

# Researchers develop risk calculator to predict survival in heart failure patients

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A UCLA team has developed an easy-to-use "risk calculator" that helps predict heart failure patients' chances of survival for up to five years and assists doctors in determining whether more or less aggressive treatment is appropriate.

Given that [heart failure](#) impacts more than 5 million Americans and numerous variables affect patient outcomes, this type of risk-assessment tool can be very helpful to physicians and patients in assessing prognosis over time and guiding medical decision-making, the researchers say.

Their new risk model is featured in the January edition of the journal *Circulation: Heart Failure*.

Since heart failure manifests differently in men and women, the team initially sought to create a sex-specific risk model for greater accuracy, an approach that hadn't been taken before. But they discovered that separate risk models for men and women weren't necessary.

"We were extremely surprised that the same exact top predictors of risk were identical in both men and women," said senior author Dr. Tamara Horwich, an assistant professor of medicine in the cardiology division at the David Geffen School of Medicine at UCLA. "We ultimately only needed to create one unified heart failure risk model for both sexes."

Heart failure occurs when the heart can no longer pump enough blood to the body's other organs. Often, patients with heart failure have reduced

left-ventricle ejection fraction, which indicates a lowered volume of blood being pumped out of this heart chamber with each beat of the heart.

In developing the risk calculator, the UCLA team used data from 2,255 heart failure patients, including 1,569 men and 686 women, who were referred to the Ahmanson–UCLA Cardiomyopathy Center between 2000 and 2011.

They collected 39 patient variables, including information like age, weight, medications, lab work and the results of diagnostic tests such as echocardiography—the use of ultrasound to investigate the action of the heart.

The team assessed each variable in terms of predicting the following serious risks: mortality, the need for an urgent transplant, and the need for a mechanical pump known as a ventricular assist device. Using a complex statistical analysis, they determined that four of the 39 factors were predictive of these serious risks in both men and women and could predict survival over a five-year period.

The four variables included:

- B-type natriuretic peptide level

This peptide (BNP) is a substance secreted from the ventricles, or lower chambers of the heart, in response to changes in pressure. The level of BNP in the blood increases when heart failure symptoms worsen and decreases when the condition is more stable.

- Peak oxygen consumption

Peak oxygen consumption (PkVO<sub>2</sub>), the maximum rate of oxygen used during exercise, is tested when a patient is on a treadmill or bike. Levels of oxygen get lower as heart failure worsens.

- New York Heart Association classification

This classification places a patient in one of four categories depending on how limited they are during physical activity. The limitations are related to breathing, shortness of breath and angina chest pain.

- Heart failure medications

Patients may be taking a common heart failure medication—an angiotensin converting enzyme inhibitor (ACEI) or an angiotensin receptor blocker (ARB).

Although women had many characteristics that differed from men—for instance, younger age at heart failure diagnosis, with higher ejection fraction—and had less coronary artery disease, these four key variables still proved the best in assessing risk in both sexes.

To develop the [risk model](#), the researchers used data from patients referred to UCLA from 2000 to 2007. They then tested and validated its use with information on patients seen from 2008 to 2011.

"The model was just as effective in predicting risk in early as well as later years, when newer heart-failure treatments had emerged," said first author Jennifer Chyu, a UCLA student researcher at the time of the study who is now at the University of Washington.

According to Horwich, the risk calculator can currently be used via an Excel spreadsheet. The team also is actively working on developing a phone app of the calculator that will be even simpler; a doctor could simply enter in the four facts about a patient and the model would instantly calculate the annual survival risk up to five years.

"Physicians can begin to use the new UCLA tool right away for their advanced [heart failure patients](#), to calculate survival risk," said study author Dr. Gregg C. Fonarow, UCLA's Eliot Corday Professor of Cardiovascular Medicine and Science and director of the Ahmanson–UCLA Cardiomyopathy Center.

For example, Fonarow said, patients at very high risk based on the calculator might consider very aggressive therapies such as a heart transplant or the surgical implantation of a heart assist device. Patients at lower risk may be able to avoid excess treatment.

The new UCLA [risk calculator](#) also performed better when tested against several other risk-prediction models, including the Seattle Heart Failure Model and the Heart Failure Survival Score.

The next step, according to Horwich, is testing the accuracy and utility of the UCLA model in a larger sample of [patients](#).

Provided by University of California, Los Angeles

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