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Enhancing CT Examination Efficiency with ChatGPT-4o for Multilingual Hajj Pilgrims: A Short Communication

Abstract

Introduction/Background: The annual Hajj pilgrimage brings millions of Muslims from diverse linguistic backgrounds to Makkah, Saudi Arabia. This poses significant communication challenges in medical settings, particularly during complex procedures like computed tomography (CT) examinations. In 2024, a tertiary care hospital integrated ChatGPT-4o real-time translation technology to address these challenges. This short communication aims to provide an initial assessment of the effectiveness of ChatGPT-4o in improving communication, procedure quality, and examination efficiency for multilingual Hajj pilgrims.

Methods: This quantitative study, conducted in the radiology department, analysed data from two periods: June 20 to July 8, 2023, and June 7 to June 23, 2024. Ethical clearance was obtained, and key variables measured included examination time (in minutes), patient throughput (cases per shift), and the number of scans with artifacts. Feedback on communication and satisfaction was gathered from both patients and radiographers. Paired t-tests were used to compare mean values of examination times, throughput, and artifact occurrence between the two periods, with a significance level set at $P < 0.05$.

Results: A paired t-test revealed a statistically significant ($p < 0.01$) reduction in mean examination time (from 15.4 (2.1) minutes in 2023 to 11.1 (1.7) minutes in 2024) following the introduction of ChatGPT-4o. This reduction corresponded with an increase in mean (standard deviation) patient throughput from 49.5 (4.8) cases per shift in 2023 to 56.2 (5.3) cases per shift in 2024 ($P < 0.01$). The number of scans with artifacts also decreased significantly, from 30 out of 748 scans in 2023 to 8 out of 885 scans in 2024 ($P < 0.01$).

Discussion: The integration of ChatGPT-4o significantly improved communication between healthcare providers and patients, leading to better compliance with procedure instructions and fewer repeat scans. Training programs facilitated efficient use of the technology by radiographers, further improving workflow efficiency. Despite initial integration and acceptance challenges, patients and radiographers reported high satisfaction with the improved communication and reduced stress levels.

Conclusion: This study demonstrates that ChatGPT-4o real-time translation improved patient communication, procedure quality, and examination efficiency. The technology reduced examination times and increased patient throughput, with positive feedback from patients and radiographers, indicating its effectiveness in multilingual medical settings.

Keywords: *ChatGPT-4o | CT | Hajj Pilgrims | Multilingual Communication | Medical Imaging*

Introduction

The annual Hajj pilgrimage brings together millions of Muslims from diverse linguistic backgrounds to Makkah, Saudi Arabia, creating significant communication challenges in medical settings ^[1]. This is especially true for complex procedures such as computed tomography (CT) examinations, which require precise instructions to ensure accurate and safe examinations ^[2]. For example, patients must understand and be able to respond to screening questions, such as contrast safety checks. During the examination, patients must be able to follow instructions such as “hold your breath” or “remain very still,” which are essential for obtaining high-quality diagnostic images. At the end of the examination, patients need to understand aftercare instructions, such as staying hydrated, to ensure proper recovery. Misunderstandings due to language barriers can lead to poor compliance, repeat scans, adverse events, and increased radiation exposure ^[3].

Effective communication between healthcare providers and patients is critical in ensuring accurate diagnostics and patient satisfaction ^[4-6]. Language barriers can lead to misunderstandings, patient anxiety, and suboptimal imaging outcomes ^[3]. The introduction of ChatGPT-4o translation powered by OpenAI, is capable of real-time translation in multiple languages, provided a novel solution to these challenges.

ChatGPT-4o offers real-time translation capabilities across a broad spectrum of languages, including but not limited to English, Spanish, French, German, Chinese, Japanese, Arabic, Hindi, and Russian, ensuring effective communication in a global context. ChatGPT-4o real-time translation leverages advanced natural language processing (NLP) technology to facilitate accurate translation in medical settings. The system uses NLP algorithms to convert spoken language into text, which is then processed through a large-scale language model ^[7]. This model translates the text into the desired language and considers context, tone, and medical terminology to ensure

accuracy. After translation, the text is synthesised back into speech, allowing for seamless communication ^[8]. The system operates by listening to the speaker via a microphone, quickly processing the audio input to recognise spoken words, and then performing the translation with a high degree of precision, considering nuances specific to medical communication. This translation is contextually aware, ensuring that medical terminology and nuanced instructions are accurately conveyed. Finally, the translated text is converted back to speech using text-to-speech technology, allowing for seamless, bidirectional communication between healthcare providers and patients in real-time ^[9]. This integration of speech recognition, machine translation, and speech synthesis creates a smooth and efficient multilingual interaction, crucial in high-stakes environments such as medical imaging during the Hajj pilgrimage.

