

## THE IMPLEMENTATION OF AI CHATBOTS IN INDONESIAN PUBLIC HOSPITALS: OPPORTUNITIES AND CHALLENGES

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### Abstract

*This study investigates the use of AI chatbots in Indonesian public hospitals to enhance healthcare service. By leveraging Natural Language Processing (NLP) and Human-AI Interaction (HAI) theories, these chatbots streamline administrative tasks, alleviate patient overcrowding, and improve communication between patients and healthcare providers. The objective of this research is to find out how AI chatbots contribute to improving patient care and access to medical services in Indonesian public hospitals. A systematic review of articles published between 2020 and 2024 was conducted using the PRISMA framework, with a focus on the implementation of AI chatbots in Indonesian hospitals. The findings highlight successful applications in hospitals such as RSUD M. Yunus and Muhammadiyah Hospital Palembang, where chatbots effectively manage patient inquiries and reduce the workload of healthcare staff. Furthermore, chatbots have played a critical role during the COVID-19 pandemic by providing timely information to patients. Despite their advantages, challenges such as system integration and privacy concerns persist. This study offers valuable insights and proposes strategies to address these issues, emphasizing the potential of AI chatbots in improving healthcare efficiency and patient outcomes in Indonesian public hospitals.*

**Keywords:** AI chatbots; Artificial Intelligence; Indonesian Public Hospital

### INTRODUCTION

The rapid advancement of artificial intelligence (AI) technologies is reshaping industries worldwide, and healthcare is no exception. AI-powered tools have demonstrated significant potential to enhance service delivery, improve efficiency, and address critical challenges in healthcare systems (Saraswat et al, 2022). Among these tools, AI chatbots have emerged as a promising innovation, particularly for automating routine administrative tasks, providing immediate responses to patient inquiries, and delivering basic healthcare guidance (Dogan & Gurcan, 2024; Nadarzynski et al, 2019). Leveraging natural language processing (NLP) and machine learning algorithms, AI chatbots simulate human-like interactions, making them effective in managing high volumes of patient engagement in a cost-effective and scalable manner.

The Indonesian healthcare system, especially the public hospital sector, faces persistent challenges such as overcrowded facilities, limited healthcare professionals, and logistical hurdles in delivering timely care (Babasih & Indriaswari, 2024; Harianto, 2024). These challenges often result in long waiting times, overburdened staff, and reduced patient satisfaction. AI chatbots offer a practical solution by serving as a frontline tool to streamline patient communication, schedule appointments, and provide instant access to general health information (Hsu & Dyun, 2022; Nivedhitha et al, 2024; Yang et al, 2024). Their ability to reduce the administrative workload and enhance patient experience makes them an attractive option for public healthcare institutions. Despite these advantages, the implementation of AI chatbots in Indonesian public hospitals remains an underexplored area in both academic research and practice. Globally, studies have predominantly focused on AI's applications in private healthcare systems or in developed nations,

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which often have better infrastructure, higher technological readiness, and more favorable policy frameworks. This leaves a significant gap in understanding how AI technologies, particularly chatbots, are being adapted to the unique needs of emerging economies like Indonesia. Factors such as technological literacy among patients and staff, integration with existing hospital information systems, and socio-cultural acceptance of AI tools may play pivotal roles in shaping the success of their implementation (Abdillah, 2024; Onitsuka et al., 2018; Suwana, 2017).

Existing research shows that there is limited focus on how AI chatbots are being used in Indonesian public hospitals. This lack of attention is surprising, especially considering how essential public hospitals are to Indonesia's healthcare system and the growing need for innovative solutions to improve the quality of services (Abdillah, 2024; Mauliana et al, 2024). Without sufficient studies on this topic, it becomes difficult to fully understand the situation, identify what works best, and develop evidence-based strategies to effectively implement AI in public healthcare settings.

This study is driven by the need to address this gap and add to the literature review about AI in healthcare. By examining the research question, "How is AI Chatbot being implemented in Indonesian Public Hospital?", This study aims to provide a clear picture of the strategies being used and the challenges. Additionally, the study intends to lay the groundwork for future research by reviewing existing knowledge, highlighting areas that need further exploration, and offering guidance for future studies.

By filling this research gap, the study has the potential to offer valuable insights for policymakers, healthcare administrators, and technology developers. It will also contribute to a broader understanding of how AI can be leveraged to address the challenges of public healthcare systems in emerging economies, ensuring that technological innovations align with local needs and constraints.

