

Analyzing clinical trial data to inform development of machine learning tools for improved treatment decisions for atrial fibrillation

BACKGROUND:

Atrial fibrillation is a condition in which the atrial chambers at the top of the heart beat irregularly. It is linked with a variety of other cardiovascular conditions, but can also occur in people who have no other known heart issues. It affects more than 35 million people worldwide, and is considered the most common serious form of cardiac arrhythmia. Progression of the condition varies, but can be associated with increased risk of heart failure, stroke, kidney disease, and other debilitating conditions. Because of increased risk of stroke, in particular, patients are often prescribed medications to prevent blood clots, commonly known as “blood thinners.” The most widely used of these, warfarin, has its own associated risks, and newer medications with less associated risk may provide a better treatment option.

RESEARCHER QUESTION:

Yizhe Xu, Ph.D., is a Postdoctoral Researcher at Stanford Center for Biomedical Informatics Research, Stanford University. For this project, Dr. Xu and a team of colleagues sought to develop a personalized treatment decision tool for dabigatran, using a machine learning method that would analyze individual patient data (IPD) from clinical trials. They did this by assessing whether and how multiple combinations of patient features could predict benefit or harm from a drug.



“The unique data sources available on the Vivli platform can help to answer particular research questions.” - Dr. Yizhe Xu

FINDINGS

The research team has summarized relevant statistical methods and provided guidance on how to select an appropriate method and evaluate the model performance that can be applied to clinical trials in any disease area. The team also advises that, for observational studies, practitioners would need to make adaptations, such as adjusting for confounding, using methods such as propensity score matching or weighting.

IMPACT

This research has produced a journal publication in the Journal of Biomedical Informatics. The research team also hopes that the case study can have wider impact by providing clear instruction and concrete examples for clinical researchers to follow in order to avoid possible mistakes and false discoveries in HTE. Improvements in research quality and HTE will directly benefit personalized treatment for patients.

RESEARCH PROCESS:

To answer the question of whether applying the latest guidance for using machine learning to estimate and evaluate heterogeneous treatment effects would produce a useful treatment decision framework, the research team used a case study approach with a dataset of IPD from more than 17,000 participants in the RELY and RELY-ABLE trials assessing dabigatran for patients with atrial fibrillation. The team applied current guidance for carefully estimating and evaluating heterogeneous treatment effects (HTEs) in an end-to-end case study, and summarized best practices and advanced methodologies to inform potential applications to personalized care in biomedical research.

NEXT STEPS:

READ MORE

[Principled estimation and evaluation of treatment effect heterogeneity: A case study application to dabigatran for patients with atrial fibrillation](#) (Journal of Biomedical Informatics)

[Interview with Dr. Xu](#)

[Find out more about requesting data from Vivli.](#)