

Brief Report

Not peer-reviewed version

---

# Transforming Radiology Communication: The Impact of GPT-4 on Crafting Patient-Friendly Summaries - A Short Review

---

[Sadhana Kalidindi](#)<sup>\*</sup> and Prasanna Vadana R.V

Posted Date: 20 August 2024

doi: 10.20944/preprints202408.1400.v1

Keywords: Large Language Models; GPT-4; Radiology Reports; Patient Comprehension; AI-driven summaries; Patient Engagement



Preprints.org is a free multidiscipline platform providing preprint service that is dedicated to making early versions of research outputs permanently available and citable. Preprints posted at Preprints.org appear in Web of Science, Crossref, Google Scholar, Scilit, Europe PMC.

Copyright: This is an open access article distributed under the Creative Commons Attribution License which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

## Brief Report

# Transforming Radiology Communication: The Impact of GPT-4 on Crafting Patient-Friendly Summaries - A Short Review

Sadhana Kalidindi and Prasanna Vadana R.V

\* Correspondence: skalidindi359@gmail.com

**Abstract:** The advent of Large Language Models like Generative Pre-trained Transformer 4 (GPT-4) has introduced a revolutionary approach to bridging the communication gap between complex radiology reports and patient comprehension. This review article explores the pivotal role of GPT-4 in generating patient-friendly summaries of radiology reports, aiming to demystify medical jargon and enhance patient engagement and understanding. Through an examination of the technological underpinnings of GPT-4, this article highlights its capability to accurately interpret and simplify radiological findings into layman's terms. It assesses the impact of such advancements on patient satisfaction, adherence to treatment plans, and overall healthcare outcomes. Furthermore, the review delves into the potential challenges and ethical considerations associated with implementing AI-driven summaries in clinical practice, including accuracy, privacy, and the need for human oversight. By offering insights into the current applications, benefits, and limitations of GPT-4 in radiology, this short review underscores the transformative potential of AI in fostering a more inclusive and patient-centric healthcare communication paradigm.

## Introduction

The ability of patients to understand their health records plays a critical role in their journey towards better health outcomes and satisfaction with their care. Clear comprehension of these records enables patients to actively participate in their treatment decisions, fostering a sense of empowerment and engagement. This engagement is crucial, as informed patients are more likely to adhere to treatment plans, ask insightful questions, and express concerns about their health, thereby facilitating a more collaborative and effective patient-provider relationship.

Specifically, when it comes to radiology reports, which often contain complex medical terminology and nuanced findings, patient understanding becomes even more vital. Radiology reports can significantly influence the course of a patient's treatment plan, including diagnoses, follow-up procedures, and the overall management of their condition. Therefore, translating these reports into patient-friendly language can demystify the medical information, reduce anxiety associated with unknown or misunderstood terms, and enhance patients' ability to make informed decisions about their health care. Ultimately, the clarity provided by simplified radiology reports not only improves patient comprehension but also contributes to a more transparent and trustful patient-healthcare provider interaction, laying the foundation for improved health outcomes and patient well-being.

However, in the current scenario where radiologists are overburdened with their workload, it is not possible for them to add additional sections in the report containing a patient friendly summary. The emergence of GPT-4, an advanced artificial intelligence model, presents an unprecedented opportunity to reshape this landscape. This article explores the utility of GPT-4 in generating patient-friendly summaries of radiology reports, emphasizing its potential to make healthcare more accessible and patient-centric.

## Patient Engagement in Healthcare:

Engaging patients in their healthcare has emerged as a pivotal strategy to enhance health outcomes, improve satisfaction, reduce costs, and benefit the clinician experience. As underscored by

Krist et al. (1), patient and family engagement is conceptualized as active partnerships across various levels of the healthcare system, including direct care, organizational design, governance, and policymaking, aiming to ameliorate health and healthcare.

In the realm of decision-making, engaging patients has shown to increase satisfaction, knowledge, and adherence to treatment plans while reducing decisional conflict and unnecessary procedures. This evolution from informed consent to shared decision-making emphasizes a balanced exchange of information, respecting patients' values and preferences in the decision-making process.

Addressing the influence of social determinants on engagement and literacy, the disparities in patient engagement based on ethnicity, socioeconomic status, and other factors are acknowledged, suggesting the need for culturally competent and linguistically suitable communication and community engagement efforts to mitigate these disparities.

