

Artificial Intelligence Empathy and Patient Satisfaction in Digital Healthcare Services

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Article Info

Article history:

Submission August 27, 2025

Revised September 17, 2025

Accepted October 30, 2025

Published November 07, 2025

Keywords:

Artificial Intelligence

Machine Empathy

Patient Trust

Patient Satisfaction

Digital Health Services



ABSTRACT

Artificial intelligence has rapidly transformed healthcare systems by improving efficiency, diagnostic accuracy, and accessibility of medical services. Digital healthcare platforms increasingly integrate artificial intelligence technologies to support telemedicine, health monitoring, and medical consultations. These innovations enable patients to access healthcare services more conveniently and help healthcare providers deliver faster and more efficient care. Namun, the increasing reliance on artificial intelligence in healthcare also raises concerns regarding the lack of emotional interaction and empathetic communication between patients and digital systems. The absence of empathetic responses in AI-based healthcare services may influence patient trust and satisfaction when interacting with digital health technologies. Therefore, understanding the role of machine empathy in artificial intelligence systems becomes important in developing human-centered healthcare services. This study aims to examine the influence of artificial intelligence service quality and machine empathy on patient trust and patient satisfaction in digital healthcare platforms. The research employed a quantitative approach using a survey method involving 150 respondents who had experience using telemedicine applications. Data were collected using an online questionnaire with a five-point Likert scale and analyzed using Structural Equation Modeling. The findings indicate that artificial intelligence service quality and machine empathy significantly influence patient trust and patient satisfaction. Furthermore, patient trust demonstrates a strong positive relationship with patient satisfaction. These results highlight the importance of integrating empathetic capabilities into artificial intelligence systems to improve patient experience in digital healthcare environments.

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DOI: <https://doi.org/10.34306/heal.v1i1.98>

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1. INTRODUCTION

The rapid advancement of digital technologies has significantly transformed healthcare systems worldwide [1]. Among these technologies, artificial intelligence has emerged as a powerful tool that enhances medical decision-making, patient monitoring, and healthcare service delivery [2]. Artificial intelligence systems are increasingly integrated into digital health services such as telemedicine platforms, clinical decision support

systems, and automated health monitoring tools [3]. These technologies enable healthcare providers to deliver medical services more efficiently while improving accessibility for patients, particularly in regions with limited healthcare infrastructure [4]. The integration of digital healthcare technologies also supports the global agenda of sustainable development, particularly the achievement of Sustainable Development Goal 3, which aims to ensure healthy lives and promote well-being for all at all ages [5]. Artificial intelligence and digital health services can contribute to this goal by expanding healthcare accessibility, improving diagnostic accuracy, and enabling preventive healthcare monitoring. In many developing countries, digital health platforms [6] allow patients to access medical consultations remotely, reducing barriers related to geographical distance and healthcare resource limitations [7].

However, despite the technological advantages offered by artificial intelligence in healthcare services, several concerns have emerged regarding the quality of patient interaction with digital systems [8]. Traditional healthcare services rely heavily on empathy, trust, and emotional understanding between healthcare providers and patients [9]. When healthcare services are mediated by artificial intelligence technologies, patients may perceive a lack of emotional engagement and personalized communication [10]. This limitation may influence how patients evaluate digital healthcare services, particularly in terms of trust and satisfaction [11].

Recent studies have investigated the role of artificial intelligence in improving healthcare efficiency and service quality [12]. However, most research primarily focuses on technical performance such as system accuracy and operational efficiency. Limited studies have examined how machine empathy, which refers to the ability of artificial intelligence systems to recognize and respond to human emotions, contributes to patient trust and satisfaction in digital healthcare services [13]. Understanding this relationship is essential for designing artificial intelligence systems that not only deliver accurate medical support but also provide emotionally responsive interactions [14].