## **LITERATURE REVIEW**

A chatbot is a computer program designed to enable dynamic and interactive communication with users through text, voice, or visual interfaces (Battineni et al, 2020; Hauser et al, 2020). This interaction involves a human engaging with a preprogrammed system capable of delivering automated responses tailored to specific inputs. Chatbot technology represents an application of Natural Language Processing (NLP), a theory within Artificial Intelligence (AI) dedicated to facilitating seamless communication between humans and computers through the use of natural language (Denecke et al, 2021; Zhou, 2020).

In exploring the role of AI chatbots in improving healthcare delivery, especially in Indonesian public hospitals, one key concept to consider is Natural Language Processing (NLP). NLP is the technology that enables chatbots to understand and respond to human language in a way that feels natural (Rane et al, 2024). For AI to be truly effective in healthcare, it must not only process information but also interact in a way that makes patients feel heard and understood (Clark & Bailey, 2024). In Indonesia, where there are many regional languages and dialects, this becomes especially important. NLP allows chatbots to navigate the complexities of local language, colloquialisms, and even cultural nuances. This ability makes it easier for patients to communicate their needs and receive accurate responses, whether they are asking for directions, health advice, or assistance with scheduling appointments. The advancement of NLP technologies, such as GPT, helps AI chatbots engage in real-time, relevant conversations that are key to enhancing both the

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efficiency and quality of healthcare interactions (Dogan & Gurcan, 2024; Nivedhitha et al., 2024). In Indonesia, the healthcare system is often burdened by overcrowded hospitals and a shortage of healthcare workers, making it difficult for patients to receive timely attention. AI chatbots powered by NLP can step in to alleviate some of these pressures by handling routine tasks, such as answering frequently asked questions, helping with appointment scheduling, and providing basic health advice (Wilson & Marasoju, 2022).

By taking care of these tasks, AI chatbots free up valuable time for medical staff to focus on more critical matters, ultimately improving service delivery. In a country like Indonesia, where public hospitals play a crucial role in healthcare provision, the introduction of chatbots can bridge the gap between patients and healthcare services (Abdillah, 2024). Through natural interactions facilitated by NLP, these chatbots ensure that patients can easily access the information they need, even in high-demand situations. This aligns with the study's focus on the challenges faced by Indonesian hospitals, such as long wait times and overburdened staff, and demonstrates how AI can be a practical solution (Mauliana et al, 2024).

Alongside NLP, another key framework to understand in the context of AI chatbots in healthcare is the Human-AI Interaction (HAI) theory. This theory highlights the importance of the relationship between humans and AI, emphasizing trust, engagement, and emotional connection (Van Berkel, Skov & Kjeldskov, 2021). In healthcare, especially in a country like Indonesia, where patients may face anxiety or uncertainty when seeking care, AI chatbots need to be more than just functional. They must also be perceived as trustworthy and compassionate. This is crucial, as patients are more likely to interact with and trust an AI that seems understanding and supportive, rather than one that feels mechanical or distant. By incorporating elements of emotional intelligence, AI chatbots can offer responses that are not only informative but also empathetic, ensuring that patients feel respected and valued during their interactions (Abdillah, 2024; Onitsuka et al., 2018). As Indonesian public hospitals often deal with a diverse and sometimes under-informed patient population, creating an emotionally supportive, user-friendly interface through AI is essential to improving patient outcomes.

The Human-AI Collaboration element within the HAI paradigm is particularly relevant for healthcare settings, where AI chatbots are seen as tools to complement, not replace, human staff. In under-resourced environments, where there are often more patients than available staff, AI chatbots help manage the administrative load by handling repetitive tasks. This allows healthcare workers to focus on providing care and addressing more complex patient needs. This collaboration between human healthcare providers and AI chatbots can lead to a more efficient, effective healthcare system, where both human skills and AI capabilities are maximized to improve overall service delivery. By viewing AI chatbots as a supportive resource rather than a replacement, healthcare institutions can ensure a smoother integration of technology into their systems, ultimately enhancing patient care and satisfaction (Abdillah, 2024; Suwana, 2017).

Theories of NLP and Human-AI Interaction offer critical insights into how AI chatbots can be integrated into the Indonesian healthcare system. NLP enables chatbots to communicate effectively with diverse populations, overcoming language and cultural barriers, while the HAI paradigm ensures that these chatbots are not only functional but also empathetic and supportive. Together, these theories provide a human-centered approach to the implementation of AI in healthcare, emphasizing the need for AI systems that can enhance patient experiences and improve healthcare delivery in Indonesian public hospitals.