### **Patient Engagement in Radiology:**

The importance of patient engagement in radiology is multifaceted and crucial for optimizing patient outcomes, enhancing the understanding of radiological findings, and fostering a collaborative healthcare environment. In the context of radiology, patient engagement extends beyond the mere delivery of imaging results, encompassing the comprehensibility of reports, access to and understanding of radiological information, and the implications of radiological findings on patient care and decision-making processes.

Cooper et al. (2) highlight the significance of shared decision-making (SDM) as a core component of patient- and family-centered care within radiology. SDM in radiology is identified through its major components: access to information, comprehension of information, appraisal of information, and application of knowledge in care decisions. This model emphasizes the role of radiologists in not only delivering imaging results but also in ensuring that patients understand their results and are able to participate actively in their care decisions. Radiologists are encouraged to facilitate patient access to imaging results, leverage multimedia reports to aid patient comprehension, and directly engage with patients to clarify findings and discuss next steps, underscoring the potential for radiology to contribute significantly to patient-centered care.

Trofimova et al. (3) discuss the opportunity to improve patient communication through the readability of radiology reports. The study identifies a gap in the current practice, where radiology reports, often filled with jargon and technical terminology, are not easily understood by patients. By advocating for reports written at a level that is accessible to patients, the authors suggest that radiology can play a pivotal role in enhancing patient understanding and engagement. This approach aligns with the broader goal of making radiology more patient-centered, by ensuring that patients are not only recipients of imaging services but active participants in understanding and acting upon their results.

These perspectives collectively underscore the evolving role of radiology in patient care. By adopting strategies aimed at improving access, comprehension, and engagement, radiology can significantly contribute to a healthcare model that values and prioritizes patient involvement. This shift not only has the potential to improve patient outcomes and satisfaction but also reinforces the critical role of radiology within the multidisciplinary healthcare team. Through these efforts, radiology can further cement its position as a key contributor to patient-centered care, enhancing the overall quality and effectiveness of healthcare delivery.

Large Language Models (LLMs) like GPT-4 can interpret and convert radiology reports which contain specialized terminology and complex descriptions, into simpler language and in multiple languages.

### **History and Evolution of GPT-4**

The journey of Generative Pre-trained Transformer 4 (GPT-4) begins with the foundational advancements in artificial intelligence and natural language processing developed by OpenAI. Tracing its lineage back to the first GPT model unveiled in 2018, each iteration of GPT has marked a significant leap in AI's ability to understand and generate human-like text. The evolution from GPT

to GPT-4 embodies a series of technological enhancements, with GPT-4 being the most sophisticated, built upon the revolutionary transformer architecture that introduced self-attention mechanisms. This allowed the model to process and generate text with unprecedented complexity and subtlety. GPT-4's development was grounded in the analysis of vast datasets, comprising diverse internet text, to capture the breadth of human knowledge and language nuances. Its predecessors, notably GPT-3, set new benchmarks for AI's capability in language comprehension and generation, enabling applications ranging from writing assistance to coding. GPT-4, with its further refined algorithms and expanded knowledge base, represents a quantum leap in AI's potential, particularly in specialized fields such as radiology. In this domain, GPT-4's advanced understanding of language and context translates into its ability to generate accurate, comprehensible summaries of complex radiological reports, thus bridging the gap between technical medical information and patient understanding. This progression underscores a broader trend of rapid advancement in AI technologies, with GPT-4 standing as a testament to the ongoing innovation and its transformative potential in healthcare and beyond.

### **GPT-4 and Patient-Friendly Summaries:**

The utilization of Large Language Models (LLMs) like ChatGPT in generating patient-friendly summaries for radiology reports signifies a transformative step in enhancing patient comprehension and engagement in their healthcare. Radiology reports, traditionally designed for physician-to-physician communication, are laden with medical jargon and complex terminologies, rendering them challenging for patients to understand.

Asser Abou Elkassem et al (4) discuss the potential of ChatGPT in simplifying radiology reports. They detail how ChatGPT, through the prompt of translating medical texts into simpler language, can enhance the readability of radiology reports. The potential for improved patient engagement by enabling individuals interact with the model in a conversational manner is also discussed.

Li et al (5) provide an empirical analysis demonstrating significant improvements in readability scores when ChatGPT is used to simplify radiology reports across major imaging modalities. Their findings indicate a marked reduction in the Flesch-Kincaid reading level and an increase in the Flesch Reading Ease Score, underscoring ChatGPT's efficacy in demystifying complex radiological information.

