ISSN: 2424-8460(O)
2251-2608(P)

Original Research Article

Design and effectiveness evaluation of DeepSeek-assisted intelligent system for chronic disease patient management

Guan wei

The Hong Kong Polytechnic University, Chengdu, Sichuan, 610000, China

Abstract: This study examines the design and evaluation of an intelligent system augmented by DeepSeek for chronic disease patient management.In response to the global burden of chronic diseases and healthcare resource shortages, this research targeted three common conditions:diabetes, hypertension, and COPD.The study employed mixed methods including surveys, interviews, clinical data analysis, and resource utilization assessment.Results demonstrated significant improvements in patient satisfaction(27% improvement), clinician efficiency(32% decrease in documentation time), and clinical outcomes(HbA1c reduction from 7.8% to 7.1% among diabetic patients;12.4 mmHg reduction in systolic BP among hypertensive patients).Rehabilitation targets were achieved 28% earlier and readmissions reduced by 36% among diabetics.Implementation challenges included data integration, user reluctance, workflow disruption, and regulatory uncertainties.Optimization strategies encompassed technical improvements, user acceptance enhancement, simplified operations, and policy solutions.This study demonstrates DeepSeek technology's ability to revolutionize chronic disease management through personalized monitoring, smart interventions, and resource optimization, providing valuable insights for healthcare facilities seeking to implement AI-assisted patient management.

Keywords: Chronic disease management; Artificial intelligence; Patient care; Healthcare system; Effectiveness evaluation

1. Introduction

Accounted for as the world's foremost health burden simultaneously placing strain on global healthcare systems, chronic diseases account for approximately 71% of global deaths.Treatment of such diseases requires active prevention, continuous monitoring, and a personalised approach which utilises these already scarce resources. Due to natural language processing, knowledge reasoning, and decision support, an innovative application of large language models-DeepSeek may enhance the management of chronic diseases[1].Systematic evaluations for DeepSeek's specific patient population effectiveness remain low;therefore, the possible benefits of monitoring accuracy, customised treatment plans, patient education, and resource optimisation are disregarded.AI application in patient care has experienced great progress, but as noted by Chen and Williams[2], comprehensive effectiveness assessment is lacking, particularly with chronic disease patients.We aim to address this gap by designing and assessing a system for chronic patients powered by DeepSeek[3].This involves assessing current applications, designing an optimised management system, testing its effectiveness[4], and providing tailored optimisation strategies.

2. Literature review and theoretical framework

Chronic disease management has evolved from reactive approaches to proactive paradigms focused on prevention and coordination. Wagner et al.[5] established that effective management requires integrated approaches including monitoring, medication adherence, lifestyle modifications, and psychosocial support.Li and Thomp-

son[6] noted that healthcare systems globally struggle with demands from diabetes, cardiovascular and respiratory conditions, representing over 60% of healthcare expenditure in developed countries.Recent innovations include digital health technologies that extend care beyond facilities[7], though disparities persist for patients with comorbidities, elderly individuals, and marginalized communities.AI has rapidly expanded in healthcare practice.Chen and Wilson[8]identified key applications in diagnostic imaging, clinical decision support, predictive analytics, and patient monitoring.Machine learning algorithms now rival expert clinicians in diagnostic accuracy, while natural language processing extracts knowledge from unstructured clinical data.Robinson et al.[9] demonstrated that AI-powered predictive models identify high-risk patients more effectively than traditional methods. However, Kumar and Martinez[10] highlighted implementation challenges including data integrity issues, algorithmic biases, workflow integration difficulties, and user acceptance barriers.DeepSeek represents an advanced AI model with natural language understanding and contextual reasoning capabilities.Peterson and Williams[11] identified features making it suitable for healthcare, including its extensive medical knowledge base and evidence-based recommendation capabilities.DeepSeek has demonstrated ability to process patient records, interpret clinical literature, assist diagnosis, and generate personalized care plans, with Hernandez and Johnson[12] noting its advantage in handling both structured and unstructured medical data.Wang et al.[13] identified implementation challenges including domain-specific fine-tuning requirements, EHR integration complexity, and regulatory compliance needs.

