

Big data analysis accurately predicts patient survival from heart failure

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Heart failure is the leading cause of death and disability in the United States, costing healthcare systems worldwide more than \$30 billion annually. Current approaches to treatment are limited by crude clinical assessments of the disease. In a new study, Yale researchers have successfully used big data methods to improve prediction of heart failure patient survival. They also described data-driven categories of patients that are distinct in their response to commonly used therapies.

This innovative approach, detailed in the *Journal of the American Heart Association*, could lead to better care for this incurable chronic condition, the researchers said.

Led by Drs. Tariq Ahmad and Nihar Desai, both assistant professors in Yale's Section of Cardiovascular Medicine, the research team analyzed health data from a large registry of more than 40,000 [patients](#). The researchers used a statistical "machine-learning" technique to first predict outcomes for the patients one year after diagnosis. They also applied cluster analysis methods to sort the patients into four clinically recognizable categories with different responses to

commonly used medications.

The big-data methods vastly outperformed currently used measures of [heart failure](#), and had better prediction of risk than previously published prediction models, Ahmad said. The research team also used entirely data-driven methods to group patients into distinct clusters that responded differently to medical therapies.

As a final step, the researchers used their findings to develop a predictive online tool that could be integrated into electronic health records in healthcare systems. Their long-term goal is to apply these advanced analytic strategies to improve research and to provide personalized care for [heart-failure](#) patients as well as "enhanced intelligence" to clinicians at the bedside, Ahmad said.

The investigators also pointed to this study as a model for future work that could be achieved through collaborations between data scientists and clinicians at Yale. They cited the recently created Center for Biomedical Data Science at Yale School of Medicine as an example of ongoing efforts to drive a paradigm shift toward team-based science across the medical center and the school.

More information: Tariq Ahmad et al. Machine Learning Methods Improve Prognostication, Identify Clinically Distinct Phenotypes, and Detect Heterogeneity in Response to Therapy in a Large Cohort of Heart Failure Patients, *Journal of the American Heart Association* (2018). [DOI: 10.1161/JAHA.117.008081](https://doi.org/10.1161/JAHA.117.008081)

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