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### **Self-study CPD activity**

**Activity Reference Number:**

**A10(25) 2029**

#### **Topic**

Communication skills

#### **Article(s)**

Harnessing ChatGPT dialogues to address claustrophobia in MRI - A radiographers' education perspective

#### **Speciality**

Diagnostic

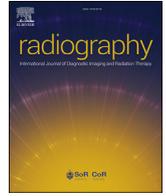
General

#### **Profession(s)**

Radiographers

Radiologists

This activity is approved for **THREE (3) *Clinical*** Continuing Education Units (CEU's)



## Harnessing ChatGPT dialogues to address claustrophobia in MRI - A radiographers' education perspective



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### ARTICLE INFO

#### Article history:

Received 29 December 2023

Received in revised form

19 February 2024

Accepted 20 February 2024

Available online 29 February 2024

#### Keywords:

ChatGPT

Generative AI

Simulation: radiographer

Claustrophobia

Magnetic resonance imaging

### ABSTRACT

**Introduction:** The healthcare sector invests significantly in communication skills training, but not always with satisfactory results. Recently, generative Large Language Models, have shown promising results in medical education. This study aims to use ChatGPT to simulate radiographer-patient conversations about the critical moment of claustrophobia management during MRI, exploring how Artificial Intelligence can improve radiographers' communication skills.

**Methods:** This study exploits specifically designed prompts on ChatGPT-3.5 and ChatGPT-4 to generate simulated conversations between virtual claustrophobic patients and six radiographers with varying levels of work experience focusing on their differences in model size and language generation capabilities. Success rates and responses were analysed. The methods of radiographers in convincing virtual patients to undergo MRI despite claustrophobia were also evaluated.

**Results:** A total of 60 simulations were conducted, achieving a success rate of 96.7% (58/60). ChatGPT-3.5 exhibited errors in 40% (12/30) of the simulations, while ChatGPT-4 showed no errors.

In terms of radiographers' communication during the simulations, out of 164 responses, 70.2% (115/164) were categorized as "Supportive Instructions," followed by "Music Therapy" at 18.3% (30/164). Experts mainly used "Supportive Instructions" (82.2%, 51/62) and "Breathing Techniques" (9.7%, 6/62). Intermediate participants favoured "Music Therapy" (26%, 13/50), while Beginner participants frequently utilized "Mild Sedation" (15.4%, 8/52).

**Conclusion:** The simulation of clinical scenarios via ChatGPT proves valuable in assessing and testing radiographers' communication skills, especially in managing claustrophobic patients during MRI. This pilot study highlights the potential of ChatGPT in preclinical training, recognizing different training needs at different levels of professional experience.

**Implications for practice:** This study is relevant in radiography practice, where AI is increasingly widespread, as it explores a new way to improve the training of radiographers.

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**Abbreviations:** AI, Artificial Intelligence; GPT, Generative Pre-trained Transformer; LLM, Large Language Model; VP, Virtual Patient; MRI, Magnetic Resonance Imaging.

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<https://doi.org/10.1016/j.radi.2024.02.015>

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### Introduction

The consistent provision of effective communication by healthcare professionals is a crucial component in the success of patient care processes. Educational institutions across various health disciplines are increasingly allocating resources to enhance communication skills training. Despite these efforts, tangible improvements are often not evident, and the impact of post-graduate clinical experience in this area appears to be limited.<sup>1–3</sup>

In the literature, studies have suggested and supported the possibility of improving the teaching and training of

communication skills of healthcare professionals and generic workers using artificial intelligence (AI) software,<sup>4</sup> such as virtual assistants or chatbots.<sup>5</sup>

One of the most well-known and popular chatbot is the free-to-use Chat Generative Pre-trained Transformer (ChatGPT). ChatGPT developed by OpenAI, is a Large Language Model (LLM), an advanced AI algorithm trained to process and generate human-like text. It learned from extensive language data, enabling it to understand and respond with contextually relevant information, optimized for dialogue using Reinforcement Learning with Human Feedback (RLHF),<sup>6,7</sup> a method that uses human demonstrations and preference comparisons to guide the model toward desired behaviour. The two most recent versions of ChatGPT are built on GPT-3.5 and GPT-4.<sup>8</sup>

Since its release in November 2022, the benefit of using ChatGPT in different scientific contexts has been tested. Sallam M. (2023) published a systematic review of the literature on the use of ChatGPT in healthcare education, research, and practice, identifying benefits in healthcare academic/scientific research, clinical practice, and education.<sup>9</sup>