Figure 1 below is an example of a GPT-4 generated patient friendly summary for a patient who had a low dose lung cancer screening CT

**Study Type:** Low Dose Lung Cancer Screening CT

**Date of Study:** [Study Date]

**Clinical History:**

Patient referred for low dose CT lung cancer screening. No known history of malignancy. Non-smoker.

**Technique:**

Low dose CT of the chest was performed without the use of intravenous contrast.

**Findings:**

**Lungs and Pleura:**

- No evidence of pulmonary nodules or masses.
- The lung parenchyma is clear without evidence of infiltrates or consolidation.
- No pleural effusions or pneumothorax.

**Liver:**

- Incidentally noted is a focal lesion in the right lobe of the liver, measuring approximately [size in cm], with characteristics consistent with a simple cyst. No other liver lesions identified.

**Other Findings:**



- The visualized portions of the upper abdomen are unremarkable.

- No enlarged mediastinal or hilar lymph nodes.
- The heart and great vessels are within normal limits for age.

**Impression:**

1. No evidence of primary lung cancer identified on low dose screening CT.
2. Incidental finding of a focal lesion in the right lobe of the liver, likely representing a simple cyst. Given the lesion's characteristics, it is likely benign.

**Recommendations:**

Considering the likely benign nature of the liver lesion identified, further evaluation with ultrasound can be considered to confirm its cystic nature if clinically warranted. If the patient has a history of malignancy or if there are clinical concerns, further evaluation with MRI or contrast-enhanced CT for characterization may be advised. In the absence of any concerning features, clinical correlation and observation with follow-up imaging in 6-12 months can be considered to ensure stability.



**Radiologist:**

**Figure 1.** a: Original report describing an incidental lesion in the liver. b: Screenshot of the patient friendly summary generated by GPT-4.





**ChatGPT**  
**Patient-Friendly Summary of Your CT Scan**

Dear [Patient Name],

We recently performed a special type of CT scan on your chest, known as a low dose lung cancer screening, because of its ability to check for early signs of lung cancer using a lower amount of radiation. I'm here to share the results with you in a way that's easy to understand.

**What We Found:**

- **Lungs:** Good news! We didn't find any signs of lung cancer or any unusual growths in your lungs. Your lungs are clear, and there are no signs of infection or fluid buildup.
- **Liver:** While we were looking at your scan, we noticed a small spot on the right side of your liver. It looks like a simple cyst, which is a small, fluid-filled sac. These are quite common and usually don't cause any problems.
- **Everything Else:** We also had a quick look at some other areas visible in the scan, like your heart and the major blood vessels, and everything appears normal.

**What Does This Mean for You?**

The spot on your liver is likely nothing to worry about, as these cysts are often harmless. However, it's always good to be thorough. We suggest two possible steps:



- **Option 1:** We can check this cyst more closely with an ultrasound, which is a simple and painless
- **Option 2:** If you or your doctor have any concerns, or if there's a history of other health issues, we might use a different type of scan, like an MRI or a CT with dye, to get a better look.

If there are no particular concerns, we might just keep an eye on it with another scan in 6 to 12 months to make sure it's not changing.

**What's Next?**

Your doctor will discuss these results with you and help decide if any further steps are needed based on your overall health and medical history. It's always important to keep us informed about any changes in your health or if you have any concerns.

We're here to answer any questions you have and support you in any way we can. Thank you for entrusting us with your care.

Sincerely,

[Your Radiologist's Name]



**Patient friendly summaries in several languages**

In many countries, radiology reports are often written in English using specialized medical jargon intended for healthcare professionals across various fields. Given the wide range of health literacy and the diversity in patients' first languages, understanding these reports can be challenging for them. ChatGPT has the capability to produce reports for the general public, adapting them to various educational backgrounds and translating them into more than 40 languages (5). Reports tailored to a patient's specific health literacy and primary language could enhance their comprehension and enable them to actively engage with their healthcare providers. This engagement could lead to a collaborative effort in understanding their health issues and in the creation of personalized care strategies that align with their unique needs and preferences.

