

THE IMPACT OF ARTIFICIAL INTELLIGENCE TECHNOLOGIES ON EARLY DIAGNOSIS OF CARDIOVASCULAR DISEASES

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<https://doi.org/10.5281/zenodo.20441605>

Abstract

Cardiovascular diseases remain a major cause of morbidity and mortality worldwide, and early diagnosis is essential for prevention of severe complications. Artificial intelligence technologies are increasingly used in cardiology for interpretation of electrocardiograms, imaging data, laboratory indicators, and clinical risk profiles. This study analyzes the role of artificial intelligence in early detection of cardiovascular diseases and evaluates its diagnostic and organizational advantages. The findings indicate that machine learning algorithms can improve risk stratification, support clinical decision-making, and identify pathological changes before clinical deterioration. Integration of artificial intelligence into routine practice may improve diagnostic accuracy and patient outcomes when combined with physician expertise.

Keywords: artificial intelligence, cardiovascular disease, early diagnosis, machine learning, clinical decision support

Introduction

Cardiovascular diseases are among the most important medical and social problems in modern healthcare. Early identification of risk factors and subclinical disorders allows clinicians to prevent myocardial infarction, stroke, heart failure, and sudden cardiac death. Traditional diagnostic methods remain highly valuable, but the growing volume of clinical data requires new analytical tools. Artificial intelligence has become a promising approach because it can process large datasets, recognize complex patterns, and support individualized prediction of disease risk. In cardiology, artificial intelligence is applied to electrocardiography, echocardiography, computed tomography, magnetic resonance imaging, laboratory evaluation, and wearable monitoring systems. The relevance of this topic is determined by the need to improve early diagnosis, reduce diagnostic delays, and optimize preventive strategies.

This topic is relevant because modern medical practice requires evidence-based analysis, early diagnosis, and interdisciplinary approaches. A deeper understanding of pathogenetic and clinical mechanisms allows healthcare professionals to improve prevention, monitoring, and treatment outcomes.

Materials and Methods

This article was prepared as an analytical review of contemporary scientific literature devoted to artificial intelligence applications in cardiovascular diagnostics. Publications on machine learning, deep learning, clinical decision support systems, ECG interpretation, cardiac imaging, and risk prediction models were analyzed. The review focused on diagnostic accuracy, clinical applicability, advantages, limitations, and ethical aspects of artificial intelligence technologies in cardiovascular medicine.

Results

The analysis showed that artificial intelligence algorithms can detect subtle changes in electrocardiographic and imaging data that may be difficult to identify during routine examination.

Machine learning models demonstrated usefulness in predicting coronary artery disease, arrhythmias, heart failure risk, and cardiovascular complications. AI-based systems also improved interpretation speed and reduced the workload of clinicians. The most effective results were achieved when artificial intelligence tools were integrated with clinical evaluation rather than used independently.

Discussion

Artificial intelligence offers important opportunities for modern cardiology; however, its use requires careful validation and clinical supervision. Algorithms depend on the quality of training data and may produce inaccurate results if used in populations different from those represented in datasets. Ethical issues, data security, transparency, and physician responsibility remain important. AI should be considered a supportive tool that enhances, but does not replace, clinical judgment. Future development should focus on explainable algorithms, integration with electronic medical records, and personalized prevention programs.

The reviewed evidence indicates that practical implementation depends on clinical context, patient characteristics, available resources, and professional competence. Therefore, future studies should include larger cohorts, standardized protocols, and long-term follow-up to improve reliability of conclusions.

Conclusion

Artificial intelligence technologies have significant potential to improve early diagnosis of cardiovascular diseases. They can support risk stratification, detect early pathological changes, and improve clinical decision-making. Successful implementation requires high-quality data, physician control, ethical regulation, and interdisciplinary cooperation. AI-based cardiology may become an important component of preventive and personalized medicine.

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