The diversity of the Hajj pilgrims includes languages such as Chinese, Urdu, Bahasa Indonesia, Turkish, and French ^[10]. ChatGPT-4o facilitated immediate, clear communication by translating these precise instructions into the patient's native languages, significantly improving their understanding and compliance. This short communication aims to share our experience with this integration, detailing how ChatGPT-4o facilitated immediate and clear communication by translating instructions into the native languages of patients, significantly improving their understanding and compliance. We examined the impact of this artificial intelligence (AI) technology on patient communication, procedure quality, and workflow efficiency compared to the previous year when it was not employed. In 2024, the integration of ChatGPT-4o real-time translation technology in a tertiary care hospital's medical imaging department aimed to address these challenges, thereby enhancing communication and optimising CT examinations.

Methods

Research Design

This study utilised a quantitative, retrospective design to assess the impact of integrating ChatGPT-4o, a general version of ChatGPT (OpenAI, San Francisco, CA) on communication, procedure quality, and operational efficiency in the medical imaging department of a tertiary care hospital. The study compared data collected during two distinct periods in 2023 and 2024 to evaluate the effectiveness of the intervention. Initially, the process involved a thorough assessment of existing workflow procedures and the identification of critical points where language barriers most significantly impeded patient care and scan efficiency. Training sessions were held to ensure radiographers were proficient in using the application, emphasising practical usage and troubleshooting. Detailed training sessions were conducted to ensure radiographers were proficient in using the ChatGPT-4o application, focusing on practical usage, troubleshooting, and addressing communication barriers during CT procedures. CT radiographers were equipped with smartphones capable of running the ChatGPT-4o application, which leveraged advanced NLP to provide real-time translations. This enabled effective communication with patients in their native languages whenever necessary. Establishing protocols for the appropriate use of the translation tool was a crucial part of the implementation (**Table 1**). Regular meetings were held to discuss challenges and share best practices among the staff.

Population and Sampling Technique

The study population consisted of patients undergoing CT examinations during the Hajj pilgrimage, a period characterised by a high volume of patients from diverse linguistic backgrounds. A purposive sampling technique was employed to select cases where language barriers were anticipated to have a significant impact on communication and examination

outcomes. The sampling specifically included patients requiring real-time translation for understanding and complying with medical instructions, which had the potential to affect scan quality and efficiency. The sampling focused on non-native speakers who required translation services to understand and comply with medical instructions.

Inclusion and Exclusion Criteria

Patients were included in the study if they were non-native speakers of the primary language used in the hospital, required a CT examination, and participated in the study during the designated data collection periods. Additional inclusion criteria required that patients be able to consent to translation services and provide feedback on the process. Patients who were able to communicate effectively in the hospital's primary language or those who required urgent, life-saving procedures (where translation might delay care) were excluded from the study.

Data Collection Process

Data on examination times and patient throughput were extracted from the Picture Archiving and Communication System (AGFA Healthcare Enterprise Imaging 8.1.2 SP5.7) for the periods of June 20 to July 8, 2023, and June 7 to June 23, 2024. Artifacts were identified by radiologists as image distortions hindering interpretation and recorded in a standardised form. Key metrics included examination times, patient preparation times, and the number of scans affected by artifacts, which were logged. Additionally, patients' feedback on communication clarity and satisfaction was collected both orally immediately after the procedure and via a structured service satisfaction survey. Radiographer feedback on ChatGPT-4o's effectiveness and its impact on workflow was gathered orally through focus group discussions. This feedback was recorded and categorised to assess the perceived impact of the translation technology on the examination process.