Figure 2 below shows GPT-4 generated patient friendly summaries for the same report used in Figure 1

**ChatGPT****Resumen amigable para el paciente de su tomografía computarizada**


Estimado/a [Nombre del Paciente],

Recientemente realizamos un tipo especial de tomografía computarizada en su pecho, conocida como un examen de detección de cáncer de pulmón de baja dosis, debido a su capacidad para verificar signos tempranos de cáncer de pulmón utilizando una menor cantidad de radiación. Estoy aquí para compartir los resultados con usted de una manera fácil de entender.

**Lo que encontramos:**

- **Pulmones:** ¡Buenas noticias! No encontramos signos de cáncer de pulmón ni ningún crecimiento inusual en sus pulmones. Sus pulmones están claros y no hay signos de infección o acumulación de líquido.
- **Hígado:** Mientras mirábamos su escaneo, notamos una pequeña mancha en el lado derecho de su hígado. Parece ser un quiste simple, que es un saco pequeño lleno de líquido. Estos son bastante comunes y generalmente no causan problemas.
- **Todo lo demás:** También echamos un vistazo rápido a algunas otras áreas visibles en el escaneo, como su corazón y los principales vasos sanguíneos, y todo parece normal.

**¿Qué significa esto para usted?**

La mancha en su hígado probablemente no  a nada de qué preocuparse, ya que estos quistes a menudo son inofensivos. Sin embargo, siempre es bueno ser minucioso. Sugerimos dos pasos

posibles:

- **Opción 1:** Podemos examinar este quiste más de cerca con una ecografía, que es una prueba simple y sin dolor que utiliza ondas de sonido para crear imágenes del interior de su cuerpo.
- **Opción 2:** Si usted o su médico tienen alguna preocupación, o si hay un historial de otros problemas de salud, podríamos utilizar un tipo diferente de escaneo, como una resonancia magnética o una tomografía computarizada con tinte, para obtener una mejor vista.

Si no hay preocupaciones particulares, podríamos simplemente vigilarlo con otro escaneo en 6 a 12 meses para asegurarnos de que no esté cambiando.

**¿Cuáles son los próximos pasos?**

Su médico discutirá estos resultados con usted y ayudará a decidir si se necesitan pasos adicionales según su salud general e historial médico. Siempre es importante mantenernos informados sobre cualquier cambio en su salud o si tiene alguna preocupación.

Estamos aquí para responder cualquier pregunta que tenga y apoyarlo de la manera que podamos. Gracias por confiarnos su cuidado.

Atentamente,

[Nombre de su radiólogo]



**Figure 2.** a: GPT-4 generated Patient friendly summary in Spanish. B: GPT-4 generated patient friendly summary in French.



ChatGPT

Résumé convivial pour le patient de votre scan CT

Cher/Chère [Nom du Patient],

Nous avons récemment effectué un type spécial de scan CT sur votre poitrine, connu sous le nom de dépistage du cancer du poumon à faible dose, en raison de sa capacité à vérifier les signes précoces du cancer du poumon en utilisant une quantité réduite de rayonnement. Je suis ici pour partager les résultats avec vous d'une manière facile à comprendre.

Ce que nous avons trouvé :

- **Poumons :** Bonne nouvelle ! Nous n'avons trouvé aucun signe de cancer du poumon ou de croissance inhabituelle dans vos poumons. Vos poumons sont clairs et il n'y a aucun signe d'infection ou d'accumulation de liquide.
- **Foie :** Pendant que nous examinions votre scan, nous avons remarqué une petite tache sur le côté droit de votre foie. Il semble s'agir d'un kyste simple, qui est une petite poche remplie de liquide. Ces kystes sont assez communs et ne causent généralement pas de problèmes.
- **Autres découvertes :** Nous avons également jeté un coup d'œil rapide à certaines autres zones visibles dans le scan, comme votre cœur et les principaux vaisseaux sanguins, et tout semble normal.

Qu'est-ce que cela signifie pour vous ?



La tache sur votre foie est probablement sans danger, car ces kystes sont souvent inoffensifs.

Cependant, il est toujours bon d'être minutieux. Nous suggérons deux étapes possibles :

- **Option 1 :** Nous pouvons examiner ce kyste de plus près avec une échographie, qui est un test simple et indolore utilisant des ondes sonores pour créer des images de l'intérieur de votre corps.
- **Option 2 :** Si vous ou votre médecin avez des préoccupations, ou s'il y a des antécédents d'autres problèmes de santé, nous pourrions utiliser un type de scan différent, comme une IRM ou un CT avec colorant, pour mieux voir.