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From the above explanation, it is clear that this study aims to explore how AI chatbots are being implemented in Indonesian public hospitals, focusing on strategies and challenges. Guided by theories of Natural Language Processing (NLP) and Human-AI Interaction (HAI), it highlights the potential of chatbots to improve efficiency and patient satisfaction while addressing barriers like the digital divide and cultural acceptance. By building on existing insights, the study aims to better understand how AI chatbots can enhance Indonesia's public healthcare system.

### **METHOD**

This study employed the PRISMA framework (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) to systematically collect data. The framework offers structured guidance for developing thorough systematic reviews, encompassing the rationale for the review, the methodology applied, and the findings derived from the analysis. Articles chosen for in-depth review were obtained from Google Scholar. Boolean logic and proximity operators were used to refine the search process.

Boolean logic consists of three primary operators: AND, OR, and NOT. AND combines concepts, ideas, or keywords to narrow the search scope by retrieving results that include all specified terms. OR links synonyms or related concepts, broadening the search by capturing results that include any of the terms. NOT excludes specific keywords, helping to refine and focus the search results. Additionally, parentheses play a crucial role in structuring search strategies, as search engines process terms within parentheses first, ensuring more precise and relevant outcomes.

In this study, the researcher used the following search: ("AI chatbot" OR "artificial intelligence chatbot") AND ("Indonesia") AND ("public hospital" OR "Rumah Sakit"). This search resulted in 42 relevant articles. To further narrow down the selection of articles for review, the researcher established inclusion and exclusion criteria based on predetermined considerations. The criteria for including and excluding articles for review are summarized in the diagram below:

**Table 1. Inclusion and Exclusion Criteria of Reviewed Articles.**

No	Criteria	Inclusion	Exclusion
1	Full paper access	✓	
2	Abstract	✓	
3	Articles published within the last five years, from 2020 to 2024.	✓	
4	Using chatbot as tools	✓	
5	Indonesian Public Hospital Contexts	✓	
6	Proceeding paper	✓	
7	Book		X
8	Monograph		X
9	Thesis and Dissertation		X
10	Inaccessible journal		X
11	Not related topic and subject		X
12	Articles are not in English or Bahasa Indonesia		X

(Source: Authors, 2024)

According to the outlined criteria, the researchers subsequently arranged the articles within a PRISMA flow diagram, as depicted below:

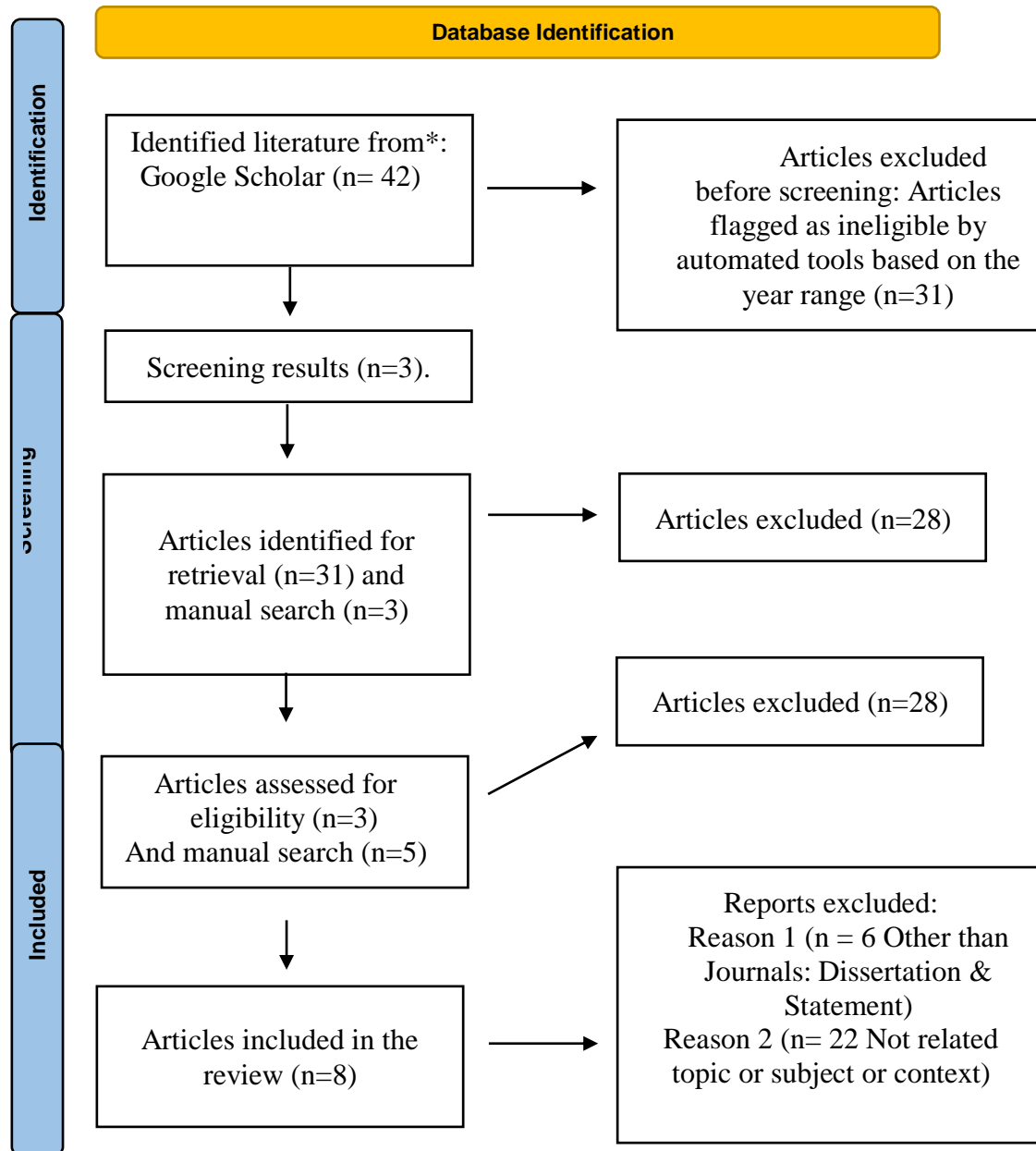


Figure 1. PRISMA flow diagram for systematic reviews including searches of databases (Adapted from Page et al., 2021)

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## RESULTS AND DISCUSSION

### Results

The use of AI chatbots in Indonesian public hospitals has become a transformative step in improving healthcare services. These chatbots enhance patient experiences, streamline operations, and address logistical issues, directly responding to the research question of how AI tools are utilized in these settings. For instance, the chatbot developed for Rumah Sakit Umum Daerah (RSUD) M. Yunus, which uses Deep Feed-Forward Neural Network technology, has shown impressive technical performance. While not yet deployed operationally, it has demonstrated high accuracy in generating coherent responses, with a validation accuracy of 91.98% and response times of less than one second (Faurina et al., 2024). A Telegram-based chatbot in Pidie Jaya has also proven instrumental in optimizing hospital management by providing real-time information about room availability and service schedules, effectively reducing logistical challenges for patients and families (Mauliana et al., 2024). Such systems hold immense potential for handling routine queries, improving information flow, and making hospital communication more efficient.

Similarly, at Muhammadiyah Hospital Palembang, an AI chatbot developed using the Unified Process (UP) method has made it easier for patients to access critical service information, such as room availability. By reducing the time and effort required to navigate hospital services, this chatbot not only improves the patient experience but also alleviates pressure on hospital staff (Eldi & Syaputra, 2024). These examples highlight how AI chatbots are being used to address key healthcare challenges, affirming their role in enhancing hospital service delivery.

Beyond routine operations, AI chatbots have demonstrated their value during public health emergencies. During the COVID-19 pandemic, they were instrumental in sharing accurate health information, combating misinformation, and promoting public health measures like social distancing. A COVID-19 chatbot achieved an accuracy rate of 90% in handling consultations, demonstrating its ability to manage complex health inquiries and its potential for broader applications (Rohim & Zuliarso, 2024). I-Mun, a chatbot designed to assist parents with children's immunization schedules, sends reminders via WhatsApp and provides immunization details through Telegram, ensuring compliance with vaccination programs and facilitating informed decision-making (Vinarti et al, 2024). Moreover, these tools supported vaccination drives and health monitoring efforts, contributing to the Sustainable Development Goals (SDGs) by improving access to healthcare services and enhancing public health literacy (Sugiono, 2024).