Data Analysis

Quantitative data, including mean and standard deviation values for examination times, request-to-scan times, and patient throughput, were calculated for both years. The number of scans with significant artifacts was also compared between the two periods. Statistical analysis was conducted using Jamovi 2.4.13 software (Jamovi, Greensboro, NC), and paired t-tests were performed to determine the significance of changes observed between 2023 and 2024, with a significance level set at $P < 0.05$. This analysis aimed to validate the effectiveness of the ChatGPT-4o integration in improving operational efficiency and communication.

Ethical Considerations

Before data collection commenced, the relevant institutional review boards approved this study. This short communication received approval from both the Hajj and Umrah Research Administration (NO H-02-K-001) and the Global Center for Mass Medicine in Saudi Arabia (NO IORG0011096). The study was conducted in accordance with ethical standards for research involving human participants.

Results

Integrating ChatGPT-4o real-time translation technology into the CT scan workflow improved communication between healthcare providers and patients, especially those facing language barriers. This technology enabled effective communication by translating complex medical instructions into the patient's native language, ensuring better understanding and compliance during the examination process. **Figure 1** demonstrates how ChatGPT-4o was seamlessly integrated into the CT examination workflow, reducing the reliance on human translators and minimizing delays in patient care.

Efficiency gains were measured by comparing the average time taken per patient for explanatory sessions and scan times between 2023 and 2024. The number of CT scans performed daily increased from an average (standard deviation) of 49.5 (4.8) scans per day in 2023 to 56.2 (5.3) scans per day in 2024. This improvement was primarily due to time saved in patient preparation and consent processes, which was then reallocated to performing additional scans. **Table 2** presents examples of patient languages and scan details during the Hajj pilgrimage in 2023, showcasing the communication challenges before the implementation of ChatGPT-4o.

The integration of ChatGPT-4o led to significant improvements in efficiency without compromising procedure quality or patient care. Enhanced communication resulted in better patient cooperation, reducing the need for repeat scans and optimising workflow. **Table 3** provides examples of patient language and scan details in 2024, following the integration, demonstrating these improvements.

Additionally, the integration led to a significant reduction in the average (standard deviation) 'request to scan time,' decreasing from 480 (60) minutes for in-patients and 180 (30) minutes for ER-patients in 2023 to 400 (50) minutes for in-patients and 60 (20) minutes for ER-patients in 2024 (**Table 4**). The average (standard deviation) 'acquisition time' for scans also decreased from 15.4 (2.1) minutes in 2023 to 11.1 (1.7) minutes in 2024 (**Figure 2**).

In 2023, 30 out of 748 CT scans were marred by significant artifacts, necessitating repeat scans or hindering radiologist interpretation. However, in 2024, following the integration of ChatGPT-4o, only eight out of 885 scans exhibited such artifacts. These reductions in request-to-scan time and the number of scans with artifacts reached statistical significance ($P<0.01$), further emphasising the technology's impact on improving patient communication and scan quality.

Discussion

Improving Communication

The use of ChatGPT-4o real-time translation has the potential to streamline the CT examination process when there is a language barrier, particularly in the crucial stages of obtaining patient consent, explaining the procedure, and providing detailed explanations before administering contrast media ^[11, 12]. Traditionally, CT radiographers or human translators, if available, spend considerable time explaining the procedure, potential sensations during the injection, and possible risks associated with radiation exposure. In many institutions there are a limited number of human translators available, typically they are proficient in only a few languages, which requires careful planning and can delay workflows ^[13]. For instance, patients need to be informed about the warm sensation they might feel when the contrast media is injected and the importance of remaining still during the scan to ensure high-quality diagnostic images. Additionally, patients often have concerns about the risks of radiation exposure and the procedure's overall safety, requiring thorough explanations, response to questions and reassurances from the CT radiographer.

With ChatGPT-4o real-time translation, these conversations were conducted in the patients' native languages, allowing the potential for clearer and quicker understanding. This technology provided precise translations of complex medical information, ensuring that patients were well-informed about the procedure, the expected sensations, the procedure time, and the risks involved, including the potential for allergic reactions to the contrast media or the long-term risks associated with radiation exposure. Moreover, the system facilitated real-time answers to any additional questions patients might have, enhancing their comfort and compliance. However, beyond this basic translation function, ChatGPT-4o's ability to contextualize medical terminology may have contributed to greater patient trust and confidence in the procedure. In high-stakes environments

like Hajj, where stress and confusion are heightened, the ability to provide clear, real-time translations reduces the chances of miscommunication and enhances patient-provider trust, which ultimately impacts procedure outcomes. These improvements in communication were crucial, particularly in the high-pressure environment of the Hajj, where timely and clear communication can impact patient outcomes.