Si il n'y a pas de préoccupations particulières, nous pourrions simplement surveiller cela avec un autre scan dans 6 à 12 mois pour s'assurer qu'il n'y a pas de changement.

Quelles sont les prochaines étapes ?

Votre médecin discutera de ces résultats avec vous et aidera à décider si des étapes supplémentaires sont nécessaires en fonction de votre santé générale et de vos antécédents médicaux. Il est toujours important de nous tenir informés de tout changement dans votre santé ou si vous avez des préoccupations.

Nous sommes ici pour répondre à toutes vos questions et vous soutenir de toutes les manières possibles. Merci de nous avoir confié votre soin.

Cordialement,

[Nom de votre radiologue]



Risks and pitfalls

This article highlights the potential of advanced language models such as GPT-4 to significantly improve patients’ understanding of radiology reports and their engagement. Yet, it's important to note that these models are not currently recognized as regulated medical devices, and their application in healthcare necessitates rigorous oversight, evaluation, and confirmation by medical experts for each specific scenario.

One notable limitation of GPT-4 involves the occurrence of "hallucinations," where the model might produce compelling but incorrect or fabricated details, potentially leading to erroneous interpretations. The protection of data privacy stands out as a critical issue, especially considering



the confidential nature of medical information; it is crucial to ensure that GPT-4 adheres to strict data privacy laws such as HIPAA to protect patient privacy. Additionally, ethical concerns, particularly regarding patient consent and the clarity of decisions made by AI, are prominent. It is imperative that patients are fully informed about the possibility of GPT-4 making mistakes and outlining steps to minimize such risks.

## Conclusions

In conclusion, the advent of Generative Pre-trained Transformer 4 (GPT-4) presents a potential breakthrough in enhancing the clarity and accessibility of radiology reports for patients. This technology can revolutionize patient engagement by translating complex medical information into simplified, understandable summaries, thereby empowering patients to actively participate in their healthcare decisions. This review underscores the importance of patient-centric approaches in radiology, highlighting how GPT-4 can contribute to a more informed patient community and foster a collaborative relationship between patients and healthcare providers.

However, the integration of GPT-4 and similar AI technologies in healthcare is not without challenges and risks. This article points to the need for rigorous oversight and ethical considerations, including safeguarding data privacy and ensuring the accuracy of AI-generated content to avoid misinterpretations that could affect clinical decision-making.

Ultimately, GPT-4 represents a promising tool in the shift towards more transparent and patient-centered healthcare. By facilitating better understanding and engagement, it holds the potential to improve healthcare outcomes and patient satisfaction significantly. Yet, its successful implementation will require careful consideration of the ethical, privacy, and oversight challenges outlined in this review.

## References

1. Krist, A. H., Tong, S. T., Aycock, R. A., & Longo, D. R. (2017, June 26). Engaging patients in decision-making and behavior change to promote prevention. *Information Services & Use*, 37(2), 105–122. <https://doi.org/10.3233/isu-170826>
2. Cooper, K., Heilbrun, M. E., Gilyard, S., Vey, B. L., & Kadom, N. (2020, January). Shared Decision Making: Radiology's Role and Opportunities. *American Journal of Roentgenology*, 214(1), W62–W66. <https://doi.org/10.2214/ajr.19.21590>
3. Trofimova, A., Vey, B. L., Safdar, N. M., Duszak, R., & Kadom, N. (2018, August). Radiology Report Readability: An Opportunity to Improve Patient Communication. *Journal of the American College of Radiology*, 15(8), 1182–1184. <https://doi.org/10.1016/j.jacr.2018.03.032>
4. Elkassem, A. A., & Smith, A. D. (2023, September). Potential Use Cases for ChatGPT in Radiology Reporting. *American Journal of Roentgenology*, 221(3), 373–376. <https://doi.org/10.2214/ajr.23.29198>
5. Li, H., Moon, J. T., Iyer, D., Balthazar, P., Krupinski, E. A., Bercu, Z. L., Newsome, J. M., Banerjee, I., Gichoya, J. W., & Trivedi, H. M. (2023, September). Decoding radiology reports: Potential application of OpenAI ChatGPT to enhance patient understanding of diagnostic reports. *Clinical Imaging*, 101, 137–141. <https://doi.org/10.1016/j.clinimag.2023.06.008>

**Disclaimer/Publisher's Note:** The statements, opinions and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of MDPI and/or the editor(s). MDPI and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions or products referred to in the content.