ChatGPT presented good skills in writing abstracts<sup>10,11</sup> and scientific articles,<sup>12,13</sup> answering questions and supporting decisions during medical activities,<sup>14–16</sup> making radiology reports more understandable to patients,<sup>17</sup> generating educational contents<sup>11,18</sup> and demonstrating ability to pass university exams at the level of medical or radiography student.<sup>19–21</sup>

The idea of combining the possibility of improving the communication skills of healthcare professionals through the use of chatbots and the benefits that an LLM software can bring to healthcare has already been explored by some authors<sup>22,23</sup> who proposed using the ChatGPT language model to create a role-playing game with the goal of simulating a doctor-patient conversation in order to provide educational feedback to the user in real-time. Currently, no study has evaluated the same possibility in a radiological examination context.

Indeed, patient communication plays an important role in medical imaging, not only in communicating the results of a radiological investigation, but also in involving patients and relatives in decisions, in providing operational instructions during examinations, and above all alleviating pain, fear, and anxiety.<sup>24</sup> About the fear and anxiety episodes of medical imaging patients, MRI (Magnetic Resonance Imaging) represents the diagnostic investigation where an increase in patient anxiety is reported in 29–56% of cases, with claustrophobia being the most prominent cause, with a 0.46–5.29% incidence of premature exam termination rate.<sup>25–27</sup> Therefore, communication with the patient becomes important to reduce the anxiety caused by claustrophobia and to improve the patient's experience during the MRI.<sup>28,29</sup>

The aim of this study is to explore the possibility of constructing scenarios related to an MRI examination in which a radiographer can role-play with a simulated patient suffering from claustrophobia using ChatGPT. The final purpose is to test whether it is possible to create an effective educational approach that includes a combination of formal didactics, role-playing, and encounters with simulated patients.

Our pilot study also aims to conduct a comparative analysis between ChatGPT-3.5 and ChatGPT-4, with a focus on assessing their efficacy in simulating clinical dialogues and identifying the improvements from GPT-3.5 to GPT-4.

## Methods

This pilot study was conducted over a three-month period, from May to July 2023, using the generative language models ChatGPT-3.5 and ChatGPT-4 developed by OpenAI.<sup>30</sup> These deep learning models

are based on a neural network architecture known as Transformer,<sup>31</sup> which enables them to generate high-quality natural text in response to a series of prompts. These language models have been used here to simulate conversations between radiographers and virtual claustrophobic patients undergoing MRI scans. Access to ChatGPT was obtained through a subscription to the OpenAI website.

### Selection of participants

Six radiographers were selected to participate in the study. These participants were chosen to represent a range of experience levels in the field of radiography. Specifically, we selected two experienced radiographers with at least 15 years of experience using MRI, identified as Expert 1 (E1) and Expert 2 (E2), two intermediate radiographers with at least 5 years of experience, identified as Intermediate 1 (I1) and Intermediate 2 (I2), and two novice radiographers with less than 5 years of experience, identified as Beginner 1 (B1) and Beginner 2 (B2). This diversity of expertise allowed us to explore how professional experience might influence the radiographer's ability to interact effectively with an artificial language model in a simulated clinical setting. Gender parity of participants (3 females and 3 males) was also ensured.

As this study was conducted in Italy and registered as quality assurance in training project, it employed a purposive sampling method and was exempted from approval by the Lombardy 6 Territorial Ethics Committee as it did not aim at “providing new knowledge about health and disease”. Furthermore, no patient information was included, and the study did not require informed consent from patients. The radiographers were informed about the study in advance. A confidentiality statement was valid for the data collection.

### Virtual patients' characteristics

To ensure that the simulated interactions were as representative as possible of real clinical interactions, we established a set of characteristics for the “virtual patients” based on the characteristics identified in patients most likely to suffer from claustrophobia during an MRI examination.<sup>32</sup>

In this specific context, five Virtual Patients were developed, ranging from the simplest “Virtual Patient 1 (VP1)” to the most complex “Virtual Patient 5 (VP5)”. The characteristics of these patients were identified considering various factors such as the type of examination to be conducted. In particular, different age groups, genders and types of MRI diagnostic examination were identified and associated with a varying incidence of claustrophobia and, consequently, a varying degree of difficulty in the conversation with the patient undergoing an MRI (Table 1).<sup>27</sup>

The starting input prompts for this study were designed to represent a range of degrees of claustrophobia and conversational complexity. Five different prompts associated with the five levels of patient conversation difficulty were constructed. For example, the “Virtual Patient 1” level simulates a patient who is unsure whether he or she has claustrophobia and is undergoing an MRI for the first time in a body district that does not involve full entry into the MRI gantry. In contrast, the prompt for the “Virtual Patient 5” level simulates a patient who suffers from severe claustrophobia and has a strong resistance to undergoing an MRI scan.