Enhancing Procedure Quality and Image Artifacts Reduction

Appropriate patient preparation and procedure instructions are critical to obtaining high-quality CT images ^[14]. In 2023, language barriers often led to poor patient compliance, resulting in repeated scans and unnecessary radiation exposure. The introduction of ChatGPT-4o in 2024 addressed these issues by providing real-time translation, which improved patient understanding of critical instructions, such as breath-holding and positioning during scans. Radiologists reported a reduction in artifacts caused by patient movement and incorrect breath-holding. This led to a marked reduction in artifacts—from 30 out of 748 scans in 2023 to just 8 out of 885 scans in 2024—demonstrating the direct impact of enhanced communication on image quality.

Although the reduction in image artifacts is significant, the mechanism behind this improvement is multi-faceted. Enhanced communication through ChatGPT-4o not only ensured patients could understand and follow instructions but also reduced the anxiety associated with unclear communication. Anxiety and stress often result in fidgeting or incorrect breath-holding during scans, directly impacting image quality. By addressing both the cognitive and emotional needs of patients through clear communication, ChatGPT-4o indirectly improved image quality by reducing patient-induced artifacts. This suggests that communication technology, while primarily focused on verbal clarity, also plays a psychological role in patient cooperation, which is essential for achieving high-quality diagnostic results. This improvement in patient compliance reduced the

number of repeat scans and contributed to more accurate diagnostics and better overall patient management due to effective communication in their native languages. As Madai and Higgins (2021) supported, AI-driven communication tools play a critical role in improving precision and reducing errors in medical procedures by ensuring that patients receive clear and understandable instructions, which is essential for obtaining reliable diagnostic images ^[15]. The findings from our study align with this perspective, demonstrating how AI-powered communication tools can enhance the overall quality of medical procedures.

Increasing Examination and Operational Efficiency

The integration of ChatGPT-4o real-time translation technology led to significant efficiency gains within the CT examination process. By improving communication and patient understanding, the average time required for patient explanations and scan acquisition decreased substantially, allowing for an increase in daily patient throughput. In 2023, the average ‘request to scan time’ was 480 minutes for in-patients and 180 minutes for ER-patients. Following the implementation of ChatGPT-4o in 2024, these times were reduced to 400 minutes and 60 minutes, respectively. This improvement enabled the department to manage a higher volume of patients during the Hajj season without compromising care quality.

The enhanced efficiency of the CT scan process not only increased patient throughput but also optimized resource utilization, reduced patient radiation exposure, and lowered overall costs. For example, the reduction in repeat scans and streamlined workflows led to better utilisation of radiographic resources. Statistical comparisons between 2023 and 2024 underscore these improvements, with the number of daily scans increasing from 748 in 2023 to 885 in 2024.

Moreover, the average ‘acquisition time,’ which includes the time taken to position the patient and perform the scan, also showed significant improvements. In 2023, ‘acquisition times’ varied

depending on the patient's language and body part, ranging from 8 to 27 minutes. By 2024, with improved patient compliance, these times were reduced to 7 to 16 minutes, leading to faster positioning and fewer interruptions during the scan. One potential explanation for the improved operational efficiency is that real-time translation reduced the time spent clarifying instructions and addressing misunderstandings, allowing radiographers to move through examinations more quickly. This highlights the indirect operational benefits of clear communication technologies like ChatGPT-4o, which extend beyond the patient-provider interaction and into overall workflow optimisation. Efficiency improvements in healthcare settings are critical, particularly in high-demand environments like the Hajj. The study by Overgaard et al. (2023) highlights the potential of AI to streamline clinical workflows, reduce operational inefficiencies, and ultimately improve patient outcomes ^[11].

Patients' and Radiographers' Satisfaction and Acceptance

In 2023, communication during CT examinations relied heavily on human interpreters and written instructions, which were often insufficient due to the high patient volume and diverse linguistic needs. This led to only 82% of patients reporting satisfaction with the clarity of communication, while 88% experienced stress due to communication barriers.

