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The Impact of Employees' AI Acceptance on Productivity in the Construction of Smart Hospitals: The Mediating Role of Collaboration

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Abstract: Against the backdrop of China's smart-hospital initiative, this review examines how frontline employees' AI acceptance translates into productivity. Synthesizing 31 empirical studies published between 2020 and 2024 across clinical and managerial settings, the evidence is synthesized and organized around four acceptance dimensions—awareness, understanding, trust, and skills—as framed by the Technology Acceptance Model (TAM), Protection Motivation Theory (PMT), and Person–Environment Fit (PE Fit) theory. Across studies, understanding and trust are most consistently linked with faster decisions and higher service quality; skills underpin effective workflow integration. Crucially, employee-AI–AI collaboration mediates these effects in most samples, converting favorable mind-sets into operational gains via shared diagnosis, decision support, and scheduling optimization. We discuss boundary conditions (leadership, culture, prior experience) and propose an integrated pathway from acceptance to collaboration to productivity. The review provides a conceptual baseline for an upcoming large-scale survey and offers actionable recommendations: prioritize trust-building, formalize collaboration protocols, and invest in continuous AI-skilling to fully realize AI's potential for enhancing productivity in smart hospitals.

Keywords: *AI acceptance, employee productivity, smart hospitals, employee-AI collaboration, Technology Acceptance Model.*

1. Introduction and Background

In recent years, China's healthcare sector has entered a period of profound digital transformation, driven by the state-led "smart hospital" initiative. This transformation has culminated in policy frameworks such as the National Health Commission's 2023 "Trinity" policy, which elevates smart medicine, smart services, and smart management as the pillars of hospital modernization (Zhang et al., 2023). The deployment of artificial intelligence across diagnostic, clinical, and operational processes has already begun to demonstrate measurable improvements in efficiency, workload reduction, and care quality (Hou et al., 2024). Yet, the realization of these benefits is by no means automatic; it depends fundamentally on the extent to which frontline clinicians—including physicians, nurses, and technicians—adopt and effectively integrate AI technologies into their everyday work.

Employee acceptance of AI is widely conceptualized as comprising four interlinked and sequential conditions: awareness of AI's existence, understanding of its functioning and limitations, appropriate trust in its outputs, and the technical and adaptive skills required for effective use (McGrath et al., 2025). Only when these four conditions are achieved does AI adoption begin to yield productivity benefits, which in this context refers to both the efficiency of clinical and administrative tasks and the quality of care delivered per unit of resources. Yet, the relationship between AI acceptance and productivity is not direct; it is realized primarily through the emergence of high-quality human–AI collaboration in daily hospital workflows (Stevens & Stetson, 2023).

Collaboration in this context denotes a synergistic partnership, where human clinical expertise and algorithmic analytics are integrated through calibrated trust, shared understanding, and clear role division(Baroni et al., 2022). Such partnerships produce gains in diagnostic accuracy, decision speed, and patient throughput that exceed what either humans or AI could achieve alone. This review, therefore, investigates how frontline employees' AI acceptance shapes productivity in China's public smart hospitals and examines employee-AI–AI collaboration as a mediating mechanism (Rafi et al., 2024). By integrating insights from the Technology Acceptance Model (TAM), Protection Motivation Theory (PMT), and Person–Environment Fit (PE Fit) theory,

this review explains how technological perceptions, psychological motivations, and contextual fit jointly shape collaboration and productivity outcomes. The findings are intended to guide hospital leaders and policymakers in designing training, change-management and policy interventions that can translate substantial AI investments into measurable performance improvements at the clinical frontline.

2. Literature Review

The Evolution of Productivity Measurement in Smart Hospitals: The conceptualization of employee productivity within healthcare, particularly in Chinese tertiary public hospitals, has evolved significantly in recent decades. Initially, the assessment of productivity focused on simple quantitative outputs such as patient throughput, bed occupancy rates, and the volume of procedures performed (Kong et al., 2021). These early measures were shaped by the imperatives of operational efficiency and were rooted in managerial approaches that viewed productivity through the lens of task completion rates and resource utilization.