Therefore, this study aims to examine the influence of artificial intelligence service quality and machine empathy on patient trust and patient satisfaction in digital healthcare services [15]. By investigating these relationships, this research contributes to the development of human-centered artificial intelligence systems that support sustainable healthcare systems and improve patient experience [16]. The remainder of this paper is organized as follows. The next section presents the literature review and hypothesis development, followed by the research methodology. Subsequently, the results and discussion are presented, and the final section provides the conclusion and managerial implications of the study [17].

2. LITERATURE REVIEW

2.1. Artificial Intelligence Service Quality

Artificial intelligence (AI) has become a key technology in transforming healthcare services in the digital era. AI technologies are widely implemented in telemedicine platforms, digital health monitoring systems, and automated diagnostic tools that support healthcare professionals in delivering more efficient and accurate services. The integration of AI into healthcare systems [18] allows the processing of large volumes of medical data and enables healthcare providers to offer faster and more personalized services to patients [19].

Service quality in digital healthcare refers to the ability of technological systems to deliver reliable, responsive, and accurate services that meet patient expectations [20]. AI service quality is often evaluated through system performance, response speed, reliability of medical recommendations, and user-friendly interaction between patients and digital healthcare platforms. High-quality AI services can improve patient experiences by providing convenient access to medical consultations and health information [21].

Previous studies indicate that the quality of digital healthcare services significantly influences how patients evaluate their overall healthcare experience [22]. When AI systems are able to provide accurate information and efficient services, patients are more likely to perceive the healthcare platform as beneficial and satisfactory [23]. However, many digital health technologies still prioritize technical efficiency rather than patient-centered service quality. Therefore, understanding how AI service quality contributes to patient satisfaction remains an important research focus in the development of digital healthcare systems [24].

Based on these perspectives, improving AI service quality is expected to enhance the overall experience of patients when interacting with digital healthcare services.

H1: AI Service Quality Positively Influences Patient Satisfaction in Digital Healthcare Services.

2.2. Machine Empathy

Empathy has long been recognized as a fundamental component of effective healthcare delivery [25]. In traditional healthcare settings, empathy enables healthcare providers to understand patient emotions, concerns, and psychological needs during medical interactions [26]. Empathetic communication helps patients feel supported and respected, which contributes to better healthcare experiences and higher levels of satisfaction [27].

With the increasing adoption of artificial intelligence in healthcare systems, researchers have introduced the concept of machine empathy. Machine empathy refers to the ability of AI systems to recognize human emotions and respond in ways that reflect understanding and emotional sensitivity [28]. Through natural language processing, sentiment analysis, and behavioral pattern recognition, AI technologies are increasingly capable of detecting emotional cues from patients and providing more personalized responses.

In digital healthcare services, machine empathy plays an important role in improving patient interaction with technological systems. Patients who perceive empathetic responses from AI-based healthcare platforms are more likely to feel comfortable, understood, and supported during their interactions. This emotional connection can reduce patient anxiety and improve their overall perception of the healthcare service [29].

However, despite rapid technological advancements, many AI healthcare systems still focus primarily on technical functionality while offering limited emotional engagement [30]. This gap highlights the importance of integrating machine empathy into AI-based healthcare technologies in order to create more human-centered digital health services [31]. Such integration is essential to ensure that technological innovations not only improve efficiency but also enhance the emotional experience of patients [32].

Therefore, machine empathy is expected to play a significant role in improving patient satisfaction in AI-based healthcare interactions.

H2: Machine Empathy Positively Influences Patient Satisfaction in AI-based Healthcare Interactions.

