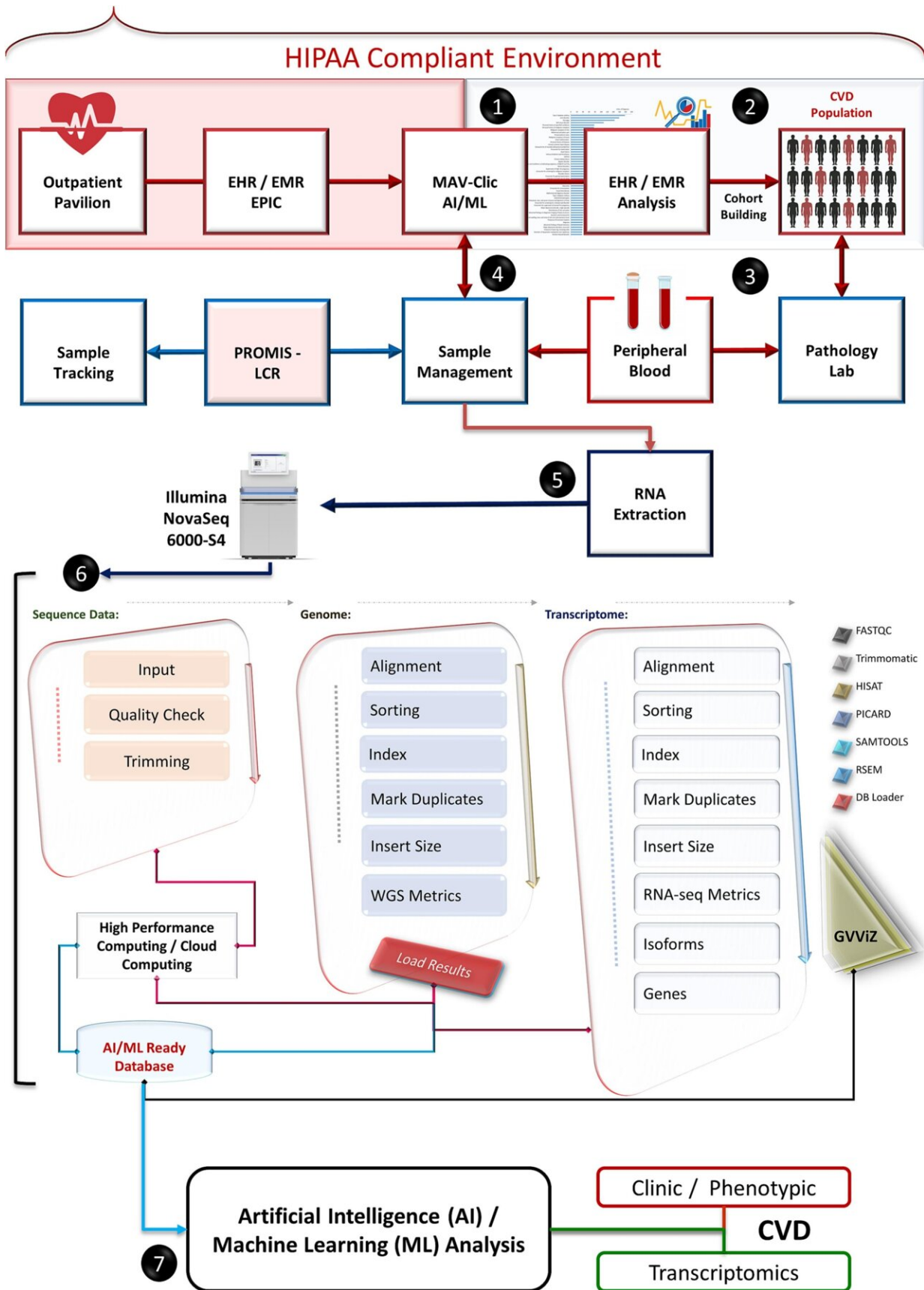


Researchers use artificial intelligence to predict cardiovascular disease

February 27 2023



Study design, workflow, and bioinformatics. Overall research methodology includes, (1) clinical data analysis; (2) cohort building; (3) cardiovascular disease-based sample collection; (4) sample management and tracking; (5) RNA extraction, and high-throughput sequencing; (6) pipeline and bioinformatics application development for RNA-seq data processing, quality checking, gene-disease annotation, and phenotyping; and (7) implementation of artificial intelligence and machine learning techniques for predictive analysis. Credit: *Genomics* (2023). DOI: 10.1016/j.ygeno.2023.110584

Researchers may be able to predict cardiovascular disease—such as arterial fibrillation and heart failure—in patients by using artificial intelligence (AI) to examine the genes in their DNA, according to a new Rutgers study.

"With the successful execution of our model, we predicted the association of highly significant [cardiovascular disease](#) genes tied to demographic variables like race, gender and age," said Zeeshan Ahmed, a core faculty member at the Rutgers Institute for Health, Health Care Policy and Aging Research (IFH) and lead author of the study, published in *Genomics*.

According to the World Health Organization, cardiovascular disease is the leading cause of death globally, yet it is estimated that more than 75 percent of premature cardiovascular disease is preventable. Atrial fibrillation and [heart failure](#) contribute to about 45 percent of all cardiovascular disease deaths.

Despite significant advancements in cardiovascular disease diagnostics, prevention and treatment, about half of the affected patients reportedly die within five years of receiving a diagnosis because of a variety of

reasons, including genetic and [environmental factors](#). Researchers said the use of AI and machine learning can accelerate our ability to identify genes that have important implications for cardiovascular disease, which can lead to improvements in diagnoses and treatment.

Researchers from IFH analyzed healthy patients and patients diagnosed with cardiovascular disease and used AI and [machine-learning](#) models to investigate the genes known to be associated with the most common manifestations of cardiovascular disease, including atrial fibrillation and heart failure.

They identified a group of genes that were significantly associated with having cardiovascular disease. Researchers also found significant differences among race, gender and age factors based on the cardiovascular disease. While age and gender factors correlated to heart failure, age and race factors correlated to [atrial fibrillation](#). For example, in the patients examined, the older the patient, the more likely they were to have a cardiovascular disease.

"Timely understanding and precise treatment of cardiovascular disease will ultimately benefit millions of individuals by reducing the high risk for mortality and improving the quality of life," said Ahmed, who is an assistant professor with the Department of Medicine at Rutgers Robert Wood Johnson Medical School.

Researchers said future research should extend this approach by analyzing the full set of genes in patients with cardiovascular disease which may reveal important biomarkers and risk factors associated with the cardiovascular disease susceptibility.

Co-authors of the study include Vignesh Venkat, Habiba Abdelhalim and William DeGroat of IFH and Saman Zeeshan of Rutgers Cancer Institute of New Jersey.

More information: Vignesh Venkat et al, Investigating genes associated with heart failure, atrial fibrillation, and other cardiovascular diseases, and predicting disease using machine learning techniques for translational research and precision medicine, *Genomics* (2023). DOI: [10.1016/j.ygeno.2023.110584](https://doi.org/10.1016/j.ygeno.2023.110584)

Provided by Rutgers University

Citation: Researchers use artificial intelligence to predict cardiovascular disease (2023, February 27) retrieved 25 April 2024 from <https://medicalxpress.com/news/2023-02-artificial-intelligence-cardiovascular-disease.html>

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