However, as the complexity of healthcare delivery increased and patient-centered care approaches became more prominent, it became clear that relying solely on quantitative metrics proved inadequate. The limitations of traditional indicators were exposed as hospitals adopted more sophisticated technologies and became increasingly aware of the need to balance operational efficiency with quality of care (Wang et al., 2023). As a result, newer frameworks emerged that incorporate service quality, resource utilization, and the effectiveness of technological integration as integral and coequal dimensions of productivity (Wang et al., 2023). The transformation of productivity measurement thus reflects both advances in clinical practice and the strategic imperative to integrate digital tools such as AI into core hospital workflows.

Consequently, a multidimensional perspective on productivity has emerged of productivity in healthcare settings. Technical efficiency, for example, now measures not only how effectively resources are allocated but also the extent to which AI-enabled systems, such as scheduling and triage algorithms, enhance operational performance (Chowdhury et al., 2022). Service quality metrics, meanwhile, have become integral to productivity assessment, encompassing clinical outcomes, patient satisfaction, error reduction rates, and the timeliness of care delivery (Jiang et al., 2023). In modern productivity frameworks, qualitative and quantitative indicators are combined—often through balanced scorecards—to capture the full spectrum of what it means for employees to be productive in a smart hospital environment (Tian et al., 2024).

The integration of Artificial Intelligence (AI) has been a decisive catalyst in the latest phase of this evolution, facilitating a paradigm shift from human-centric efficiency to a model that values the integration of human and algorithmic capabilities. Contemporary studies indicate that when AI is properly implemented, it can improve both the efficiency of processes and the quality of outcomes. For example, AI-based diagnostic support has been shown to improve accuracy, while AI-driven scheduling tools can increase facility utilization rates by up to 35%, while maintaining, or even enhancing, standards of patient care (Kumar & Mittal, 2024). This dual emphasis on efficiency and quality reflects the increasing sophistication of healthcare delivery and highlights the importance of collaborative frameworks that integrate AI into clinical practice (Kong et al., 2023).

Importantly, healthcare-specific considerations introduce unique challenges into productivity measurement. The critical and complex nature of medical services means that indicators must be sensitive to patient safety standards, professional guidelines, and ethical concerns (Simón et al., 2024). The inclusion of AI adds yet another layer of complexity, demanding that productivity measures account for both technological efficiency and the preservation of professional autonomy and clinical expertise. This comprehensive framework thus provides the foundation for analyzing how different dimensions of AI acceptance influence productivity outcomes in healthcare environments.

The Dimensions of AI Acceptance and Their Effects on Productivity: The relationship between AI acceptance and productivity is multifaceted and dynamic, with recent empirical work highlighting four primary dimensions: awareness, understanding, trust, and skills. Each dimension exerts direct and indirect effects on employee productivity, often mediated by collaborative mechanisms.

AI Awareness: As a foundational dimension refers to employees' recognition of AI's presence in their work

environment and their understanding of its potential to reshape clinical practice and service delivery (Bai et al., 2024). Studies have shown that heightened AI awareness can significantly influence work behaviors and productivity, primarily by enabling professionals to identify and leverage opportunities for AI augmentation in their daily tasks (Ding, 2021). However, awareness is not always uniformly positive; while it can foster innovation and intrinsic motivation, it can also generate performance anxiety and emotional strain—especially in environments where support systems are weak or organizational change is poorly managed (Liang et al., 2022).

The relationship between AI awareness and productivity is further shaped by the availability of organizational support, the nature of job crafting, and career development opportunities. Enhanced awareness has been linked to improved service performance, adaptivity, and greater career competencies, especially in settings where technological competence is central to effective service delivery. (Kong et al., 2021). Moreover, the effect of AI awareness on productivity tends to deepen over time as professionals gain experience with new systems, indicating a temporal dimension to acceptance (Wang et al., 2023). Individual differences such as age, professional role, and prior experience also moderate the awareness–productivity link, with younger or more adaptable staff often achieving productivity gains more rapidly (Marikyan et al., 2022). Significantly, research has revealed that AI awareness enhances not only individual productivity but also collaborative practices, leading to stronger team performance in coordinated care environments (Kumar & Mittal, 2024).

AI Understanding: The second dimension, AI understanding, encompasses deep knowledge of AI systems' functionalities, limitations, and practical applications in the clinical context (Pinski et al., 2023). Professionals with a high degree of understanding are better positioned to integrate AI tools into their practice, optimize system usage, and make informed decisions about when and how to rely on algorithmic support. (Theis et al., 2023). This capability is associated with improvements in task efficiency, reduced error rates, and the capacity to leverage AI for complex problem-solving and decision-making tasks (Kumar & Mittal, 2024).