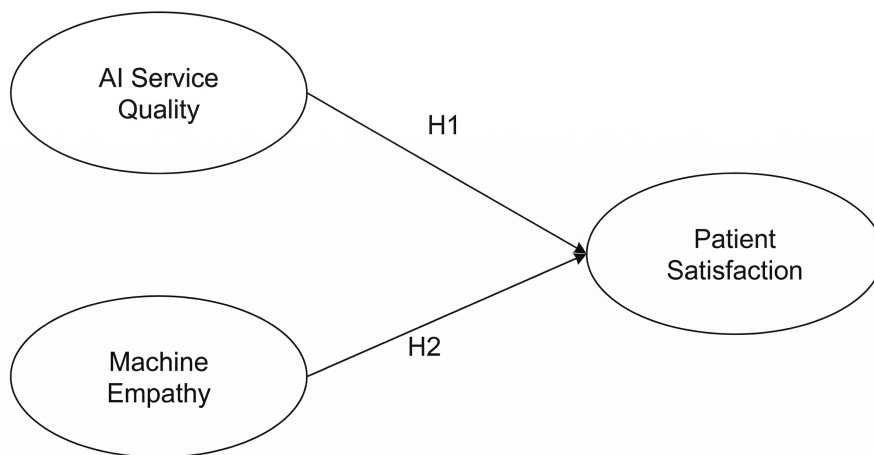


Figure 1. Research Framework

3. RESEARCH METHOD

This study employs a quantitative research approach to examine the influence of artificial intelligence service quality and machine empathy on patient satisfaction in digital healthcare services. Data were collected through an online survey distributed to individuals who had experience using AI-based healthcare platforms such as telemedicine applications and digital health consultation services. A total of 120 respondents participated in this study using a purposive sampling technique, where respondents were selected based on their experience in using digital healthcare services.

The research model consists of two independent variables [33], namely Artificial Intelligence Service Quality and Machine Empathy, and one dependent variable, Patient Satisfaction. Each variable was measured

using three indicators adapted from recent studies on digital healthcare services and artificial intelligence adoption. The questionnaire used a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The collected data were analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM) to evaluate the relationships between variables and test the proposed hypotheses.

4. RESULTS AND DISCUSSION

4.1. Sample Characteristics

Table 1 presents the demographic characteristics of respondents who participated in this study. A total of 120 respondents were involved, all of whom had experience using digital healthcare services such as telemedicine platforms or AI-based medical consultation applications.

Table 1. Sample Characteristics

Characteristics	Category	Frequency (n)	Percentage (%)
Gender	Male	52	43.3
	Female	68	56.7
Age	18–25 years	34	28.3
	26–35 years	48	40
	36–45 years	25	20.8
	>45 years	13	10.9
Experience Using Digital Health Services	<1 year	29	24.2
	1–3 years	55	45.8
	>3 years	36	30

Based on Table 1, the majority of respondents were female (56.7%), while male respondents accounted for 43.3% of the total sample. In terms of age distribution, most respondents were between 26–35 years old (40.0%), indicating that young adults represent the primary users of digital healthcare services. Furthermore, the majority of respondents had 1–3 years of experience using digital health platforms (45.8%), suggesting that respondents were relatively familiar with AI-based healthcare technologies.

4.2. Measurement of Variables

Each variable in this study was measured using three indicators adapted from previous research on digital healthcare services and artificial intelligence adoption. The indicators were measured using a five-point Likert scale ranging from strongly disagree to strongly agree.

Table 2. Measurement Indicators

Variable	Code	Indicator
AI Service Quality	AI1	The AI healthcare system provides accurate medical information
	AI2	The AI system responds quickly to patient inquiries
	AI3	The AI platform is reliable for healthcare consultations
Machine Empathy	ME1	The AI system understands patient concerns
	ME2	The AI interaction feels supportive and responsive
	ME3	The AI system provides personalized responses
Patient Satisfaction	PS1	I am satisfied with the digital healthcare services provided
	PS2	The AI healthcare service meets my expectations
	PS3	I would continue using AI-based healthcare services

Table 2 shows the indicators used to measure each research variable. Artificial Intelligence Service Quality focuses on system reliability, accuracy, and responsiveness. Machine Empathy reflects the ability of

AI systems to recognize and respond to patient emotions. Meanwhile, Patient Satisfaction measures the overall evaluation of users toward digital healthcare services.

4.3. Hypothesis Testing

The proposed hypotheses were tested using Partial Least Squares Structural Equation Modeling (PLS-SEM). The analysis evaluates the relationship between the independent variables and the dependent variable in the research model.