However, while these innovations are promising, they also come with significant challenges. One major issue is the limited datasets available for chatbot training. For example, the RSUD M. Yunus chatbot, though highly accurate in its current form, requires broader datasets to respond effectively to a wider range of patient inquiries (Faurina et al., 2024). Additionally, digital inequities in Indonesia, particularly in rural areas, present obstacles to the equitable adoption of AI technology. A lack of adequate infrastructure and low levels of digital literacy in these regions hinder both patients and healthcare providers from fully benefiting from these tools (Abdillah, 2024). Likewise, a chatbot employing Feed Forward Neural Network (FFNN) technology performed effectively for basic inquiries but required substantial dataset expansion for broader applicability and improved accuracy (Chandra et al., 2021). These challenges underscore the importance of investing in infrastructure and digital education to ensure that AI-driven solutions reach all corners of the country.

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Ethical concerns also play a critical role in the implementation of chatbots in healthcare. Since these systems handle sensitive patient information, ensuring data privacy and complying with regulations is essential. Transparency in how chatbots operate is equally important for building trust and encouraging widespread use (Abdillah, 2024). Addressing these ethical issues is not merely a technical requirement but also a necessary step to ensure patient safety and confidence in AI-based healthcare solutions.

Thus, AI chatbots represent a significant advancement in modernizing healthcare delivery in Indonesia. They offer practical solutions to longstanding challenges, such as improving service efficiency and accessibility, while addressing critical public health needs. However, their success depends on overcoming barriers like limited datasets, digital inequities, and ethical concerns. To fully harness the potential of AI chatbots, a holistic approach is necessary. By addressing these factors, Indonesian public hospitals can leverage AI technologies to create more equitable, efficient, and patient-centered healthcare systems, directly aligning with the research question on their utilization and impact.

## **Discussion**

AI chatbots are becoming more common in Indonesian public hospitals to make healthcare faster, easier, and more efficient. These chatbots help patients by quickly answering their questions, handling administrative tasks, and improving communication within hospitals. For example, RSUD M. Yunus has a chatbot that responds in less than one second, giving patients quick information and reducing wait times (Faurina et al., 2024). In Pidie Jaya, a chatbot on Telegram gives real-time updates about room availability and hospital schedules, making it easier for patients and their families to communicate (Mauliana et al., 2024).

AI chatbots are also useful for public health. For example, during the COVID-19 pandemic, a chatbot provided accurate information to the public with a 90% accuracy rate (Rohim & Zuliarso, 2024). The I-Mun chatbot helps parents track their children's immunization schedules, improving health and vaccination rates (Vinarti et al., 2024). According to Clark & Bailey (2024), such services could happen as chatbots are available 24/7, offering help at all hours. They further notes that AI chatbots can automate tasks like appointment scheduling and prescription refills, giving healthcare workers more time to focus on patients. They also help patients with chronic diseases manage their health without needing to visit a doctor frequently. Chatbots are especially helpful in rural areas where healthcare access is limited, allowing patients to decide if they need medical attention (Abdillah, 2024; Clark & Bailey, 2024).

Despite the benefits, there are challenges with using chatbots in healthcare. One problem is that chatbots may not always have the most up-to-date information, which could lead to incorrect advice (Clark & Bailey, 2024; Coghlan et al., 2023). Another challenge is that not everyone has access to the internet, especially in rural areas, limiting the reach of these tools (Abdillah, 2024; Clark & Bailey, 2024). Data privacy is also a concern because chatbots collect personal information. It's important to ensure that this information is protected and handled transparently to build trust with users (Coghlan et al., 2023).

AI chatbots have great potential to improve healthcare in Indonesia by making processes faster, easier, and more efficient. However, it's important to address challenges like data privacy, access to technology, and ensuring accurate information. By doing so, Indonesian hospitals can make the most of chatbot technology to improve patient care.

## CLOSING

### Conclusion

In conclusion, AI chatbots have proven to be a valuable tool in enhancing healthcare delivery in Indonesian public hospitals by improving patient experience, streamlining operations, and providing timely information. They have also been crucial in public health efforts, such as managing the COVID-19 pandemic and supporting vaccination drives. Despite their potential, challenges such as limited datasets, digital inequities, and data privacy concerns must be addressed to fully harness the benefits of this technology. By overcoming these obstacles, AI chatbots can play a key role in creating a more efficient, accessible, and equitable healthcare system in Indonesia.

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