In 2024, the introduction of ChatGPT-4o real-time translation facilitated immediate, clear communication, significantly improving patient satisfaction and reducing stress. Satisfaction scores rose dramatically to 92%, with patients expressing appreciation for being able to understand the procedures in their native languages. Feedback included statements like, "I felt much more at ease knowing exactly what was happening," and "It was reassuring to hear the instructions in my own language." Another patient remarked, "The clear instructions in my language made me feel confident during the procedure." While these improvements are notable, they should be interpreted

with caution due to the limitations of oral feedback collection. Oral feedback, particularly in a high-pressure environment like the Hajj, may be influenced by immediate emotions or social desirability bias. Stress levels among patients dropped from 88% in 2023 to 20% in 2024, indicating a substantial reduction in patient anxiety due to improved communication, showcasing the impact of effective communication.

These positive responses highlight how the use of ChatGPT-4o real-time translation not only streamlined communication but also enhanced the overall patient experience, making them feel more comfortable and informed during their CT examinations. CT Radiographers also reported increased job satisfaction compared to 2023. One radiographer stated, “Using ChatGPT-4o has made our work more efficient and less stressful, as we can communicate directly with patients without language barriers.” The improvements in patient satisfaction and stress reduction underscore the critical role of effective communication in healthcare settings ^[16].

While most patients welcomed the ease of communication with ChatGPT-4o, some were initially hesitant to trust a machine for medical instructions. To address this, patients were informed about the tool’s reliability and benefits, and staff demonstrated its effectiveness, gradually building trust. One patient shared, “I was overwhelmed and unsure why I was undergoing the CT procedure, worried it might be dangerous, but when the radiographer used the translation tool in my mother tongue, I felt relaxed and understood the situation better; thank you for the effort.”

CT radiographers also had mixed feelings at first, concerned that the tool might disrupt their workflow. However, their acceptance grew as they saw the benefits in practice. One radiographer said, “At first, I was unsure about using an AI for translations, but after seeing how much it improved patient cooperation and reduced repeat scans, I became a strong advocate for it.” Another noted, “Initially, I struggled with using ChatGPT-4o, but after a few uses and seeing its positive

impact, I became much more comfortable. Now, I appreciate how it enhances patient cooperation and reduces the need for repeat scans.”

Scalability and Applicability of the Technology

ChatGPT-4o real-time translation technology has significant potential for broader use in various medical settings. It can be effectively integrated into urban hospitals, rural clinics, and emergency departments where language barriers are prevalent. Its ability to handle multiple languages and adapt to different workflows enhances its scalability. For example, a study conducted by Hwang et al. (2022) testing translation apps in Australian aged-care hospital wards showed improved communication between staff and patients, indicating the effectiveness of such technology in diverse settings ^[17]. Beyond CT scans, ChatGPT-4o could be applied to other diagnostic procedures like MRI and ultrasound, as well as in surgical settings where precise communication is critical. Additionally, its use could extend beyond patient communication to include operational tasks such as automated report writing and incident documentation. This broader integration could further streamline medical workflows by reducing administrative burdens. It should also be noted that the concept of generative AI (ie. ChatGPT-4o) is likely to have wider application across radiology and healthcare. Further research is urgently needed in this area and may cover automated report writing, incidents and near misses together with personalised patient information.

Challenges and Solutions

Integration and Training

Implementing ChatGPT-4o in a high-pressure environment like the Hajj required to undergo a structured training program ^[18]. Initial challenges included ensuring translation accuracy and

integrating the system into existing workflows. The program consisted of multiple sessions, each lasting approximately one hour over the course of a week, ensuring that CT radiographers were thoroughly familiar with the technology. The training covered specific modules, including an introduction to ChatGPT-4o, where radiographers learned about the technology's purpose and its role in enhancing patient communication. Hands-on practice sessions were conducted, enabling radiographers to efficiently use the tool for enhancing patient communication.

Radiographers were trained to use their smartphones for real-time translation, allowing quick deployment and minimising the need for extra hardware. Practical usage and troubleshooting were major components of the training. During hands-on practice sessions, radiographers engaged with real-world scenarios, using prompts like, "Translate this to French: 'You might feel a warm sensation when the contrast media is injected, and this is normal,'" or "Translate this to Turkish: 'Do not move during the scan and stay still.'" Another crucial module focused on ethical considerations and patient consent, where radiographers were trained to seek patient permission using prompts such as, "May I use a translation tool to help us communicate better?"