Full prompts are published in GitHub repository for data sharing [dataset].<sup>33</sup>

### Starting prompt development

The main method for starting a role-playing game with ChatGPT is to create an effective initial input prompt. To model an initial

**Table 1**  
Characteristics of “virtual patients”.

	Age (no. of years)	Gender	Type of MRI exam	Patient's enter	Severity of claustrophobia	Failed previous MRI exams
Virtual Patient 1 (VP1)	24	Male	Knee	Feet first	+	No
Virtual Patient 2 (VP2)	45	Female	Abdomen	Head first	++	No
Virtual Patient 3 (VP3)	45	Male	Brain	Head first	+++	No
Virtual Patient 4 (VP4)	55	Female	Abdomen	Head first	++++	Yes
Virtual Patient 5 (VP5)	60	Female	Brain	Head first	+++++	Yes

input request, two examples reported in the literature were considered. The first involved an input based on a simulated business negotiation,<sup>34</sup> the second involved the simulation of a scenario in a medical setting.<sup>23</sup> An input request had to include information on the type of scenario the author wished to simulate and the role the author wanted ChatGPT to play. The prompts then described the patient's characteristics and the scenario according to the difficulty level and role-playing rules so that ChatGPT could initiate the conversation scenario.

To maintain linguistic consistency and relevance for our participants, all simulations and prompts were conducted in Italian, catering specifically to the native language of our Italian-speaking participants, ensuring that the proposed actions were presented in their mother tongue. Furthermore, for broader accessibility and documentation purposes, the prompts have also been translated into English and made available on GitHub.

Two-minute scenarios were implemented to mirror clinical practice, underscoring the necessity for rapid decision-making and efficient communication, which are essential in real-world clinical settings, rather than serving as a constraint on the scenario itself. Utilizing ChatGPT Playground, an interactive web interface provided by OpenAI,<sup>35</sup> that allows users to experiment with and fine-tune the responses of the ChatGPT model by adjusting parameters, providing prompts, and viewing the AI's outputs in real-time, the team evaluated GPT's responsiveness, the coherence of its responses, and the adaptability of virtual scenarios. Drawing from the genuine experience of interacting with a patient scheduled for an MRI,<sup>36</sup> this dynamic testing environment was essential for refining scripts to reflect real-world clinical situations. Two senior radiographers (G.R.B. and D.C.) assessed the applicability and credibility of the scenarios, as well as the realism of the interactions presented. In the context of this study, the team adopted a zero-shot method.<sup>37,38</sup> This method refers to an approach for prompting an LLM to generate text without providing any specific instructions or examples. This method was designed to ensure that the LLM's responses are not biased by the prompts and are instead based on its understanding of the task and the information it has been trained on.

There are several advantages to using the zero-shot method for instance, it allows the LLM to generate more creative and original responses, as it is not limited by the predefined rules of the prompts.<sup>37,38</sup>

#### Study design flow

The study was conducted in several phases, each of which contributed to a different aspect of our research objective.

- Preparation phase: During this phase, the team recruited participants and designed conversation prompts for “virtual patients”.
- Simulation phase: In this phase, each participant conducted a series of conversations with “virtual patients” using ChatGPT language prompts. Each participant went through a series of clinical scenarios, each of which required handling a patient

with claustrophobia who had to undergo an MRI. Each participant used a new dialogue box for every scenario, thereby guaranteeing that each simulation was conducted in isolation from the others and every simulation, the participants always introduced themselves to the virtual patient.

- Evaluation phase: After each simulation, participants were asked to provide feedback on the conversation with the virtual patient based on their experience. This feedback was useful to determine the effectiveness of ChatGPT as a simulator of clinical conversations.

The study employed quantitative and qualitative analyses, providing mean scores and standard deviations for each dimension, and examined the simulations, success rates, and responses of virtual patients and participants. The latter evaluation focused on the effectiveness of the radiographers in convincing the virtual patient to undergo MRI despite claustrophobia, mapping the variety of techniques utilized in simulations and evaluating their effectiveness based on participant experiences.

