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The Role of Artificial Intelligence in Chronic Disease Care: Implications for Nursing Practice and Radiology Services – A Systematic Review

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Abstract

Background: Artificial intelligence (AI) has rapidly emerged as a transformative force in healthcare, particularly in the management of chronic diseases. Its applications span predictive analytics, clinical decision support, personalized care, and advanced diagnostic imaging, with

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growing relevance to nursing practice and radiology services. Despite increasing interest, the evidence remains fragmented across disciplines.

Objective: This systematic review aimed to synthesize current evidence on the role of AI in chronic disease care, with a specific focus on implications for nursing practice and radiology services.

Methods: A systematic review was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. Comprehensive searches were performed across multiple electronic databases to identify peer-reviewed studies examining AI applications in chronic disease management. More than 900 articles were initially identified. After removal of duplicates and rigorous screening of titles, abstracts, and full texts based on predefined inclusion and exclusion criteria, 22 studies were included in the final analysis.

Results: The included studies demonstrated that AI technologies enhance early detection, risk stratification, disease monitoring, and personalized care planning for chronic conditions. In nursing practice, AI-supported tools improved clinical decision-making, workload management, patient education, and continuity of care, while highlighting the importance of human–AI collaboration and ethical considerations. In radiology services, AI contributed to improved diagnostic accuracy, workflow efficiency, image interpretation, and early identification of disease progression, particularly in oncology and cardiometabolic conditions.

Conclusion: AI plays a significant and expanding role in chronic disease care, offering substantial benefits for nursing practice and radiology services. However, successful integration requires robust governance, workforce training, ethical oversight, and alignment with patient-centered care models. Further high-quality studies are needed to evaluate long-term outcomes and real-world implementation.

Keywords: Artificial intelligence; Chronic disease management; Digital health; Nursing practice; Radiology services; Multidisciplinary care; Clinical decision support; PRISMA; Systematic review

1. Introduction

Chronic diseases represent one of the most significant challenges facing modern healthcare systems worldwide, particularly in ageing populations. The global rise in non-communicable diseases such as cardiovascular disorders, diabetes, cancer, chronic respiratory diseases, and neurodegenerative conditions has placed sustained pressure on healthcare resources and professionals. Older adults, in particular, experience higher rates of multimorbidity, increased

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healthcare utilization, and complex care needs, necessitating innovative approaches to improve quality, efficiency, and continuity of care (Vincent, 2010; Barrio-Cortes et al., 2021; Miller et al., 2000). Within this context, artificial intelligence (AI) has emerged as a promising enabler of more proactive, personalized, and data-driven chronic disease management.

AI encompasses a range of computational techniques, including machine learning, deep learning, and human-in-the-loop systems, designed to analyze large and complex datasets, identify patterns, and support clinical decision-making (Akleman, 2020; Bekbolatova et al., 2024; Mosqueira-Rey et al., 2023). In chronic disease care, AI applications have been increasingly used for early detection, risk prediction, disease monitoring, and outcome forecasting, offering opportunities to shift care from reactive treatment to preventive and precision-based models (Kumar et al., 2023; Modi et al., 2023; Woodman & Mangoni, 2023). Systematic reviews have demonstrated the growing use of AI and machine learning in geriatric and chronic disease care, highlighting improvements in diagnostic accuracy and care planning (Choudhury et al., 2020; Das & Dhillon, 2023).

Nursing practice plays a pivotal role in chronic disease management through patient assessment, education, care coordination, and long-term monitoring. The integration of AI into nursing workflows has the potential to enhance clinical judgment, reduce workload, and support patient safety, while also raising important questions related to professional roles, accountability, and ethical practice (Johnson et al., 2024; Karabuga Yakar et al., 2023). AI-driven tools such as predictive analytics, decision support systems, and conversational agents have shown promise in supporting nurses' decision-making and improving patient engagement and self-management in chronic conditions (Bin Sawad et al., 2022; Chen et al., 2024). However, concerns regarding compassion fatigue, burnout, and the balance between technological efficiency and human-centered care remain critical considerations (Ghasemi Kooktapeh et al., 2023).