AI understanding also contributes to enhanced confidence in system use, which in turn leads to faster and more effective decision-making (F. J. Wang et al., 2023). As healthcare professionals develop a deeper understanding of AI capabilities, they become more adept at integrating new technologies into existing workflows, thereby streamlining operations and improving patient care (Simón et al., 2024). This dimension further enables error prevention, adaptive capacity, and collaborative practices—each of which plays a vital role in boosting productivity, especially in the context of complex clinical tasks (Weisz et al., 2024).

AI Trust: The third dimension, trust in AI, constitutes a prerequisite for effective and productive system utilization. Trust entails confidence in the reliability, transparency, and clinical appropriateness of AI outputs (Marikyan et al., 2022). When professionals trust AI, they are more willing to incorporate algorithmic insights into clinical judgement and decision-making, accelerating workflow processes without sacrificing accuracy (Kerasidou et al., 2022). Trust in AI has also been associated with greater resource utilization, well-being, and job satisfaction, particularly in environments where AI is integrated deeply into work routines (Kumar & Mittal, 2024).

Yet, the development of trust must be carefully managed. Excessive trust can be equally problematic as distrust, particularly if it leads to complacency or uncritical acceptance of AI recommendations (Kerasidou et al., 2022). Research has shown that the most effective trust-building strategies are those that balance transparency, reliability, and consistent system performance, while also maintaining professional oversight and autonomy (Cadavid et al., 2024). Organizational culture, professional experience, and previous exposure to technology all play moderating roles in how trust is translated into productivity (Khaksar et al., 2023).

AI Skills: The final dimension, AI skills, refers to the technical and adaptive competencies required for effective engagement with AI systems. The development of these skills is associated with higher productivity across a range of healthcare contexts, including diagnostic imaging, laboratory medicine, and other technology-intensive specialties (Chuang, 2024). Advanced AI skills empower healthcare professionals to make more informed decisions, integrate AI-generated insights with clinical expertise, and respond effectively to technological change (Chowdhury et al., 2023).

Importantly, organizations that invest in both technical and adaptive skill development tend to realize the greatest productivity gains, highlighting the importance of a balanced and sustained approach to training and professional development (Wang et al., 2024) . These findings underscore the fundamental role of AI skills in enabling healthcare professionals to fully leverage the capabilities of smart hospital technologies.

3. Review Methodology

A structured literature search was conducted (2020–2024) across multidisciplinary databases in health management and information systems to identify empirical studies linking AI acceptance to employee productivity in hospital settings. The search strategy incorporated terms related to acceptance constructs ("awareness", "understanding/knowledge", "trust", "skills/training"), mediating factors ("collaboration", "human-AI teaming"), and outcomes ("productivity", "efficiency", "quality of care"). The inclusion criteria comprised: (i) peer-reviewed empirical studies or systematic reviews in English; (ii) hospital or clinical workforce context; (iii) explicit measures of at least one acceptance dimension and productivity-related outcomes; and (iv) clear analytic links to collaboration or teaming where applicable. Exclusion criteria encompassed opinion pieces, editorials, and studies with purely technical model performance without workforce outcomes. Two reviewers screened titles/abstracts and then full texts, resolving discrepancies through consensus discussion. Data extraction focused on design, setting, sample, constructs, measures, and principal findings. Thirty-one high-quality empirical articles were selected for synthesis for synthesis while retaining broader background evidence to map theoretical consistency (TAM, PMT, and Person–Environment Fit). The study selection process is illustrated in the PRISMA flow diagram (Figure 1).