This involved recording the number of responses needed to convince the virtual patient and documenting the methods used to support patients with claustrophobia, as outlined in Al-Shemmari et al. (2022) by using “Supportive instructions”, “Mild sedation”, “Musical therapy”, “Virtual reality” and “Breathing technique”.<sup>29</sup>

#### Comparison of ChatGPT-3.5 and ChatGPT-4

A secondary objective of our study was to compare the effectiveness in simulating clinical conversations of two different versions of ChatGPT, i.e. the ones based on GPT-3.5 and GPT-4, which differ in terms of model size and language generation capability. The participants experienced all the virtual patients with Chat GPT-3.5 and then performed the same scenarios with Chat GPT-4. To compare these two models, the team submitted the same simulation to participants with both versions.

#### Results

All simulations were performed with ChatGPT-3.5 and ChatGPT-4 for analysis and comparison of results. Using both versions of ChatGPT, the study comprised 60 simulations.

For each simulation, the software's ability to credibly recreate the clinical scenario was evaluated, including counting the number of errors made by the chatbot (e.g. role change during simulation). The simulations performed had a success rate of 96.7% (58/60 simulations), where success was defined as the simulation concluding with the virtual patient agreeing to proceed with the examination. Conversely, a failure is when the virtual patient refuses to proceed. The issues identified in the two cases of failure were due to overly restrictive conversations by the radiographers, leaving no room for further dialogue. This aspect could be more thoroughly investigated with a larger sample size to allow for a more accurate assessment and to understand whether it can be attributed to ineffective communication approaches or a bias in the LLM.

ChatGPT-3.5 made errors in 40% of the simulations (12/30) and never made errors during the simulations performed with ChatGPT-4 (0%, 0/30). The errors consisted of a change in the role of the chatbot from patient to radiographer. These errors were corrected directly by the participant calling the chatbot back to the correct role.

Regarding the radiographers' ability to convince the virtual patient to perform the MRI investigation despite claustrophobia, as shown in Fig. 1 we considered all the textual messages from the participants in all 60 simulations. The study included a total of 584 interactions between the participants and the virtual patient. Of these, the team identified 164 distinct responses aimed at convincing the claustrophobic "virtual patient" to perform an MRI examination, regardless of the level of difficulty. On average, the scenarios lasted 1 min 45 s, with a variability of plus or minus 10 s. In detail, 70.2% (115/164) of the responses used are in the field of "Supportive instructions", followed by "Musical therapy" (30/164, 18.3%), "Mild sedation" (11/164, 6.7%), "Breathing techniques" (8/164, 4.8%) and "Virtual reality" (0/164, 0%).

Analysing participants' responses to their different experiences, Experts used 62 out of 164 responses (37.8%), mainly "Supportive instructions" (51/62, 82.2%), followed by "Breathing techniques" (6/62, 9.7%), "Musical therapy" (4/62, 6.5%) and "Mild sedation" (1/62, 1.6%).

Intermediate participants used 50 out of 164 responses (30.5%), mainly "Supportive instructions" (33/50, 66%), followed by "Musical therapy" (13/50, 26%), "Mild sedation" and "Breathing techniques" both 4% (2/50).

Instead, Beginners used 52 out of 164 responses (31.7%), mainly "Supportive instructions" (31/52, 59.6%), followed by "Musical therapy" (13/52, 25%) and "Mild sedation" (8/52, 15.4%). As shown in Fig. 2, across all simulations, the usage of techniques at different levels of virtual patients has been analysed. The data analysis confirms the separately observed trends. Specifically, supportive instructions (115/164 70.1%) and musical support (30/164 18.3%) are the most used techniques across all levels of experience and difficulty.

Interestingly, on average, supportive instructions were applied 3.8 times per simulation, while musical therapy was used about once per simulation.

Beginners, on the other hand, show a more balanced use between musical therapy and mild sedation ( $10.5 \pm 2.5$ ), compared to experts and intermediates ( $0.575 \pm 0.045$ ), even though they use mild sedation more frequently compared to the other two groups.

Through a qualitative analysis, among the various techniques analyzed, Supportive Instructions and Musical Therapy have been identified as the most effective. Specifically, Supportive Instructions positively convinced the virtual patient in 31 out of 60 responses (18.90%), while Musical Therapy did so in 22 out of 60 responses (13.41%). It's important to emphasize that in evaluating the effectiveness of methods, it must be considered that combinations of techniques can occur in interactions with virtual patients to optimize the convincing process. Participants provided positive feedback on the simulation experience. They expressed that engaging in a conversation with a "virtual patient" closely mirrored the dynamics of interacting with a real patient.

Additionally, all participants acknowledged the significant training value embedded in the simulation. They recognized its efficacy in honing the skills required to employ similar techniques effectively with actual patients. This underscores the simulation's practical utility as a preparatory tool for real-world scenarios.

