports

Radiology and imaging are only two of the areas of healthcare that could change if artificial intelligence ChatGPT-4 in particular is integrated into clinical settings. Patient care and workflow in radiology departments can be improved by using ChatGPT-4, a generative artificial intelligence model, to write MRI reports more accurately and efficiently [10]. Studies have indicated that ChatGPT can be a useful tool for radiologic decision-making. It can not only expedite clinical processes but also encourage appropriate use of radiology services [10]. In the context of radiology [11]. By using ChatGPT-4 as a supplement to radiologic decision-making, medical professionals may be able to increase diagnosis speed and accuracy, which will likely improve patient outcomes in radiology practice. Additionally, research has been done on ChatGPT-4's viability in clinical contexts, including support for clinical practice and scientific creation, underscoring its potential uses in medical environments [12]. The versatility and utility of ChatGPT-4 in multiple healthcare domains, including radiology and imaging, is highlighted by its capacity to reason about public health subjects and assist clinical decision-making processes, while using ChatGPT-4 in radiology and imaging can improve report writing and diagnostic procedures, there are some potential drawbacks to the technology that need to be considered. It is imperative to guarantee the precision, dependability, and moral use of ChatGPT-4 when composing MRI reports in order to preserve the caliber and honesty of radiological procedures [11].

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Clinical ChatGPT-4 apps for MRI report authoring offer a substantial chance to boost diagnostic accuracy, optimize radiology workflows, and expedite healthcare decision-making. Healthcare professionals may be able to improve patient care and advance the area of medical imaging by utilizing ChatGPT-4's features in radiology practice.

4.2. Writing The CT Reports

The application of ChatGPT-4 in clinical settings offers an innovative way to improve radiology practices' accuracy and efficiency, especially when it comes to generating CT reports. The specific application of ChatGPT-4 in radiologic decision-making, including the development of CT reports, is an area of significant interest and investigation, even though the use of artificial intelligence in healthcare is gaining speed [10,11]. Studies assessing ChatGPT-4's ability for clinical decision support in radiology, notably in finding relevant imaging services for clinical presentations like breast cancer screening and breast discomfort, have showed potential as an adjunct for radiologic decision-making [11]. This demonstrates how ChatGPT-4 may help radiologists create thorough and precise CT reports, supporting the interpretation of imaging results and improving diagnostic procedures. Furthermore, ChatGPT-4's practicability in healthcare settings, such as its ability to assist clinical practice and scientific output, highlights its adaptability and prospective use in a range of medical fields, including radiology [12]. Radiologists might potentially improve workflow efficiency, improve documentation accuracy, and expedite the process of generating CT reports by utilizing ChatGPT-4's capabilities. However, issues with using AI models like ChatGPT for clinical diagnostic and treatment decisions have been brought up, including misunderstanding, hallucinations, and reliance on out-of-date information [13]. By addressing these issues, we may reduce potential hazards and improve the dependability of CT reports produced by ChatGPT-4. We do this by implementing stringent validation procedures, ongoing model training, and making sure human oversight is integrated. The clinical use of ChatGPT-4 for creating CT reports has great potential to change radiologic practices by enhancing productivity, precision, and decision-making. Radiologists may be able to improve patient care and outcomes in the field of musculoskeletal imaging by resolving obstacles and utilizing the advantages of AI models such as ChatGPT-4.

4.3. Writing The X-Ray Reports

Radiology and imaging are only two of the areas of healthcare that could change if artificial intelligence ChatGPT-4 in particular is integrated into clinical settings. With ChatGPT-4's enhanced language model, X-ray report writing may be made more accurate and efficient, which will improve patient care and diagnostic procedures. Recent research has shown that ChatGPT can be a useful tool for radiologic decision-making and has the potential to streamline clinical processes and promote the prudent use of radiological services [11]. Radiologists can expedite the interpretation of X-ray pictures and the creation of thorough reports by utilizing ChatGPT-4's features, which will ultimately result in more effective and efficient patient management. Additionally, ChatGPT has demonstrated encouraging outcomes in pathology and urology, among other medical specialties, in terms of streamlining administrative duties and improving clinical documentation [13,14]. These results imply that ChatGPT-4 can be a useful tool for helping radiologists produce thorough and precise X-ray reports, which will enhance the workflow in radiology as a whole. Additionally, prior research has demonstrated the potential uses of ChatGPT-4 in musculoskeletal imaging, which highlights the technology's adaptability and usefulness in a range of therapeutic contexts [15]. Healthcare professionals can gain from increased diagnostic process accuracy, consistency, and speed by utilizing ChatGPT-4's capabilities when composing X-ray reports for musculoskeletal disorders.