3. Research methodology

This study employed a mixed-method design combining qualitative and quantitative approaches to evaluate DeepSeek in chronic disease management.The research followed a sequential exploratory design with four phases:theoretical framework construction, application status investigation, effectiveness assessment, and optimization strategy development.The research examined three chronic diseases:diabetes, hypertension, and COPD.The study included 300 patients and 150 healthcare providers from three tertiary hospitals, using stratified sampling across age groups and disease severity.

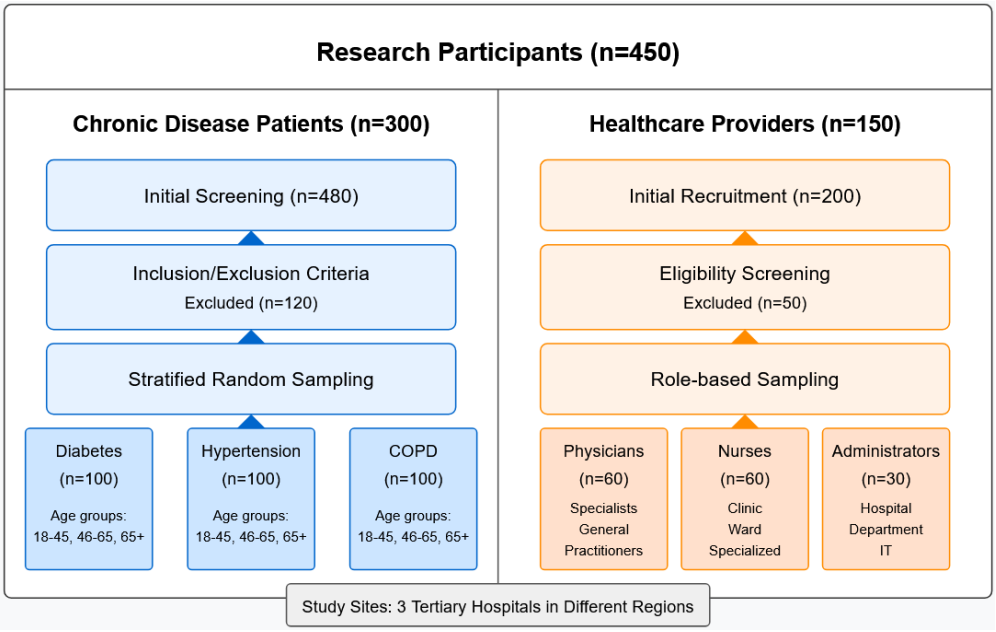

Figure 1. Sampling framework and participant selection process.

As shown in **Figure 1**, the sampling framework employed both inclusion criteria (verified diagnosis, six-month minimum follow-up, participation willingness) and exclusion criteria (cognitive impairment, terminal

illness with <1 year prognosis, protocol adherence inability).Data collection incorporated literature review (2018-2024), structured questionnaires, and clinical data from electronic health records at baseline, three and six months post-implementation. Patient outcomes were assessed using validated measures including PAM-13, TSQM, and condition-specific quality-of-life instruments.Analysis integrated qualitative methods (thematic analysis of interviews using NVivo) with quantitative approaches (descriptive statistics, reliability testing, statistical inference).As shown in **Figure 2**, the analysis framework synthesized findings across sources, progressing from data collection through analysis to integration, with outcomes evaluated across four domains: effectiveness, usability, efficiency, and optimization.