## Discussion

### Preclinical simulation

Our pilot study delved into the development of a simulation involving an MRI examination, wherein radiographers engaged in role-playing scenarios with a "virtual patient" experiencing claustrophobia, facilitated by prompts generated through different versions of ChatGPT.

The use of LLMs and LLM-based chatbots has shown potential in research and teaching methods. AI chatbots can play a crucial role in creating learning assessments and generating exercises, quizzes, and scenarios that can be used in a classroom context to aid in student practice and evaluation.<sup>39</sup> Another aspect evaluated in previous studies is the capabilities of LLMs in decision-making and radiology reporting to enhance the stages of clinical practice and reporting.<sup>40–43</sup> Other innovative training methods use technologies

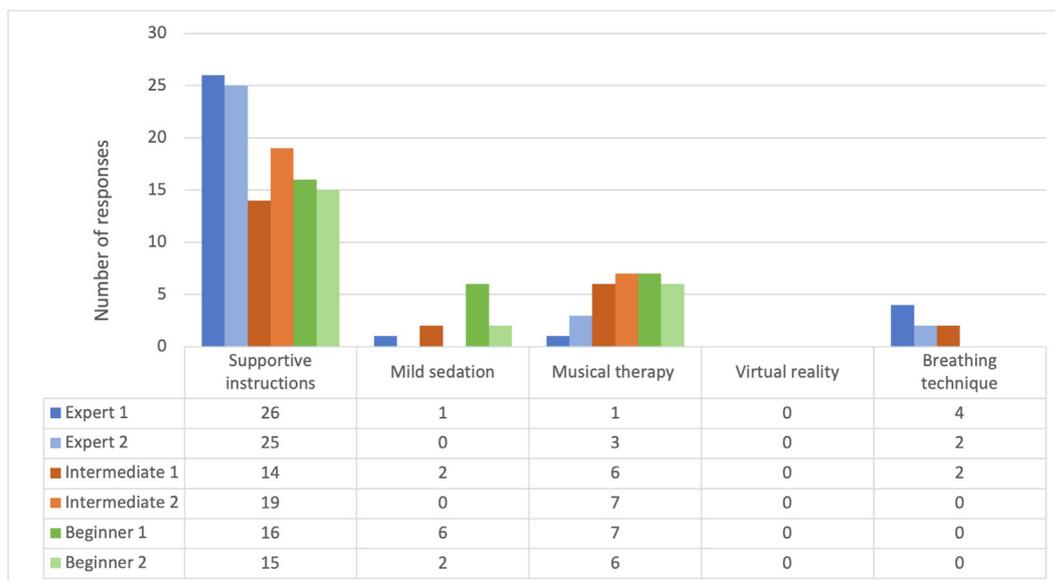
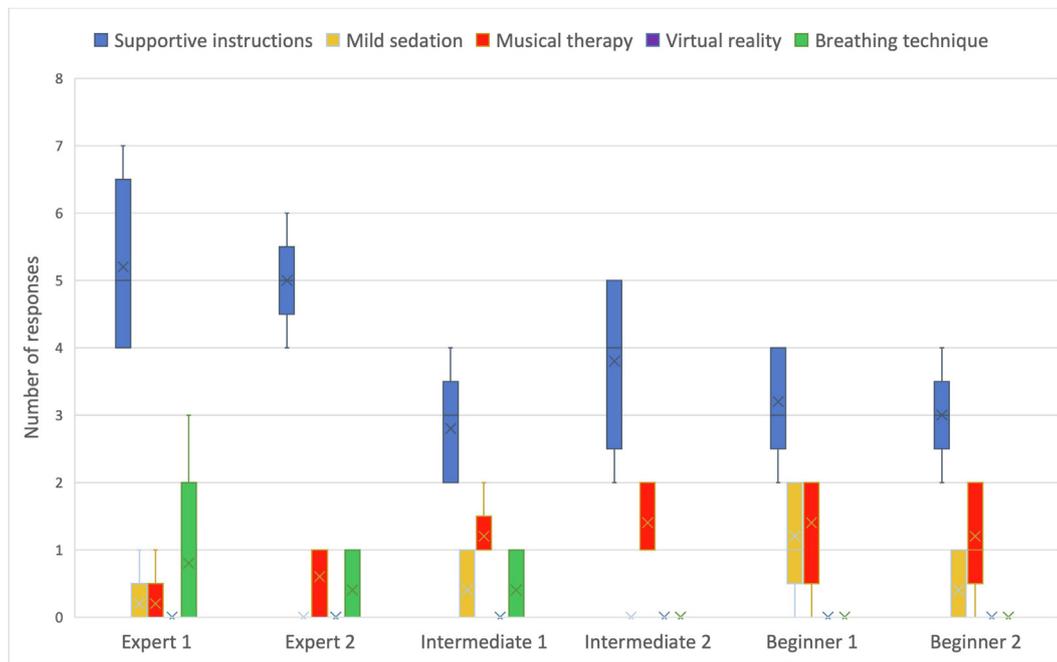


Figure 1. Number of responses needed to persuade the patient per participant.