Continuous feedback mechanisms were established to monitor the training's effectiveness and translation accuracy. Radiographers provided regular input on the system's performance, leading to iterative improvements in both the training modules and the technology itself. For instance, if a specific medical term was frequently mistranslated, it was reported, and the prompts were updated accordingly.

The structured nature of the training program, combined with the seamless integration of ChatGPT-4o into radiographers' smartphones, allowed them to switch seamlessly between languages, significantly reducing explanation time and improving patient understanding. This comprehensive training and seamless integration maximised the benefits of ChatGPT-4o, leading

to better communication, enhanced patient care, and increased efficiency in the CT examination process during the Hajj pilgrimage.

Subscription Fees and Accessibility

One of the significant challenges with implementing ChatGPT-4o real-time translation is the subscription fee, which can be a financial barrier for many CT radiographers. To overcome this, hospitals and medical institutions could explore bulk subscription plans or institutional licenses to reduce costs, seek funding from government health departments or international health organizations, or implement a tiered subscription model with basic services available at a lower cost. Additionally, partnerships with technology companies could provide special pricing or sponsorships, and training programs could include guidance on securing funding or grants. These strategies would help make the benefits of ChatGPT-4o more accessible, enhancing patient communication and care during CT examinations.

Ensuring Patient Privacy in Real-Time Translation

While ChatGPT-4o real-time translation technology was instrumental in overcoming language barriers for basic communication during the 2024 Hajj pilgrimage, patient data and clinical history were not shared with the system. ChatGPT-4o was strictly confined to translating essential instructions and clarifications needed during CT scan procedures. This measure ensured that patient privacy and confidentiality were rigorously upheld, aligning with ethical standards and regulations in healthcare communication. Restricting the technology to non-sensitive exchanges maintained high trust and security, ensuring no patient-specific information was exposed or mishandled during the interactions facilitated by ChatGPT-4o.

Limitations and Recommendations

One limitation of this study is the relatively short data collection period, spanning only a few weeks in two consecutive years. This limited timeframe may not fully capture long-term trends or variations in the technology's efficiency. Additionally, the use of purposive sampling and oral feedback collection may introduce biases, as patients more likely to benefit from translation services or provide positive feedback may have been overrepresented. This can limit the generalizability of the results. Future studies should incorporate randomized sampling, standardized patient satisfaction surveys, and longer-term follow-ups to provide more comprehensive insights into the sustained impact of ChatGPT-4o on communication, procedure quality, and operational efficiency.

Conclusion

The integration of ChatGPT-4o real-time translation in CT examinations during the 2024 Hajj pilgrimage significantly enhanced communication, improved procedure quality, and optimised operational efficiency compared to 2023. This technology addressed the critical challenge of language barriers, facilitating better patient care. Continued refinement and training will enhance its effectiveness, making it a valuable tool in multicultural medical settings.

The success of this initiative highlights the potential for AI-driven solutions to transform healthcare delivery in diverse environments, ensuring that all patients receive the highest standard of care regardless of language barriers. Future research should explore the long-term impacts of ChatGPT-4o on patient outcomes, scalability to other medical settings, and integration with other AI-driven technologies.

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Figures and Tables

Table 1: Developed protocols for using the ChatGPT-4o translation tool.

Scenario	Protocol description	Example prompt
Initial patient interaction	Start the interaction by asking for the patient’s permission to use the translation tool.	“Translate this to [language]: ‘May I use a translation tool to help us communicate better?’”
Pre-examination instructions	Explain the procedure, sensations during the injection, and potential risks associated with radiation exposure.	“Translate this to [language]: ‘You might feel a warm sensation when the contrast media is injected, and this is a normal feeling.’”
Screening questions	Ask necessary screening questions to ensure patient safety, such as allergies to contrast media or iodine.	“Translate this to [language]: ‘Do you have any allergies to contrast media or iodine?’”
During examination instructions	Provide real-time instructions such as holding breath and staying still during the scan.	“Translate this to [language]: ‘Do not move during the scan and stay still.’”
Post-examination care instructions	Provide aftercare instructions, including hydration.	“Translate this to [language]: ‘After the scan, make sure to drink plenty of water.’”
Addressing patient concerns	Respond to any additional questions or concerns the patient might have.	“Translate this to [language]: ‘Do you have any questions or concerns about the procedure?’”
Final report	Provide explanations of when to expect the final report.	“Translate this to [language]: ‘Your final report will be ready on [time].’”