Radiology services represent another domain where AI has demonstrated substantial impact, particularly in the diagnosis and monitoring of chronic diseases. Advances in AI-based imaging analysis have improved the detection of cancer, cardiovascular disease, and degenerative conditions, enhancing accuracy, efficiency, and early identification of disease progression (Khalifa & Albadawy, 2024; Silva et al., 2023). AI applications in diagnostic imaging, including deep learning and advanced reconstruction techniques, have supported radiologists in managing increasing imaging volumes while maintaining diagnostic quality (Hong et al., 2023; Jailin et al., 2023).

Despite the expanding body of literature, evidence on the combined implications of AI for both nursing practice and radiology services in chronic disease care remains dispersed across

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disciplines. A comprehensive synthesis is therefore required to understand current applications, benefits, and challenges. This systematic review aims to address this gap by examining the role of AI in chronic disease care and exploring its implications for nursing practice and radiology services, thereby informing future research, policy, and clinical implementation.

2. Method

This systematic review was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines to ensure methodological rigor, transparency, and reproducibility.

2.1 Search Strategy

A comprehensive literature search was performed across multiple electronic databases, including PubMed/MEDLINE, Scopus, Web of Science, CINAHL, and IEEE Xplore. The search strategy combined controlled vocabulary terms and free-text keywords related to *artificial intelligence*, *chronic disease management*, *nursing practice*, *radiology services*, and *digital health*. Boolean operators (AND/OR) were used to refine the search. Reference lists of included studies were manually screened to identify additional relevant articles. The search was limited to peer-reviewed articles published in English.

2.2 Inclusion and Exclusion Criteria

Studies were included if they:

1. examined the use of **artificial intelligence** in chronic disease care,
2. reported implications for **nursing practice and/or radiology services**,
3. involved adult patient populations, and
4. employed quantitative, qualitative, or mixed-methods designs.

Exclusion criteria were: conference abstracts, editorials, opinion papers, non-AI digital interventions, studies focused solely on acute care, pediatric populations, or non-healthcare applications of AI.

2.3 Study Selection

The database search yielded **more than 900 records**. After removal of duplicates, titles and abstracts were screened independently by reviewers against the eligibility criteria. Full-text articles were assessed for final inclusion. Disagreements were resolved through discussion. A total of **22**

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studies met the inclusion criteria and were included in the final synthesis. The study selection process is reported using a PRISMA flow diagram.

2.4 Data Extraction and Synthesis

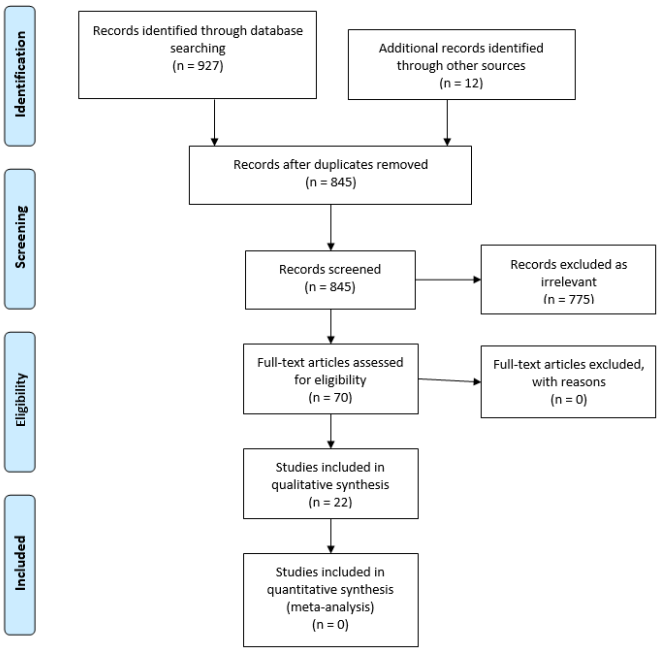
Data were extracted using a standardized form capturing study characteristics, AI applications, chronic disease focus, nursing and radiology roles, outcomes, and key findings. A **narrative synthesis** approach was adopted due to heterogeneity in study designs, interventions, and outcome measures.