**Figure 2.** The use of methods for supporting patients with claustrophobia at different levels of virtual patients. [Supportive instructions (blue); mild sedation (orange); Musical therapy (red); Virtual reality (purple); Breathing technique (green)].

such as Virtual Reality, which focus primarily on improving technical skills and familiarity with procedures.<sup>44–46</sup>

In our study, the team explored something different using ChatGPT, which represents a new training avenue for radiographers. This approach not only allows them to evaluate their skills but also to experiment with cutting-edge communication strategies, customized for a wide range of professional expertise levels.

Our investigation focused on simulating a conversation scenario with a patient afflicted by claustrophobia undergoing an MRI. This allowed participants to evaluate their knowledge in a controlled, preclinical environment.

Studies show that managing claustrophobia and stress before performing an MRI examination can increase scan quality,<sup>36</sup> decrease scan disruptions<sup>47,48</sup> and lead to greater patient cooperation.<sup>49,50</sup>

This approach can be extended to construct diverse clinical simulations, exploring scenarios where radiographers interact with patients during different diagnostic procedures.

Research on mammography procedures underscores the importance of communication strategies concerning the mammography process, breast compression, and pain management as critical topics for effectively managing patient anxiety.<sup>51,52</sup> Similarly, in radiotherapy sessions, addressing anxiety related to cancer risk and treatment success is a fundamental aspect of the patient's experience.<sup>53</sup> Through our pilot study, the necessity for radiographers to utilize communication skills to improve patient care and support is emphasized, identifying this skill as a key focus in their professional training. The integration of ChatGPT in these simulations holds the potential to foster the acquisition of new knowledge and the refinement of existing skills in patient communication techniques.

Our initial approach included evaluating advanced language models such as GPT-4 and Google's Bard,<sup>54</sup> especially its latest version, Gemini. These models were chosen for their advanced capabilities and relevance to our study's goals.

During our research, we faced a limitation with Bard. Despite its advancements, Bard does not support simulating realistic patient

dialogues, a key component of our study. This limitation is not just technical but also reflects the ethical considerations in language model design. Bard's inability to simulate patient interactions highlights the ethical safeguards that integrated into AI systems, especially in sensitive areas like healthcare.

Our decision to focus on GPT-4 was based not only on its technical superiority but also on its alignment with our research requirements, emphasizing our commitment to a comprehensive and ethically responsible study.<sup>55</sup> Therefore, our study should be seen as an exploration of the capabilities and limitations of current language models within the ethical boundaries of AI research.

In doing this, we found particularly insightful the possibility to evaluate the progress of the current version of ChatGPT, i.e. the one based on GPT-4, with the previous one, based on GPT-3.5, since the latter can be considered as a baseline for a series of comparative observations.

The team advocates for a balanced and critical approach in adopting such technologies, emphasizing the need for ongoing dialogue and reflection on the ethical implications of AI across various fields.<sup>56</sup>

### Knowledge analysis

Exploiting ChatGPT's text-based capabilities, a comprehensive quantitative analysis of radiographers' communication skills was conducted, focusing on their interactions with claustrophobic patients undergoing MRI examinations. The simulation allowed for an examination of participants' skills and techniques in managing these scenarios.

A notable finding was the prevalent use of "Supportive instruction" across all experience levels (radiographer-based) and difficulty levels (case-based).

This consistent application underscores its perceived significance in effectively managing claustrophobic patients, regardless of the complexity of the case or the participants' professional experience, in accordance with the study by AI-Shemmari (2022).<sup>57</sup>

The literature shows that MRI anxiety can be reduced effectively if only by providing patients with standard information about the examination and the scans to be performed.<sup>58,59</sup> Other studies show that a simple change such as being on a first-name basis with the patient is important to the patient.<sup>60,61</sup> Instructions to the patient can be minimized due to the time the radiographer can spend communicating with the patient due to keeping the scanner busy and decreasing procedure changeover times. The team pointed out that our study and the choice of giving 2 min of time in the simulation is in line with the evidence that shows a trend to decrease the time spent with the patient increasingly.