The clinical use of ChatGPT-4 for X-ray report writing has great potential to advance radiology procedures and enhance patient outcomes. Healthcare practitioners can optimize diagnostic workflows and provide high-quality care in musculoskeletal imaging and other areas by adopting this cutting-edge technology and investigating its possibilities in radiology settings.

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4.4. Challenges in the Use of ChatGPT-4 in Musculoskeletal Imaging

The terrain of difficulties in utilizing ChatGPT-4 for musculoskeletal imaging is complicated and needs to be carefully considered. Although ChatGPT-4 has the potential to transform healthcare decision-making and diagnostic procedures, particularly musculoskeletal imaging, a number of issues and barriers must be resolved before it can be successfully integrated. One of the main obstacles is the requirement for further technological advancement in order to guarantee the consistency and dependability of the interpretation of musculoskeletal imaging tests utilizing deep learning techniques [16]. This emphasizes how crucial it is to improve ChatGPT-4's and other AI models' capacity to precisely assess and comprehend complicated imaging data in the musculoskeletal field. Furthermore, doubts have been expressed about ChatGPT models' capacity to deliver trustworthy information for educational purposes and precisely respond to medical queries [17,18]. It is crucial to validate the effectiveness of AI models in healthcare contexts, including musculoskeletal imaging, as demonstrated by the requirement to ascertain ChatGPT's correctness in responding to medical examination questions. Furthermore, using ChatGPT professionally for academic writing is severely hampered by its possible shortcomings in handling hazardous content, false information, and plagiarism [19].

To guarantee the moral and precise application of ChatGPT-4 in musculoskeletal imaging, strong protocols are needed to handle these issues and preserve the accuracy of the data offered. Furthermore, ChatGPT models' ability in responding to inquiries on particular medical specializations, including neurology and dermatology, has demonstrated both promise and limitations [20,21]. Leveraging ChatGPT-4 in musculoskeletal imaging requires an understanding of the bounds of AI capabilities in specialized medical domains, as domain-specific knowledge is critical for accurate interpretation. While ChatGPT-4 has the potential to revolutionize musculoskeletal imaging, there are obstacles to overcome in order to fully realize its benefits in improving diagnostic procedures and decision-making in this crucial area of healthcare. These obstacles include those related to technical development, accuracy in answering medical questions, ethical issues, and domain-specific limitations.

4.5. Future Considerations of Artificial Intelligence in Musculoskeletal Imaging

Artificial intelligence in musculoskeletal imaging has many potential applications, but there are also several obstacles that must be carefully considered. It is clear that artificial intelligence, and especially ChatGPT models, have the power to completely transform healthcare practice, research, and teaching [22]. Nonetheless, questions remain about how well AI models will function in complicated domains like medicine, where sophisticated and nuanced reasoning is critical [12]. In order to ensure the appropriate and efficient use of these potent instruments, it is imperative to address potential limitations and ethical issues as the medical community continues to investigate the applications of AI in musculoskeletal imaging [15]. The importance of cutting-edge technology in the field of musculoskeletal imaging, such as Sono elastography for tendon assessment and 3 Tesla field strength for MRI, has been emphasized [23–25]. These technologies have promise for a variety of therapeutic applications and provide useful answers to problems. Furthermore, musculoskeletal radiology may benefit from the use of artificial intelligence and deep learning techniques, which could improve imaging quality and speed while enhancing earlier advancements in the area [24,26]. Even with the progress made in AI, there are still legal obstacles to overcome before Natural Language Processing based tools (NLP) systems such as ChatGPT may be used legally to make healthcare decisions [27]. The absence of a well-defined regulatory framework for NLP-based technologies emphasizes the necessity of precise policies and norms when integrating AI into healthcare environments. Furthermore, to fully utilize AI models' potential in specialized medical domains, one must comprehend the limitations and capabilities of these models.

Ultimately, artificial intelligence in musculoskeletal imaging has enormous potential to revolutionize medical diagnosis and decision-making. The application of AI models such as ChatGPT in musculoskeletal imaging can result in major improvements in patient treatment and results by

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tackling issues with performance validation, ethical considerations, regulatory frameworks, and domain-specific restrictions.

5. Conclusions

Investigating ChatGPT-4's potential uses in musculoskeletal imaging offers fascinating prospects to transform radiography patient care and diagnosis. ChatGPT-4 has the potential to improve patient outcomes, expedite radiology operations, and improve diagnostic accuracy by improving the generation of MRI, CT, and X-ray reports. But issues like assuring model reliability, domain-specific constraints, and ethical implications must be addressed. Future initiatives should focus on validation, ethical monitoring, and regulatory frameworks to fully harness AI's potential while protecting the value of human expertise in healthcare. In order to advance medical science and achieve notable advancements in patient care and healthcare outcomes, human skill and technology must work together.

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