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The potential of artificial intelligence and machine learning algorithms in the field of cardiovascular diseases

Kardiyovasküler hastalıklar alanında yapay zeka ve makine öğrenimi algoritmalarının potansiyeli

Can Ramazan Öncel[1], Ahmet Aslan[2*]

1.Medical School of Alanya Alaaddin Keykubat University, Department of Cardiology Alanya/Antalya, Türkiye

2.Medical School of Alanya Alaaddin Keykubat University, Department of Orthopedics and Traumatology, Alanya/Antalya, Türkiye

ABSTRACT

Artificial intelligence (AI) and machine learning (ML) is a form of intelligence that has a wide-reaching impact on various aspects of contemporary life, including the field of medicine. Artificial intelligence tools and technology are utilized for the early identification and diagnosis of severe or intricate heart conditions. The potential of artificial intelligence (AI) in cardiovascular medicine is significant. However, the major challenges hindering the development of AI applications in this field include the scarcity of diverse data and limited availability of huge datasets. These revolutionary digital technologies will play a significant role in shaping the future of cardiology.

Key Words: Artificial intelligence, machine learning, cardiovascular disease

ÖZ

Yapay zeka (AI) ve makine öğrenimi (ML), tıp da dahil olmak üzere modern yaşamın neredeyse her alanına dokunan bir zekadır. Yapay zeka araçları ve teknolojileri, ciddi veya karmaşık kalp sorunlarının erken risk tahmini ve teşhisine uygulanmaktadır. Kardiyovasküler tıpta yapay zekanın potansiyeli büyüktür, ancak sınırlı veri çeşitliliği ve birçok büyük veri tabanına erişim eksikliği, yapay zeka uygulamalarının geliştirilmesinin önündeki en büyük engeller arasındadır. Kardiyolojinin geleceği büyük ölçüde bu yenilikçi dijital teknolojilere dayanacaktır.

Anahtar Sözcükler: Yapay zeka, makine öğrenimi, kardiyovasküler hastalıklar

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* Corresponding Author: Ahmet Aslan, MD, Medical School of Alanya Alaaddin Keykubat University, Department of Orthopedics and Traumatology, Alanya/Antalya, Türkiye. Phone: 05056462411 / mail: ahmet.aslan@alanya.edu.tr

ORCID: 0000-0001-5797-1287

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Artificial intelligence (AI) is intelligence that affects nearly every aspect of modern life, including medicine. Clinical practice increasingly employs artificial intelligence tools and technology to assist individuals suffering from or at risk of developing heart disease. We use these novel techniques to detect and diagnose serious or complex heart diseases early.Furthermore, AI has the ability to improve medical image analysis, such as echocardiography and cardiac MRI scans. Clinical data like electrocardiograms (ECGs), echocardiograms, and medical imaging can apply machine learning algorithms to predict outcomes, stratify risks, and identify cardiovascular diseases [1].

One of the most common uses of machine learning (ML) in cardiology is to predict heart rhythm abnormalities. The most common clinically significant arrhythmia, atrial fibrillation (AF) carries a substantial risk of stroke, heart failure and death. Therefore, significant efforts are currently underway to enhance AF screening, early identification and treatment. Among these initiatives, AI technology

has shown therapeutic utility and potential. Artificial intelligence has enabled the prediction of AF using multivariable models as well as the improvement of 12-lead ECGs in sinus rhythm. Consumer-direct goods such as smartphones and watches use AI-based algorithms widely to identify AF through platoplethysmography, both actively and passively [2]. Recent studies show that artificial intelligence can provide useful prognostic evaluations and treatment recommendations.

With the rising prevalence of heart failure, it is crucial to ensure precise diagnosis and personalized treatment. Wearable gadgets and remote monitoring assisted by AI, allow for early identification of heart failure and better patient care. Machine learning systems can reduce needless hospitalizations for heart failure by identifying individuals who are more likely to experience cardiac decompensation after discharge than traditional risk assessments. Artificial intelligence uses a variety of data from these individuals, including ECGs, echocardiograms and electronic health records [3]. Kwon et al., demonstrated that an AI-enabled smart watch with a 2-lead ECG could diagnose heart failure with a lower ejection fraction with satisfactory accuracy [4]. Another relevant field is heart transplantation, where ML algorithms appear to be useful for predicting the likelihood of mortality, transplantation or transplant success in individuals on the waiting list.

Artificial intelligence has proven to be more effective than traditional risk scales in predicting cardiovascular disease risk in the general population, ranging from primary care to conventional electronic medical records. However, the findings vary depending on sample size, indicating that ML approaches perform better with larger samples. Medical experts can use AI to help diagnose coronary artery disease (CAD) by analyzing computed tomography and magnetic resonance images to assess the presence and severity of plaque in the coronary arteries. Medical professionals can also take advantage of the real-time feedback and guidance offered by AI algorithms during CAD procedures such as angioplasty and stent implantation [5]. AI methodologies, combined with the growing accessibility of big data, have already made notable progress in the fields of disease detection, risk assessment, phenotyping and clinical decision support for a range of cardiovascular diseases, including atherosclerotic heart disease, peripheral arterial disease, abdominal aortic aneurysm and carotid artery disease [6].

In the near future, artificial intelligence may bring about a paradigm shift in cardiovascular medicine. The potential for AI in cardiovascular medicine is enormous but the restricted diversity of data and lack of access to many huge databases are among the most significant barriers to the development of AI applications. The future of cardiology will be highly reliant on these revolutionary digital technologies. Despite this, we have not adequately addressed the ethical quandaries surrounding the adoption of AI technology in the real world.

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