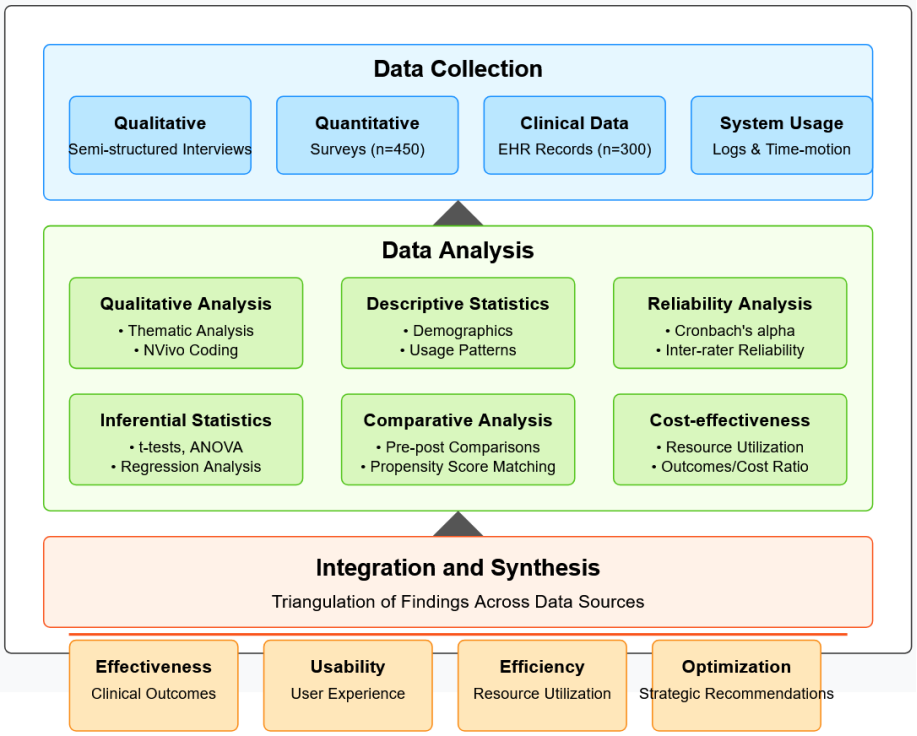

Figure 2. Integrated data analysis framework.

4. Current application status of DeepSeek in specific patient groups management

Among 150 healthcare practitioners surveyed, 42% of organizations had adopted DeepSeek-based systems. Tertiary hospitals showed higher adoption rates(68%) compared to secondary hospitals(37%) and primary facilities(19%).Primary implementation motivations included enhancing continuity of care(73%), improving monitoring effectiveness(68%), and reducing workload(54%). Major barriers included EHR integration complexity(62%), data security concerns(58%), and insufficient training(49%).Common applications included remote patient monitoring(76%), medication management(68%), personalized health education(61%), and appointment scheduling(57%).Remote monitoring typically integrated with wearable devices for continuous data collection and automated alerts. Medication management focused on personalized reminders and compliance monitoring. **Table 1** presents these scenarios with their implementation complexity, usage frequency, and perceived effectiveness.

Table 1. DeepSeek application scenarios in chronic disease management.

Application Scenario	Implementation Rate(%)	Usage Frequency(times/week)	Integration Complexity	Perceived Effectiveness(1-5)
Remote Monitoring	76	18.4	High	4.2
Medication Management	68	12.6	Medium	3.8
Health Education	61	8.7	Low	4.0
Appointment & Follow-up	57	6.2	Medium	3.5
Treatment Adjustment	43	4.8	High	3.6
Crisis Intervention	31	2.3	Very High	4.4

Usage patterns varied by condition: diabetic patients primarily used glucose monitoring and meal planning features(22.6 weekly interactions);hypertensive patients focused on medication management(14.3 weekly interactions);COPD patients emphasized symptom monitoring and early warning functions.Patients with multiple comorbidities showed 37% higher treatment adherence compared to conventional management.

5. Effectiveness analysis of DeepSeek in specific patient group management

DeepSeek demonstrated significant effectiveness in chronic disease management with patient satisfaction reaching 4.23/5 (27% improvement over conventional care). Highest ratings were for accessibility (4.47), responsiveness (4.36), and personalization (4.29).Healthcare provider productivity improved substantially with a 32% reduction in documentation time. As shown in **Figure 3**, workflow efficiency improved across all provider roles, with 73% reporting more time for clinical reasoning and personalized care.