Wen X et al.<sup>62</sup> demonstrate that music therapy is a safe, non-invasive, non-pharmacological and inexpensive method for the patient to reduce anxiety and improve comfort in patients undergoing MRI examinations. Other evidence shows that in more complex cases, the operator can recommend relaxation techniques to reduce anxiety and allow for a high-performance examination.<sup>47,63</sup> Breathing control and behavioral relaxation training are useful for reducing anxiety and normalizing elevated blood pressure.<sup>61,64,65</sup>

In line with the findings of previous studies,<sup>66,67</sup> this suggests that the use of these techniques may vary based on radiographers' experience, with more experienced practitioners preferring approaches that require more collaboration such as "Breathing techniques".

Xiaoyu Wang et al.<sup>68</sup> point out that a rational choice must be made based on patient compliance, examination duration, and examination site, taking into account the specific characteristics of each patient. This assessment emerged among beginners with a tendency to use 'mild sedation' techniques, even at lower levels of difficulty in contrast to radiographers with high levels of experience. Other studies show that communicating with the patient with recorded films or using Virtual Reality can contribute to a decrease of anxiety.<sup>45,69</sup> Although the topic is highlighted, the use of Virtual Reality in managing claustrophobic patients was not considered by any participants.<sup>70</sup> The probable reason for not incorporating Virtual Reality in the simulations could be attributed to the absence of this technology in our institute, thereby creating an implicit bias among the participants. This absence may indicate a limited integration of virtual reality in clinical practices and a potential gap in radiographers' awareness and knowledge.<sup>67</sup>

These disparities in technique preferences across experience levels highlight potential variations in skills, comfort levels, or preferences among radiographers. As indicated in the literature, emphasise that the use of simulation can provide students with an active learning experience, closely modelled on real-life situations, which creates a bridge between theory and practice.<sup>70,71</sup> This information can be instrumental in identifying training gaps, enabling the development of targeted courses or workshops to enhance staff proficiency in diverse clinical scenarios.

### Limitations

While ChatGPT holds considerable potential for medical education, particularly in the training of radiographers, it is not without limitations that may hinder its large-scale implementation. Notably, as ChatGPT is not specifically designed for clinical simulations, the accuracy and reliability of its responses cannot be guaranteed. Research has indicated that its medical responses are "mostly and almost completely correct", which falls short of the precision required for an educational tool.<sup>72</sup>

Furthermore, a distinction exists between the functionality of the freely accessible GPT-3.5 and the fee-based GPT-4. The latter demonstrated a zero-error rate during simulations, emphasizing

the importance of using the most updated software for enhanced reliability in future simulations.

These results in this study could potentially be achieved with other LLM models as well, hence this experimentation is not aimed at advocating one model over another.<sup>73</sup>

While virtual role-playing games facilitated by ChatGPT can be valuable, it is crucial to acknowledge their limitations. They cannot fully replace real conversations with patients, particularly when moving from textual to face-to-face interactions. Exploring additional software that replicates voice conversations with patients through video and microphone capabilities may be desirable for a more comprehensive training experience.

Additionally, when utilizing interactive software like ChatGPT, it is essential to consider biases in algorithms. As the model draws information mainly from web sources, responses generated may inadvertently reflect social and systemic biases. While these biases were not perceived in our simulations, it is essential to recognize that algorithms, being created by humans, may inadvertently incorporate implicit and explicit biases.<sup>74</sup> Ongoing awareness and efforts to mitigate biases should be integral to the responsible use of such technology in education and training.

Following this pilot study, the aim is to increase the number of radiographers and students by integrating the collection of participants' opinions in future studies, using structured methods such as surveys or interviews, to gain a deeper understanding, improve our research results and communication models for evaluating participants and further improve evaluation performances.<sup>75–77</sup>

### Conclusions

The integration of ChatGPT into the training of radiographers proves to be a valuable tool for assessing and enhancing the preparedness of professionals, ultimately contributing to the improvement of patient care.

In our specific case, the utilization of ChatGPT in simulations provided a comprehensive analysis of radiographers' knowledge, considering varying experience levels, particularly in managing claustrophobic patients undergoing MRI examinations. The discerned patterns in the use of specific communication techniques suggested a need for tailored training approaches based on the distinct requirements of professionals at different experience levels.

In conclusion, this pilot study not only underscores the utility of advanced AI techniques in training scenarios but also emphasizes the importance in the educational field for training health personnel and maintaining skills. Acknowledging and addressing the specific needs of professionals across various experience levels are pivotal for optimizing the effectiveness of training methodologies in the field of radiography.