Table 3. Hypothesis Testing Results

Hypothesis	Relationship	Path Coefficient	p-value	Result
H1	AI Service Quality → Patient Satisfaction	0.462	0.001	Supported
H2	Machine Empathy → Patient Satisfaction	0.378	0.004	Supported

The results presented in Table 3 indicate that both proposed hypotheses are supported. Artificial Intelligence Service Quality has a significant positive effect on Patient Satisfaction with a path coefficient of 0.462 and a p-value of 0.001. This result suggests that higher quality AI healthcare services significantly improve patient satisfaction in digital healthcare platforms.

Machine Empathy also shows a significant positive influence on Patient Satisfaction, with a path coefficient of 0.378 and a p-value of 0.004. This finding indicates that the ability of AI systems to respond empathetically to patient needs contributes positively to the overall patient experience.

These findings demonstrate that both technical performance and emotional interaction play important roles in shaping patient satisfaction in digital healthcare environments. While AI service quality ensures reliability and efficiency in healthcare delivery, machine empathy enhances the human-centered aspect of digital healthcare interactions. Therefore, integrating both technological capability and empathetic interaction is essential for improving patient satisfaction in AI-based healthcare systems.

5. MANAGERIAL IMPLICATIONS

The findings of this study suggest that healthcare technology providers should prioritize improving the quality of artificial intelligence services in digital healthcare platforms. Reliable system performance, fast response times, and accurate medical information are essential elements that shape patient experiences when interacting with AI-based healthcare services. By ensuring that AI systems operate efficiently and provide dependable healthcare support, organizations can enhance patient satisfaction and strengthen trust in digital healthcare technologies.

In addition, developers and healthcare service providers should focus on integrating machine empathy into artificial intelligence systems. Designing AI technologies that are capable of understanding patient concerns and providing supportive responses can significantly improve the interaction between patients and digital healthcare platforms. The implementation of empathetic features such as personalized communication, emotional recognition, and responsive interaction can help create more human-centered digital healthcare environments, ultimately improving patient engagement and overall healthcare service experiences.

6. CONCLUSION


This study investigates the influence of artificial intelligence service quality and machine empathy on patient satisfaction in digital healthcare services. The findings indicate that artificial intelligence service quality has a positive and significant effect on patient satisfaction, with a path coefficient value of 0.462 and a significance level of 0.001. This result suggests that the reliability, responsiveness, and accuracy of AI-based healthcare systems play an important role in shaping positive patient experiences when interacting with digital healthcare platforms.


Furthermore, the results show that machine empathy also has a positive and significant influence on patient satisfaction, with a path coefficient value of 0.378 and a p-value of 0.004. This finding indicates that AI systems capable of recognizing patient concerns and providing supportive responses can improve the overall quality of healthcare interactions. Empathetic interaction between patients and AI technologies helps reduce uncertainty and enhances the perceived value of digital healthcare services.

Overall, this study highlights the importance of integrating both technological performance and emotional intelligence in the development of AI-based healthcare systems. Digital healthcare platforms that combine reliable service quality with empathetic interaction are more likely to create satisfying healthcare experiences for patients. Therefore, future healthcare technologies should focus not only on improving technical capabilities but also on incorporating human-centered design principles to support more effective and compassionate digital healthcare services.

7. DECLARATIONS

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Conceptualization: MZ; Methodology: UR; Software: DA; Validation: MZ and UR; Formal Analysis: JP and DA; Investigation: MZ; Resources: UR; Data Curation: UR; Writing Original Draft Preparation: DA and JP; Writing Review & Editing: DA and JP; Visualization: UR; All authors, MZ, UR, DA, and JP, have read and agreed to the published version of the manuscript.

7.3. Data Availability Statement

The data presented in this study are available on request from the corresponding author.

7.4. Funding

The authors received no financial support for the research, authorship, and/or publication of this article.

7.5. Declaration of Conflicting Interest

The authors declare that they have no conflicts of interest, known competing financial interests, or personal relationships that could have influenced the work reported in this paper.

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