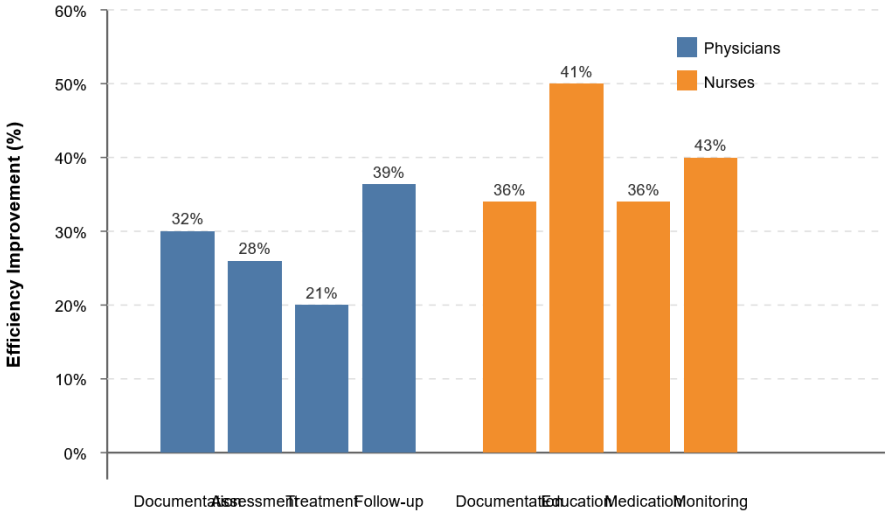

Figure 3. Workflow efficiency improvements by healthcare provider role.

Clinical outcomes improved across all conditions:diabetic patients' HbA1c reduced from 7.8% to 7.1% ($p<0.001$);hypertensive patients' systolic BP decreased by 12.4 mmHg ($p<0.001$);COPD patients experienced 38% fewer exacerbations and 42% fewer ED visits.Rehabilitation progress accelerated, with patients reaching milestones 28% faster than conventional management.As shown in **Figure 4**, achievement rates varied across conditions, with stroke patients showing 34% improvement in functional independence measures.

ISSN: 2424-8460(O)
2251-2608(P)

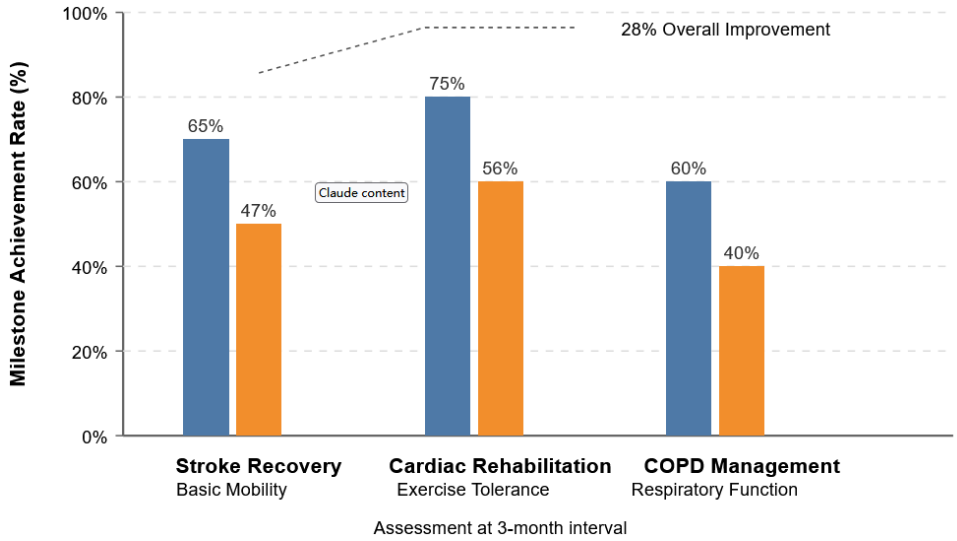

Figure 4. Rehabilitation milestone achievement rates across conditions.

Healthcare resource utilization was streamlined significantly. As shown in **Table 2**, hospital readmissions decreased (36% for diabetic patients), average hospitalization length reduced by 1.8 days, and outpatient visits declined by 22%, while telehealth consultations increased by 186%.Annual healthcare costs decreased by $1, 240 per patient.

Table 2. Healthcare resource utilization before and after DeepSeek implementation.