### Conflict of interest statement

All authors of this manuscript declare no relationships with any companies whose products or services may be related to the subject matter of the article.

### Acknowledgements

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

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# QUESTIONNAIRE

A10(25)

## Harnessing ChatGPT dialogues to address claustrophobia in MRI - A radiographers' education perspective

### INSTRUCTIONS

- Read through the article and answer the multiple-choice questions provided below.
- **Some questions may have more than one correct answer;** in which case you must mark **all** the correct answers.

### Abstract

**Question 1:** What was the main aim of the study discussed in the article?

- A:** To use ChatGPT to simulate radiographer-patient conversations in preparation for an MRI scan
- B:** To use ChatGPT to reduce the duration of MRI scans
- C:** To use ChatGPT to simulate radiographer-patient conversations about the critical moment of claustrophobia management during MRI

**Question 2:** Which version of ChatGPT showed no errors during simulations in this study?

- A:** ChatGPT-3.5
- B:** ChatGPT-2
- C:** ChatGPT-4
- D:** ChatGPT-1

**Question 3:** What was the most commonly technique used by radiographers during the simulations?

- A:** Mild sedation
- B:** Supportive instructions
- C:** Virtual reality
- D:** Breathing techniques

**Question 4:** Which group of radiographers primarily used "Breathing Techniques" during the simulations?

- A:** Beginners
- B:** Intermediate participants
- C:** Experts
- D:** All participants equally

### Introduction

**Question 5:** What percentage of patients report increased anxiety during MRI procedures?

- A:** 19-26%
- B:** 29-56%
- C:** 69-76%
- D:** 69-96%

**Question 6:** What is the incidence of premature exam termination due to claustrophobia during MRI?

- A:** 0.36-4.29%
- B:** 0.46-5.29%
- C:** 0.56-3.29%
- D:** 0.66-4.29%

### Methods

**Question 7:** Which of the following statements are TRUE with reference to the characteristics of virtual patients selected?

- A:** They ranged from the simplest (Virtual Patient 1 – VP1) to the most complex (Virtual patient 5 – VP5)
- B:** The type of examination to be conducted was NOT considered
- C:** They all had illustrated similar levels of claustrophobia during previous MRI scans

**Question 8:** Which type of patient was simulated in the most complex scenario?

- A:** Older, patients living alone with no social support structure and with several chronic conditions
- B:** Patients with mild claustrophobia who "believed" that an MRI will trigger severe claustrophobia
- C:** Patients with severe claustrophobia and strong resistance to undergoing an MRI scan
- D:** Patients with no previous MRI experience

**Question 9:** What is one of the advantages of using the zero-shot method in ChatGPT simulations?

- A:** It allows the LLM to generate more creative and original responses
- B:** It requires detailed prompts for each scenario
- C:** It is limited to specific clinical tasks
- D:** It restricts the use of AI in clinical settings

**Question 10:** How were the radiographers' abilities evaluated in this study?

- A:** Through peer group evaluation
- B:** By assessing the number of responses needed to convince the virtual patient
- C:** By the time spent on each simulation
- D:** By observing their interaction with real patients

## Results

**Question 11:** What was the overall success rate of the simulations in this study?

- A: 79.7%
- B: 89.7%
- C: 96.7%
- D: 100%

**Question 12:** Which trends were confirmed by the data analysis regarding the techniques used across all levels of experience and difficulty?

- A: Virtual reality was used most
- B: Supportive instructions were the most frequently used
- C: Music therapy was not effective
- D: Breathing techniques were the least effective

**Question 13:** Which method was **NOT** considered by any participants during the simulations?

- A: Virtual reality
- B: Music therapy
- C: Mild sedation
- D: Supportive instructions

## Discussion

**Question 14:** Is it **TRUE** that other studies show that being on a first name basis with the patient is important to the patient?

- A: YES
- B: NO

**Question 15:** Is the following statement **TRUE** or **FALSE**?  
“Studies show that managing claustrophobia and stress before performing an MRI examination can increase scan quality, decrease scan disruptions and lead to greater patient cooperation”.

- A: TRUE
- B: FALSE

**THE END**



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**ANSWER SHEET**

**A10(25)**

Harnessing ChatGPT dialogues to address claustrophobia in MRI - A radiographers' education perspective

	*Time spent on activity						hour					min				
	A	B	C	D	E		A	B	C	D	E	A	B	C	D	E
1						9										
2						10										
3						11										
4						12										
5						13										
6						14										
7						15										
8																

How relevant was the content of this activity to your scope of practice?			
			
Not at all	Somewhat	Mostly	Extremely

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