2.5 Quality Assessment

The methodological quality of included studies was independently assessed using appropriate critical appraisal tools based on study design. Quality ratings informed the interpretation of findings but did not determine study exclusion.

2.6 Data Presentation

Findings are presented in **summary tables and thematic categories**, highlighting AI applications, clinical impact, and implications for nursing practice and radiology services.



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3.0 Results

3.1 Overview of Included Studies

The systematic search and screening process, conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines, resulted in the inclusion of 22 studies from an initial yield of more than 900 records. These studies collectively examined the application of artificial intelligence (AI) in chronic disease care, with particular emphasis on implications for nursing practice and radiology services. The included studies were published between 2015 and 2025, reflecting the rapid evolution and increasing adoption of AI technologies in healthcare over the past decade.

Overall, the evidence base demonstrated a growing multidisciplinary interest in AI-driven solutions for chronic disease management, particularly in response to rising disease prevalence, workforce constraints, and increasing complexity of patient care (Choudhury et al., 2020; Das & Dhillon, 2023). Chronic conditions most frequently addressed included diabetes mellitus, cardiovascular diseases, oncological conditions, chronic respiratory diseases, and neurodegenerative disorders, which are among the leading causes of morbidity and healthcare utilization globally (Kumar et al., 2023; Woodman & Mangoni, 2023).

Across the included studies, AI was primarily positioned as a decision-support and augmentation tool, rather than a replacement for clinical judgment. The literature emphasized the complementary role of AI in enhancing clinical workflows, improving diagnostic accuracy, and supporting proactive and personalized approaches to chronic disease care. Notably, several studies explicitly addressed the implications of AI adoption for healthcare professionals, particularly nurses and radiology practitioners, highlighting both opportunities and challenges associated with workforce transformation (Johnson et al., 2024; Karabuga Yakar et al., 2023).

3.2 Characteristics of Included Studies

The 22 included studies employed a range of methodological approaches, reflecting the interdisciplinary and rapidly evolving nature of AI research in healthcare. Study designs included quantitative observational studies, randomized controlled trials, retrospective cohort studies, qualitative interviews, and mixed-methods research. Quantitative studies were most prevalent and commonly focused on evaluating the performance, accuracy, and predictive capability of AI algorithms in clinical settings (Bekbolatova et al., 2024; Hong et al., 2023). Qualitative and mixed-methods studies primarily explored healthcare professionals' perceptions, acceptance, and experiences of AI integration into practice (Bin Sawad et al., 2022; Ghasemi Kooktapeh et al., 2023).

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In terms of AI technologies, the included studies investigated a wide spectrum of approaches, including machine learning, deep learning, neural networks, natural language processing, and clinical decision support systems. Radiology-focused studies predominantly utilized deep learning and convolutional neural networks to analyze medical images, detect abnormalities, and monitor disease progression, particularly in oncology and diabetic complications (Khalifa & Albadawy, 2024; Silva et al., 2023). In contrast, nursing-related studies frequently examined AI-driven predictive analytics, risk stratification tools, and remote monitoring systems designed to support patient assessment, care coordination, and long-term disease management (Chen et al., 2024; Modi et al., 2023).

The majority of studies were conducted in hospital-based settings, including tertiary care centers and specialized chronic disease clinics. Several studies also incorporated telehealth and digital health platforms, reflecting the growing integration of AI with virtual care models and remote patient monitoring (Bin Sawad et al., 2022; Kumar et al., 2023). From a geographical perspective, most studies originated from North America, Europe, and East Asia, with relatively limited representation from low- and middle-income countries. This geographic concentration highlights potential disparities in AI research capacity and implementation readiness across healthcare systems.