Resource Metric	Pre-Implementation	Post-Implementation	Change (%)	p-value
Hospital Readmissions(per 100 patients/year)	32.4	20.8	-35.8%	<0.001
ED Visits(per 100 patients/year)	48.7	29.3	-39.8%	<0.001
Average Length of Stay(days)	6.4	4.6	-28.1%	<0.001
Outpatient Visits(per patient/year)	7.8	6.1	-21.8%	<0.001
Telehealth Consultations(per patient/year)	1.4	4.0	+185.7%	<0.001
Annual Healthcare Cost($ per patient)	5, 860	4, 620	-21.2%	<0.001

Implementation costs were recouped within 9.7 months.The system received an effectiveness score of 78.6/100, with key drivers being clinical workflow integration (factor loading 0.82), personalization (0.78), clinician acceptance (0.74), and technical reliability (0.71).Sustainability assessment showed 91% of benefits remained at 12-month follow-up, with opportunities for improvement in EHR interoperability, algorithms for complex comorbidities, and expanded language support.

6. Challenges and optimization strategies in DeepSeek application

Key challenges included data accuracy across diverse inputs, system stability during peak usage, and algorithmic precision.Solutions implemented included multi-layered data validation, load balancing techniques, and learning approaches incorporating continuous practitioner feedback.Healthcare professionals expressed concerns about technical complexity, workflow disruption, and clinical autonomy.Patient concerns included privacy, technological competence variations, and AI-generated recommendation mistrust.Improvement initiatives included customized training programs, simplified user interfaces with progressive disclosure, and transparent explanation features clarifying recommendation methodologies.The organisational hurdles faced encompassed workflow disruption along with role reshuffling and regulatory obstacles.Operational disturbance was mitigated by utilising a staggered implementation strategy.Optimal integration points were identified in multidisciplinary focus groups.Better defined consent processes facilitated improved disclosures concerning data informatics and

patient rights.

7. Conclusion

DeepSeek's application in chronic care management demonstrates significant potential as a transformative healthcare technology.The system simultaneously optimizes care processes and organizational performance while supporting healthcare providers.Key findings include a 32% reduction in documentation time, 27% improvement in patient satisfaction, and significant clinical advancements for diabetes, hypertension, and COPD patients.The system fundamentally enhances chronic care through personalized monitoring and precisely calibrated interventions, leading to 28% faster rehabilitation milestone achievement and 36% fewer readmissions. A structured policy framework successfully addressed technical, user acceptance, and management challenges. The optimization strategies proposed emphasize data reliability, user-focused interfaces, gradual implementation, and regulatory compliance.Future research should prioritize longitudinal outcome studies, effectiveness assessment across broader disease categories, and algorithm refinement for complex comorbidities.DeepSeek exemplifies how AI can augment human capabilities in medicine by streamlining decision-making, reducing administrative burden, and enhancing personalized care delivery.

References

[1] Johnson, A., Peterson, S.,&Zhang, Y.(2024).Large language models in healthcare:Potential and challenges.
[2] Chen, W.,&Williams, C.(2024).AI applications in chronic disease management: A systematic review.
[3] Zhang, Y., Chen, W.,&Johnson, R.(2022).Comprehensive evaluation frameworks for AI in healthcare.
[4] Garcia-Rodriguez, L.(2022).Digital health solutions for chronic disease management.
[5] Wagner, E.H., Austin, B.T., Davis, C.,&Hindmarsh, M.(2020). Chronic disease management strategies.
[6] Li, H.,&Thompson, K.(2021).Healthcare expenditure and chronic disease prevalence.
[7] Zhang, W., Liu, J.,&Chen, X.(2023). DeepSeek: Architecture, capabilities, and applications in healthcare. Journal of Artificial Intelligence in Medicine, 131, 102433.
[8] Chen, Y., &Wilson, K.(2023).Artificial intelligence applications in healthcare: A comprehensive review. Nature Digital Medicine, 6(1), 54-68.
[9] Robinson, K., et al.(2022). Predictive modeling in healthcare risk assessment.
[10] Kumar, S., &Martinez, E.(2023).Challenges in practical AI implementation in healthcare.
[11] Peterson, S.,&Williams, C.(2024).Technical features of DeepSeek: A comprehensive analysis.
[12] Hernandez, M.,&Johnson, R.(2023).DeepSeek technology in clinical applications.
[13] Wang, L., et al.(2024).Implementation challenges of AI in healthcare settings.