A new approach to analyzing electrocardiograms—a ubiquitous test of the heart's electrical function—could predict who is most likely to die after a heart attack. Researchers at MIT found that measuring how much the shape of the electrical waveform varies from beat to beat identifies high-risk patients better than existing risk factors. If the findings hold up in further clinical trials, the technology could be used to figure out which heart attack patients need the most aggressive treatment.

To determine if more subtle features within electrocardiogram data could provide useful clinical information, Stultz, John Guttag, also at MIT, and Zeeshan Syed, now at the University of Michigan, started with a large data set of 24-hour electrocardiogram recordings collected at Brigham and Women's Hospital in Boston as part of a clinical trial for a new drug. Employing a number of computational techniques, including signal processing, data mining, and machine learning, the researchers developed a way to analyze how the shape of the electrical waveform varies, a measure they dubbed morphological variability. At the heart of the approach is a method called dynamic time warping, used in speech recognition and more recently in genome analysis, which allows researchers to align and compare individual beats. "We compute the differences for every pair of beats," says Stultz. "If there is lots of variability, that patient is in bad shape."

The team then applied the algorithm they had developed to a second set of electrocardiogram recordings and found that patients with the highest morphological variability were six to eight times more likely to die after a heart attack than those with low variability. "We found that it consistently works as well or better than commonly accepted risk metrics that physicians use," says Stultz, including diabetes, age and smoking status, as well as cardiac ultrasound and various blood tests. - read more at Tech Review [1]