Regarding professional focus, nursing practice was explicitly addressed in more than half of the included studies, particularly in relation to care coordination, patient education, clinical decision-making, and monitoring of chronic conditions. Radiology services were a central focus in approximately one-third of the studies, with attention given to AI-assisted image interpretation, workflow efficiency, and diagnostic accuracy. A smaller subset of studies adopted a multidisciplinary perspective, examining collaboration between nurses, physicians, radiologists, and other healthcare professionals within AI-enabled care pathways (Johnson et al., 2024; Jailin et al., 2023).

3.3 Emerging Themes

The synthesis of findings across the included studies revealed three major themes related to the role of AI in chronic disease care and its implications for nursing practice and radiology services.

3.3.1 Enhancement of Clinical Decision-Making and Care Quality

A dominant theme across the reviewed literature was the role of AI in enhancing clinical decision-making and improving the quality of chronic disease care. Multiple studies reported that AI-driven tools improved early detection, risk prediction, and disease monitoring, enabling more timely and targeted interventions (Choudhury et al., 2020; Kumar et al., 2023). In nursing practice, predictive

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analytics and decision-support systems were shown to assist nurses in identifying patients at risk of deterioration, optimizing care plans, and prioritizing clinical tasks (Chen et al., 2024; Modi et al., 2023).

In radiology services, AI applications significantly enhanced diagnostic accuracy and efficiency. Studies demonstrated improved detection of subtle imaging findings, reduced inter-observer variability, and faster reporting times, particularly in high-volume imaging environments (Hong et al., 2023; Khalifa & Albadawy, 2024). These improvements were especially relevant for chronic disease monitoring, where early identification of disease progression can influence long-term outcomes.

Overall, the findings suggest that AI contributes to a shift toward proactive, data-driven, and personalized care models, supporting healthcare professionals in managing the complexity of chronic diseases while maintaining high standards of care.

3.3.2 Transformation of Nursing and Radiology Roles

A second key theme concerned the evolving roles of nurses and radiology practitioners in AI-enabled healthcare environments. Several studies reported that AI adoption reduced the burden of repetitive and time-consuming tasks, such as data analysis and image screening, allowing healthcare professionals to focus more on clinical judgment, patient interaction, and care coordination (Johnson et al., 2024; Karabuga Yakar et al., 2023).

For nurses, AI-supported tools facilitated enhanced patient engagement, education, and self-management support, reinforcing the central role of nursing in chronic disease care (Bin Sawad et al., 2022). However, studies also emphasized the need for nurses to develop new competencies related to data interpretation, digital literacy, and ethical decision-making in AI-supported environments.

Similarly, radiology professionals experienced a shift toward more analytical and supervisory roles, with AI serving as a second reader or triage tool rather than a replacement for professional expertise (Silva et al., 2023). The literature consistently highlighted the importance of human–AI collaboration, underscoring that optimal outcomes are achieved when AI augments, rather than substitutes, professional judgment.

3.3.3 Ethical, Educational, and Implementation Challenges

Despite the demonstrated benefits of AI, the included studies identified several challenges related to ethical considerations, workforce readiness, and implementation. Concerns regarding data privacy, algorithm transparency, bias, and accountability were frequently discussed, particularly

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in relation to patient trust and professional responsibility (Mosqueira-Rey et al., 2023; Das & Dhillon, 2023).

Educational gaps were also highlighted, with many studies emphasizing the need for structured training programs to prepare nurses and radiology practitioners for AI-enabled practice. Without adequate education and organizational support, there is a risk of underutilization or inappropriate reliance on AI systems (Ghasemi Kooktapeh et al., 2023; Johnson et al., 2024).