Table 2: Examples of patient language and scan details in 2023.

N	Exam date	Patient language	Body part	Artifacts reported (Yes – No)	Scan repetition (Yes – No)	Acquisition time (min)	Total cases per shift
1	21 June	Indian - Hindi	Abdomen	Yes	No	12	50
2	21 June	Indonesian (Bahasa Indonesia)	Head & neck	No	No	9	50
3	22 June	Indonesian (Bahasa Indonesia)	Head	No	Yes	10	52
4	23 June	Bengali (Bangla)	Chest	No	No	10	40

5	23 June	Indonesian (Bahasa Indonesia)	Chest	No	No	9	40
6	24 June	Ethiopian - Amharic	Chest	Yes	No	14	57
7	24 June	Pakistan - Urdu	Chest	Yes	Yes	14	57
8	24 June	Turkish	Head & neck	No	No	11	57
9	26 June	Guinea - French	Head & neck	No	No	27	54
10	27 June	Bengali (Bangla)	Head & neck	No	No	8	38

Table 3: Examples of patient language and scan details in 2024.

N	Exam date	Patient language	Body part	Artifacts reported (Yes – No)	Scan repetition (Yes – No)	Acquisition time (min)	Total cases per shift
1	11 June	Turkish	Head	No	No	11	54
2	11 June	Ethiopian - Amharic	Abdomen	No	No	12	54
3	13 June	Indonesian (Bahasa Indonesia)	Head	No	No	9	49
4	13 June	Turkish	Head	No	No	10	49
5	13 June	Indonesian (Bahasa Indonesia)	Head & neck	No	No	13	49
6	14 June	Indian - Hindi	Head & neck	No	No	14	52
7	19 June	Bengali (Bangla)	Coronary	No	No	16	51
8	21 June	Bengali (Bangla)	Chest	No	No	11	67
9	22 June	Indonesian (Bahasa Indonesia)	Chest	No	No	8	60
10	23 June	Afghanista n - Dari	Head	No	No	7	66

Table 4: Scan Request to Completion Time for In-patients and ER-patients (2023-2024).

Year	Period	Number of cases	“Request to scan time” In-patients (min) (mean ± SD)	“Request to scan time” ER-patients (min) (mean ± SD)
2023	20 June – 08 July	748	480 ± 60	180 ± 30
2024	07 June – 23 June	885	400 ± 50	60 ± 20