Figure 1: PRISMA Flow Diagram for Literature Screening

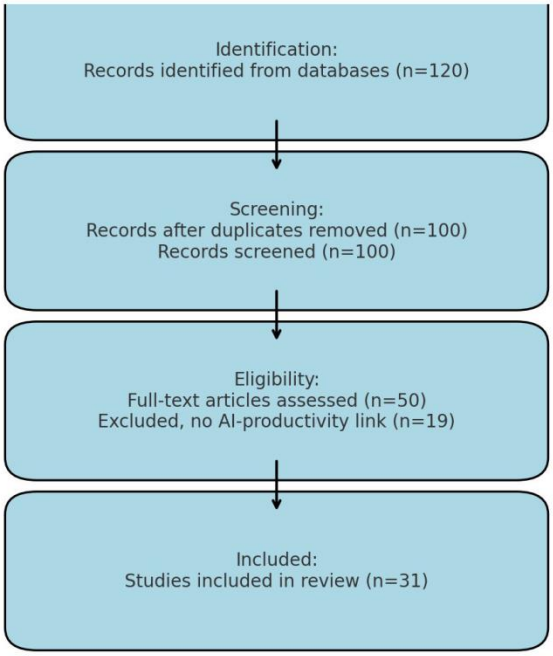

Figure 1 presents the PRISMA flow diagram describing the systematic screening process for relevant studies. Out of 120 initially identified records, 31 studies met the inclusion criteria, providing the empirical basis for the review and analysis.

4. Results and Discussion

Employee–AI Collaboration: The Key Mediator

While each dimension of AI acceptance exerts an independent effect on productivity, research has consistently demonstrated that these relationships are significantly mediated by the quality of employee-AI–AI collaboration. The development of effective collaboration is now recognized as a critical pathway for achieving

the productivity benefits of AI in healthcare settings.

Foundations of Collaboration: Collaboration between employees and AI systems is more than a matter of technological coexistence; it is a complex, adaptive partnership shaped by mutual awareness, shared goals, and role complementarity (Chandio et al., 2024). Studies have shown that healthcare professionals with enhanced awareness of smart technologies are more proactive in engaging with AI systems, especially when organizations provide strong support and foster a collaborative spirit (Kong et al., 2021). The depth of AI awareness—whether it is superficial or includes practical knowledge—determines the effectiveness of collaborative relationships (Wang et al., 2023).

Organizational factors, such as leadership style, commitment to change, and the availability of training, further shape the extent to which AI awareness leads to productive collaboration (Kumar & Mittal, 2024). Leadership that is supportive and change-oriented can alleviate employee concerns regarding job displacement and create an environment conducive to collaborative innovation.

From Understanding and Trust to Collaboration: A Comprehensive understanding of AI is another crucial precondition for effective collaboration. Professionals who grasp both the technical principles and practical applications of AI are better able to allocate tasks appropriately, optimize workflow integration, and engage in mutual learning with AI systems (Theis et al., 2023). The development of shared mental models—where both humans and AI "understand" their respective roles—underpins high-quality collaboration, particularly in diagnostic and administrative tasks (Makarius et al., 2020).

Trust serves as both an antecedent to and an outcome of successful collaboration. Healthcare professionals who trust AI systems are more likely to engage in meaningful and productive partnerships with these technologies. (K. Hou et al., 2023). Trust-building is influenced by technical interoperability, transparency, and the demonstration of consistent system performance. (Simón et al., 2024). The relationship between trust and collaboration is often reciprocal: as professionals accumulate successful collaborative experiences with AI, their trust in the technology deepens, creating positive feedback loops that further enhance productivity. (Marikyan et al., 2022).

The Role of AI Skills in Collaboration: Skill development is fundamentally tied to collaborative effectiveness. Employees with strong technical and adaptive skills are better equipped to establish productive working relationships with AI systems, leading to improved resource utilization, workflow integration, and decision support (Chuang, 2024). Comprehensive training that addresses both technical and interpersonal dimensions of AI collaboration is particularly effective, as it prepares professionals for the dynamic and reciprocal nature of human–AI partnerships (Morandini et al., 2023).

Skill development is also a progressive process, requiring ongoing investment in both individual and team-level competencies. (Hemmer et al., 2025). Organizations that adopt a structured and holistic approach to skill development are more likely to achieve sustainable improvements in human–AI collaboration and, by extension, productivity. (Patil & Shankar, 2023).

How Collaboration Boosts Productivity: The positive impact of collaboration on productivity is well-established in both empirical studies and theoretical models. Effective collaboration enhances situational awareness, supports coordinated decision-making, and facilitates knowledge sharing, enabling healthcare professionals to leverage AI capabilities more effectively (Makarius et al., 2020). Collaborative practices also optimize resource allocation and task coordination, thereby reducing cognitive burden and allowing professionals to concentrate on high-value activities (Jiang et al., 2023).