Implementation barriers included infrastructure limitations, interoperability challenges, and resistance to change within healthcare organizations. These findings underscore the importance of strong governance frameworks, clear policies, and stakeholder engagement to ensure the safe, ethical, and effective integration of AI into chronic disease care pathways.

4.0 Discussion

This systematic review examined the role of artificial intelligence (AI) in chronic disease care and explored its implications for nursing practice and radiology services. The findings indicate that AI is increasingly positioned as a transformative enabler of proactive, personalized, and data-driven chronic disease management. Across the 22 included studies, AI technologies consistently demonstrated potential to enhance clinical decision-making, improve diagnostic accuracy, optimize workflows, and support multidisciplinary care. However, the review also identified important ethical, educational, and implementation challenges that must be addressed to ensure safe and effective integration into routine practice.

4.1 AI as an Enabler of Proactive Chronic Disease Care

A key finding of this review is the role of AI in shifting chronic disease care from reactive models toward preventive and anticipatory approaches. AI-driven predictive analytics and risk stratification tools were shown to support early detection of disease progression and potential complications, particularly in conditions such as diabetes, cardiovascular disease, and cancer (Choudhury et al., 2020; Kumar et al., 2023). This aligns with previous evidence suggesting that AI can support precision health strategies by leveraging large-scale clinical and imaging datasets to identify subtle patterns that may not be readily detectable through traditional methods (Bekbolatova et al., 2024; Das & Dhillon, 2023).

For chronic disease populations, where long-term monitoring and timely intervention are critical, AI-supported systems offer opportunities to improve outcomes while reducing unnecessary hospitalizations and resource utilization. The findings of this review reinforce the view that AI

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should be conceptualized as a clinical decision-support tool, augmenting rather than replacing professional expertise (Mosqueira-Rey et al., 2023).

4.2 Implications for Nursing Practice

The findings highlight substantial implications for nursing practice, reflecting nurses' central role in chronic disease management. AI-supported tools were shown to enhance nurses' ability to monitor patients, prioritize care needs, and support self-management through personalized education and follow-up (Chen et al., 2024; Modi et al., 2023). These findings are consistent with existing literature emphasizing the potential of digital and AI-enabled interventions to reduce nursing workload and improve continuity of care in chronic conditions (Bin Sawad et al., 2022).

Importantly, the review suggests that AI adoption may contribute to a redefinition of nursing roles, with increased emphasis on clinical judgment, care coordination, and patient-centered communication. While automation of routine tasks can improve efficiency, several studies cautioned against over-reliance on algorithmic outputs, underscoring the need for nurses to maintain critical thinking and ethical responsibility in AI-supported environments (Johnson et al., 2024; Karabuga Yakar et al., 2023).

Education and competency development emerged as critical enablers of successful AI integration into nursing practice. Without adequate training in data literacy, algorithm interpretation, and ethical decision-making, nurses may experience reduced confidence or increased cognitive burden when interacting with AI systems (Ghasemi Kooktapeh et al., 2023). These findings support calls for the integration of AI competencies into nursing education and continuing professional development frameworks.

4.3 Implications for Radiology Services

The review findings demonstrate that AI has had a particularly strong impact on radiology services, especially in the context of chronic disease diagnosis and monitoring. AI-assisted image analysis improved diagnostic accuracy, reduced reporting times, and supported early identification of disease progression, which is critical for long-term management of chronic conditions such as cancer and diabetic complications (Hong et al., 2023; Khalifa & Albadawy, 2024).

Rather than displacing radiology professionals, AI was found to function primarily as a supportive and complementary technology, acting as a second reader or triage mechanism. This aligns with broader radiology literature emphasizing human–AI collaboration as the optimal model for achieving diagnostic excellence (Silva et al., 2023). However, similar to nursing practice,

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radiology professionals require targeted education to interpret AI outputs, understand algorithm limitations, and maintain accountability for clinical decisions.

