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The Role of AI in Early Detection and Prediction of Hypertension

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Introduction

Hypertension is a leading cause of premature death and disability globally, often progressing silently until it manifests in serious complications such as stroke, heart failure, or chronic kidney disease. Early detection and effective risk prediction are crucial to preventing the disease and reducing its long-term burden. Traditional approaches to hypertension screening rely on intermittent clinical measurements and general population risk stratification models, which often fail to capture subtle, individualized patterns. In recent years, Artificial Intelligence (AI) has emerged as a transformative force in healthcare, offering new ways to analyze vast and complex datasets with speed and accuracy. In the context of hypertension, AI applications are being developed to predict risk, detect early signs, optimize diagnostics and support clinical decision-making. This report explores the growing role of AI in the early detection and prediction of hypertension, highlighting its potential benefits, technological advances and challenges in real-world deployment [1].

Description

At the heart of AI's utility in hypertension lies Machine Learning (ML) a subset of AI that enables systems to learn patterns from data without explicit programming. By analyzing large volumes of patient data, including demographics, lifestyle factors, Electronic Health Records (EHRs), wearable sensor data and genetic profiles, ML algorithms can identify individuals at high risk for developing hypertension with greater accuracy than conventional tools. Logistic regression, decision trees, random forests, support vector machines and deep learning networks have all been tested in various studies. For example, ML models trained on longitudinal EHR data have successfully predicted the onset of hypertension several years in advance by recognizing patterns in blood pressure variability, lab results and medication history. These predictive capabilities allow for earlier interventions tailored to individual risk profiles. Importantly, ML algorithms continue to evolve through feedback and validation, making them dynamic tools in preventive cardiology. However, their effectiveness relies on the quality, completeness and diversity of input data [2].

AI-driven wearable devices are revolutionizing how hypertension is monitored and managed outside clinical settings. Smartwatches, fitness bands and cuffless blood pressure monitors now incorporate AI algorithms that process continuous physiological data such as heart rate variability, pulse transit time, sleep patterns and stress levels. These devices can provide real-time alerts about abnormal blood pressure trends or cardiovascular events, enabling timely intervention. Moreover, AI models can filter out noise, adapt to individual baselines and learn from user behavior over time, improving the precision of hypertension detection. A notable example is the integration of AI in Photoplethysmography (PPG) sensors, which allows blood pressure estimation from wrist-worn devices without the need for traditional cuffs. Such innovations enhance accessibility, especially in remote or underserved areas and promote patient engagement through user-friendly health insights. As wearable adoption grows, so too does the potential for AI to reshape hypertension screening from a reactive to a proactive practice [3].

Another key application of AI in hypertension detection is Natural Language Processing (NLP), which enables machines to interpret and analyze unstructured clinical text data. Much of the valuable information in patient records such as physician notes, diagnostic impressions and symptom descriptions exists in narrative form. NLP tools can extract hypertension-related features, track blood pressure trajectories, identify medication non-adherence and detect comorbidities with higher sensitivity than traditional coding systems. This allows healthcare providers to uncover hidden or undocumented cases of hypertension and flag at-risk individuals earlier in the care pathway. Furthermore, combining structured and unstructured data sources enhances the accuracy of AI predictions. NLP also facilitates population health surveillance, enabling health systems to monitor hypertension trends, treatment patterns and disparities across different regions or demographic groups. The integration of NLP into AI platforms empowers clinicians to harness the full breadth of available data, improving both individual and public health decision-making [4-5].

Conclusion

AI is increasingly being used in Clinical Decision Support Systems (CDSS) to guide hypertension diagnosis, treatment planning and risk communication. These systems synthesize information from patient records, clinical guidelines and predictive algorithms to provide evidence-based recommendations. For example, AI can help determine the optimal timing for antihypertensive therapy initiation, suggest drug choices based on patient-specific factors (e.g., age, kidney function, comorbidities) and predict potential adverse reactions. This personalization enhances treatment efficacy and minimizes trial-and-error prescribing. AI also enables better communication with patients through interactive dashboards and decision aids, which simplify complex medical information.

Acknowledgment

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Conflict of Interest

None.

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References

1. Donkor, R., A. A. Jammal and D. S. Greenfield. 2025. "Relationship between blood pressure and rates of glaucomatous visual field progression: The vascular imaging in glaucoma study." *Ophthalmology* 132: 30–38.

2. Visco, Valeria, Carmine Izzo, Costantino Mancusi, Antonella Rispoli, Michele Tedeschi, Nicola Virtuoso, Angelo Giano, Renato Gioia, Americo Melfi, Bianca Serio, et al. 2023. “Artificial intelligence in hypertension management: An ace up your sleeve.” *J Cardiovasc Dev Dis* 10 (2): 74.

3. Alkhodari, Mohanad, Zhaohan Xiong, Ahsan H. Khandoker and Leontios J. Hadjileontiadis, et al. “The role of Artificial Intelligence in hypertensive disorders of pregnancy: Towards personalized healthcare.” *Expert Rev Cardiovasc Ther* 21 (7): 531–543.

4. Kumar, Natasha Raj, Adi Hirshberg and Sindhu K. Srinivas. 2022. “Best practices for managing postpartum hypertension.” *Curr Obstet Gynecol Rep* 11 (3): 159–168

5. Jhee, Jong Hyun, SungHee Lee, Yejin Park and Sang Eun Lee, et al. 2019. “Prediction model development of late-onset preeclampsia using machine learning-based methods.” *Plos One* 14 (8): e0221202.

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