Collaborative relationships are especially important in clinical decision-making, where the integration of human and AI insights can enhance diagnostic precision and reduce decision-making time. Successful collaboration also increases work engagement and enhances job satisfaction, contributing to sustainable performance improvements (Simón et al., 2024). In sum, employee-AI–AI collaboration is a critical mediator that translates AI acceptance into measurable productivity gains.

The Mediating Role of Collaboration: Evidence from Recent Research
An expanding body of empirical evidence confirms that collaboration mediates the relationship between each AI acceptance dimension and productivity. This mediating effect has been observed in numerous contexts and is often enhanced by supportive organizational structures and clear professional role definition.

Awareness, Collaboration, and Productivity
Several studies have shown that while AI awareness directly influences productivity, its impact is significantly enhanced when channeled through effective collaboration (Liang et al., 2022). Collaborative practices channel the intrinsic motivation generated by awareness into promotion-focused job crafting strategies, which in turn enhance productivity (Kang et al., 2023). The mediating effect is particularly strong in environments where organizational commitment and structured support are present (Kong et al., 2021). The temporal dimension of this relationship is also significant: as awareness and collaboration develop together, productivity gains are sustained and deepened over time (Kumar & Mittal, 2024).

Understanding, Collaboration, and Productivity: The link between AI understanding and productivity is similarly mediated by collaboration. Comprehensive understanding enables the formation of shared situation awareness and sophisticated mental models, which are essential for high-stakes clinical decision-making processes. (Pinski et al., 2023). The mediation effect is most pronounced in complex and rapidly evolving clinical contexts, where professionals and AI must work together to deliver high-quality outcomes (Jiang et al., 2023).

Trust, Collaboration, and Productivity: Trust in AI enhances the willingness of professionals to engage in collaborative practices, thereby improving team performance and operational efficiency (Hou et al., 2023). Psychological factors, such as reduced technological anxiety and increased confidence, further strengthen this mediation pathway. Organizational culture and clear communication are key moderators, helping to sustain trust-based collaboration and ensure long-term productivity improvements (Wang et al., 2023).

Skills, Collaboration, and Productivity: Finally, AI skills empower healthcare professionals to participate in more effective and mutually beneficial collaborations with AI systems. The influence of skill development on productivity manifests not just through improved task performance but also through the ability to adapt to technological change and engage in continuous learning (Morandini et al., 2023). Organizations that systematically invest in both individual and team-level skill development attain more consistent and significant productivity improvements (Chowdhury et al., 2022).

Theoretical Foundations: Explaining the Acceptance–Collaboration–Productivity Chain
A robust theoretical foundation underpins the observed relationships between AI acceptance, collaboration, and productivity. The integration of the Technology Acceptance Model (TAM), Protection Motivation Theory (PMT), and Person–Environment Fit (PE Fit) theory provides a comprehensive framework for understanding these dynamics.

Technology Acceptance Model (TAM): TAM posits that perceived usefulness and ease of use serve as the primary drivers of technology adoption (Kumar & Mittal, 2024). In the healthcare context, these core constructs are augmented by additional considerations, including professional autonomy, ethical concerns, and the unique risks associated with clinical practice (Dutta & Mishra, 2024).Recent extensions of TAM highlight the importance of trust and collaboration as critical mediators, reflecting the high-stakes environment of smart hospitals (Chen & Lee, 2024).

Protection Motivation Theory (PMT): PMT provides insight into the cognitive and motivational processes that influence employee responses to technological transformation. The theory's dual focus on threat and coping appraisals explains why some professionals embrace AI as a way to enhance their effectiveness, while others perceive it as a threat to their professional identity or job security (Hornikel et al., 2021). Effective coping strategies, supported by organizational training and peer support, enable employees to convert acceptance into productive engagement and collaborative behavior (Theis et al., 2023).

Person–Environment Fit Theory (PE Fit): PE Fit theory emphasizes the alignment between individual

characteristics (such as skills, values, and professional identity) and the technological demands of the work environment (Parvez et al., 2022). Strong person–technology and person–organization fit are associated with higher acceptance rates, more effective collaboration, and improved productivity outcomes (Upadhyay et al., 2022). This alignment is particularly important in the dynamic context of AI integration, where roles and responsibilities are continuously evolving (Dutta & Mishra, 2024).