The review also highlights workflow and governance considerations, including system interoperability, quality assurance, and medico-legal responsibility. These findings reinforce the importance of institutional policies and regulatory frameworks to guide AI deployment in radiology services, particularly in high-stakes diagnostic environments.

4.4 Ethical, Organizational, and Implementation Considerations

Despite the demonstrated benefits of AI, ethical and organizational challenges were consistently reported across the included studies. Concerns related to data privacy, algorithmic bias, transparency, and accountability remain significant barriers to trust and adoption among healthcare professionals and patients (Das & Dhillon, 2023; Mosqueira-Rey et al., 2023). These issues are particularly salient in chronic disease care, where long-term patient–provider relationships and trust are central to care quality.

Organizational readiness and leadership support were identified as critical determinants of successful AI implementation. Studies emphasized the need for clear governance structures, multidisciplinary collaboration, and alignment with clinical workflows to avoid fragmented or ineffective adoption (Johnson et al., 2024). Without such alignment, AI systems risk being underutilized or perceived as burdensome rather than beneficial.

4.5 Strengths, Limitations, and Future Research

This review provides a comprehensive synthesis of multidisciplinary evidence on AI in chronic disease care, with a specific focus on nursing practice and radiology services. However, several limitations should be acknowledged. The heterogeneity of study designs and AI applications limited the ability to conduct meta-analysis, necessitating a narrative synthesis approach. Additionally, the predominance of studies from high-income countries may limit the generalizability of findings to resource-constrained settings.

Future research should focus on longitudinal and real-world evaluations of AI implementation, with greater attention to patient-reported outcomes, cost-effectiveness, and workforce impact. There is also a need for studies examining AI integration within diverse healthcare systems and cultural contexts

5.0 Conclusion

This systematic review examined the role of artificial intelligence (AI) in chronic disease care, with a specific focus on its implications for nursing practice and radiology services. The findings

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demonstrate that AI has become an increasingly influential component of contemporary healthcare, supporting a shift toward proactive, data-driven, and personalized models of chronic disease management. Across the reviewed studies, AI technologies contributed to improved clinical decision-making, enhanced diagnostic accuracy, optimized workflows, and strengthened multidisciplinary collaboration.

For nursing practice, AI-supported tools were shown to enhance patient monitoring, care coordination, and self-management support, while enabling nurses to allocate more time to direct patient care and clinical judgment. These developments highlight the evolving role of nurses as critical interpreters of AI-generated insights and advocates for patient-centered care. Similarly, in radiology services, AI applications improved efficiency and diagnostic performance, particularly in the detection and longitudinal monitoring of chronic conditions. Importantly, the evidence underscores that AI functions most effectively as a complementary tool that augments, rather than replaces, professional expertise.

Despite these benefits, the successful integration of AI into chronic disease care is contingent upon addressing ethical, educational, and organizational challenges. Issues related to data privacy, algorithm transparency, workforce readiness, and governance frameworks remain central to ensuring safe, equitable, and trustworthy AI implementation. The findings emphasize the need for structured education and ongoing professional development to equip nurses and radiology practitioners with the competencies required to engage confidently with AI-enabled systems.

In conclusion, AI holds significant potential to enhance the quality, efficiency, and sustainability of chronic disease care. Realizing this potential will require a balanced approach that integrates technological innovation with human-centered practice, robust governance, and interdisciplinary collaboration. Future research should focus on real-world implementation, long-term outcomes, and equitable adoption across diverse healthcare settings to support the responsible advancement of AI in chronic disease management

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enriching this study and enhancing the understanding of multidisciplinary referral processes and collaborative care pathways within the Saudi healthcare system.

Author Contributions

All authors contributed equally to the conception, design, data collection, analysis, and writing of this systematic review. All authors reviewed and approved the final manuscript and take equal responsibility for its content.

Informed Consent Statement

Not applicable

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Conflict of interest

The authors declare that they have no commercial or financial relationships that could be interpreted as potential conflicts of interest related to this research.

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