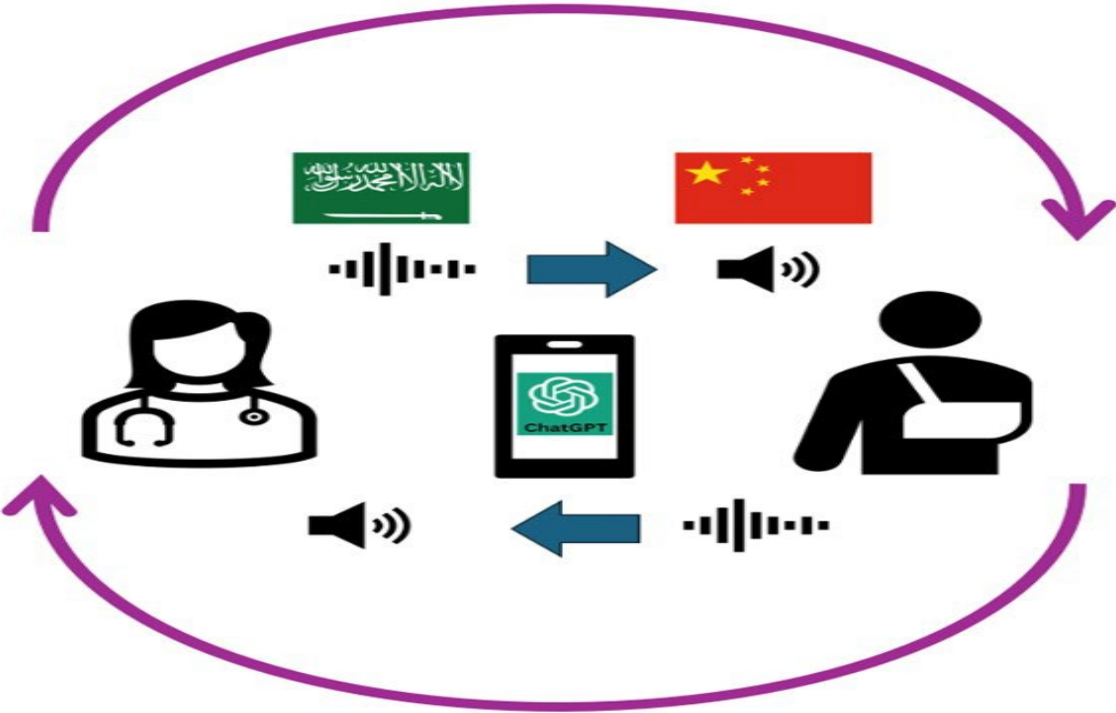


Figure 1: Schematic illustrating the concept of ChatGPT-4o real-time translation.

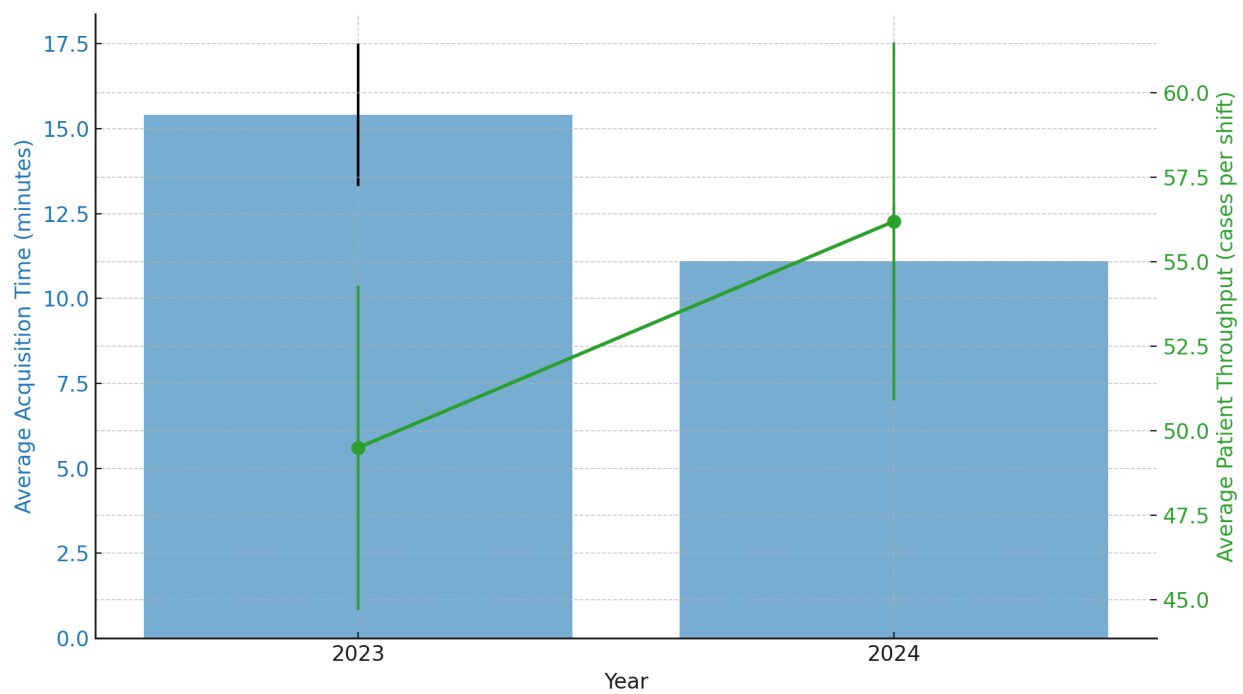


Figure 2: CT scan acquisition time and patient throughput (2023 vs 2024).