The integration of these theoretical frameworks explains both the direct effects of AI acceptance on productivity and the critical mediating role of collaboration. Each theory offers a unique perspective: TAM illuminates the cognitive appraisal process, PMT highlights motivational dynamics, and PE Fit theory addresses the importance of contextual alignment. Together, they support a nuanced understanding of how AI acceptance can lead to productivity gains when mediated by effective employee-AI–AI collaboration. The integrated framework is summarized in Figure 2.

Figure 2: Theoretical Model of AI Acceptance–Collaboration–Productivity

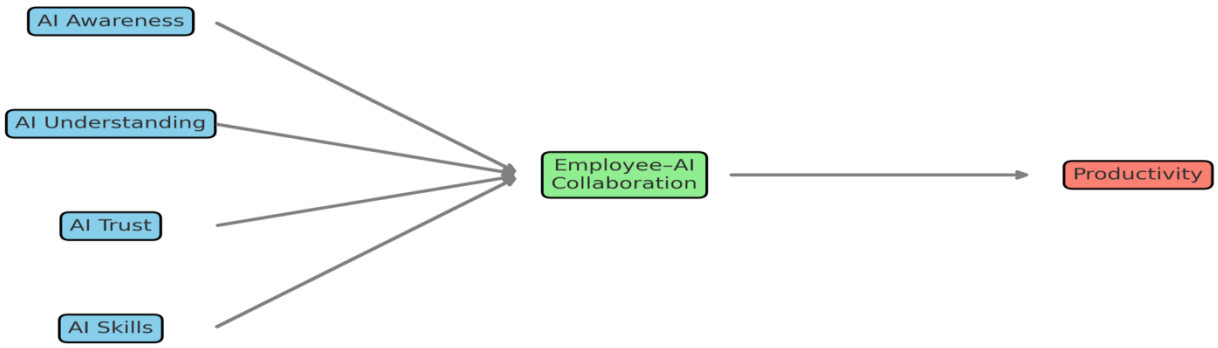

Figure 2 illustrates the conceptual framework underpinning this study. It shows how four dimensions of AI acceptance influence productivity directly and indirectly via employee-AI–AI collaboration. The model integrates the Technology Acceptance Model (TAM), Protection Motivation Theory (PMT), and Person–Environment Fit (PE Fit) perspectives to explain the observed relationships.

5. Managerial Implications and Recommendations

The findings of this review offer several important implications for hospital leaders, policymakers, and researchers. First, initiatives to realize the productivity potential of AI in smart hospitals should prioritize strategies that enhance awareness, deepen understanding, build trust, and develop skills among frontline professionals. These approaches require supporting organizational initiatives that foster collaborative work environments and provide ongoing training and support.

Second, the design and implementation of AI systems should prioritize enabling high-quality collaboration. This includes developing clear protocols for human–AI interaction, ensuring transparency and reliability in system outputs, and establishing clear protocols for human-AI interaction continuous learning and adaptation.

Third, future research should continue to investigate the mediating and moderating variables influencing the relationship between AI acceptance and productivity. Large-scale, multi-level studies—including a planned 500-participant survey—are needed to test integrated models and explore the relative importance of each acceptance dimension. There is also a need for research that examines specialty-specific collaborative models and the longitudinal processes through which professionals and AI systems co-evolve.

Finally, the development and validation of new productivity metrics that effectively capture contributions from both human and AI agents will be critical as smart hospitals continue to evolve.

Conclusion

China's smart hospital initiative represents a leading initiative in global efforts to leverage digital innovation for healthcare transformation. This review has shown that employees' AI acceptance—encompassing awareness, understanding, trust, and skills—is a necessary, yet insufficient, condition for achieving productivity gains in this context. The critical mediating role of employee-AI–AI collaboration has been empirically established, with high-quality partnerships serving as the crucial mechanism for transforming acceptance.

By integrating the Technology Acceptance Model, Protection Motivation Theory, and Person–Environment Fit perspectives, this review establishes an integrated conceptual framework for research and practice. Hospital leaders and policymakers should prioritize developing trust, structured collaboration protocols, and continuous skill development to ensure the realization of AI's transformative potential throughout China's rapidly digitizing healthcare system.

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