

With Artificial Intelligence Transforming Cardiovascular Care

Scientists reviewed current developments in [artificial intelligence](#) (AI)-based innovations such as diagnostic, biomarker detection, and prognostic tools that are improving the quality, precision, and efficacy of multimodal cardiovascular care in the areas of biomedical discovery, as well as clinical practice.



Study

In the present study, the researchers reviewed the use of AI-based tools in cardiovascular research and clinical practice, as well as the potential areas of cardiovascular health that might become reliant on AI in the future. These include diagnosing cardiovascular disease using AI-based tools, risk stratification based on [digital biomarkers](#), and using AI-based tools for clinical care and determining prognostic outcomes.

However, integrating AI-based tools into [healthcare workflows](#) also poses potential risks, and the review also discusses the challenges in integrating AI into cardiovascular healthcare and the implementation of safeguards for potential risk mitigation. The study also highlights the transformative impact of AI on cardiovascular care by enabling more personalized, precise, and accessible healthcare solutions.

AI-based Innovations in Cardiovascular Healthcare

Machine learning and AI-based tools are effective in processing unstructured, raw data of biometric images and signals to determine phenotypic variations and predict disease risk. One example of AI's effectiveness in risk screening is the interpretation of electrocardiograms. The AI-guided process uses [electrocardiograms](#) in sinus rhythm to screen for paroxysmal atrial fibrillation.

Furthermore, AI-based assessment of electrocardiographic signatures that occur before overt changes in myocardial function could help detect various structural diseases of the heart, such as [hypertrophic cardiomyopathy](#), left ventricular systolic dysfunction, and transthyretin amyloid cardiomyopathy. The integration of this AI technology into portable devices, smartwatches, and stethoscopes has also improved accessibility and deployment for the monitoring and care of patients with chronic and acute cardiovascular conditions.

Incorporating AI into cardiovascular diagnostic methods has also reduced the need for trained personnel to use the [diagnostic tools](#), with deep-learning-based guidance systems providing accurate instructions for using the equipment and interpreting results.

Moreover, the review discusses how AI enables opportunistic screening of cardiovascular diseases using common diagnostic tools like [chest X-rays](#), thus broadening the scope and reach of cardiovascular diagnostics.

Wearable AI-based devices that monitor health parameters also provide digital biomarkers for cardiovascular risk assessment and [disease](#) prediction. Metrics such as variation in heart rate, step counts, and sleep duration and quality can effectively predict cardiovascular outcomes and have been shown to predict a two-fold variation in the development of cardiovascular disease.

Another domain in which AI-based tools are contributing to improving cardiovascular healthcare is predicting the possibility of adverse outcomes and defining the disease trajectory. AI also helps incorporate unstructured data such as chest X-rays, electrocardiograms, and [echocardiograms](#) in predicting the progression of cardiovascular events and determining the prognosis.

The prognostic role of AI-based tools also extends to determining how specific therapies in individuals may impact the outcomes. For example, AI-based tools can integrate multimodal data to discriminate the risk of non-arrhythmic versus arrhythmic mortality in cases where implantable cardioverter-defibrillators are recommended despite the [heterogeneous risk](#).

Future Applications of AI in Cardiovascular Health

The researchers stated that while the focus of AI technology thus far has been to create tools with applications in various aspects of cardiovascular [healthcare](#), with growing data on disease and population characteristics, deep learning models can be trained to perform better and adapt to different populations. These adaptive models promise to refine the accuracy of diagnostic and prognostic tools by learning from diverse demographic and clinical data.

However, it is essential to ensure that the data used for training these [deep-learning models](#) do not encode a bias that can impact the risk predictions made for the disease while accounting for demographic confounders.

AI-assisted technologies are already being used to standardize the assessment and documentation process, maximizing the direct [clinical care](#) available to the patients. These tools can potentially also be used for the grading and characterization of cardiovascular recordings, accelerating population-wide screening. The decreased need for trained individuals to use AI-based diagnostic tools can also democratize and improve access to high-quality cardiovascular diagnosis and clinical care.

The study also underscores the importance of addressing [health equity](#) to ensure that AI technologies benefit all segments of the population, particularly those in under-resourced settings.

Conclusion

To summarize, the review discussed the current and future use of AI-based tools in the diagnosis, prognosis, and digital biomarker-based risk stratification of cardiovascular disease. The researchers also discussed some of the pitfalls and challenges in optimizing and standardizing AI-based cardiovascular healthcare that can be accessed by all. This includes ensuring data privacy and security, achieving interoperability across health systems, and implementing appropriate [regulatory controls](#).

Source:

<https://www.news-medical.net/news/20240625/AI-transforming-cardiovascular-care-with-groundbreaking-diagnostic-and-prognostic-innovations.aspx>