Predicting how CPR will work minutes ahead

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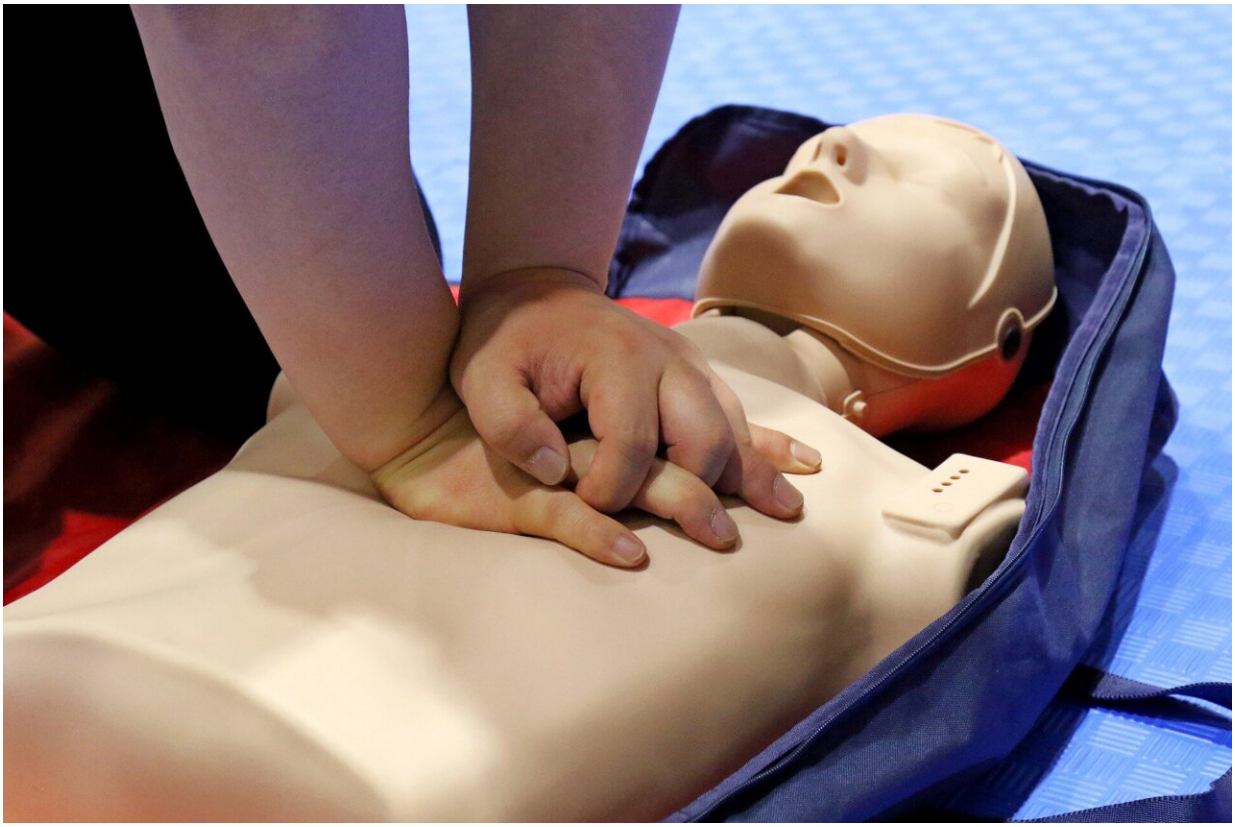

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After examining 298 patients who experienced cardiac arrest, researchers found that ECG markers can provide a clue as to how the treatment is working—as much as four to five minutes into the future.

This ability to see how the treatment is working can save many lives.

Every year, between 1,200 and 1,500 patients suffer a cardiac arrest in Norwegian hospitals. Rapid, correct treatment is absolutely essential in helping these patients survive.

Even if a patient suffers a cardiac arrest within the hospital's four walls, the prognosis is often poor. Only one in four survives.

CPR, the same for everyone

When a heart stops, doctors have to hurry, and the life-saving effort can last a long time.

But doctors rarely have a sense of what the outcome will be.

"Now, everyone gets the same treatment. Given the wide range in different types of cardiac arrest and patients, we think this isn't the most logical approach," said Anders Norvik, a senior consultant at St. Olavs Hospital and a Ph.D. candidate at NTNU.

Norvik, along with researchers from Trondheim, Stavanger, the U.S. and Spain, has tried to find a solution to this problem.

In a new study published in the journal *Resuscitation*, the team has analyzed ECG data from 298 patients who experienced cardiac arrest. The information was taken from defibrillators at St. Olavs Hospital in Trondheim and two American hospitals.

"We chose ECG for the method because all cardiac arrest patients will be connected to an ECG monitor with electrodes. Either the ECG monitor is built into the defibrillator that the ambulance or emergency team brings with it, or it is part of a separate monitoring system in the hospital," says Eirik Skogvoll, an NTNU professor and senior consultant in pediatric anesthesia at St. Olavs Hospital. "In other words, the ECG is

always available and thus a universal source of information."

The researchers first analyzed the data by examining the progress of the individual patient, and finding out whether the person's pulse comes back spontaneously as a result of the treatment. Next, the researchers examined the ECG recorded immediately before the person's heart rate changed.

"It turns out that there is a higher heart rate just before the patient's pulse returns than if the patient's pulse does not return. That gives us the possibility of an ongoing prognostic assessment—a kind of weather forecast of good or bad weather," Skogvoll said.

The researchers also used other information from the ECG, the ECG signal width. When the signal width is narrow or tapering, that's a good sign. But if the width is broad or spreading, that's not so good.

Tailored treatment the goal

The hope is that the new method can allow for more tailored treatments in the future.

"It may mean that we continue the good treatment that is given, if the result on the ECG points in the right direction. It may also mean that we have to reassess part of the treatment strategy if the result points in the wrong direction," Skogvoll, who led the study, said.

"This could be a way to individualize cardiac arrest treatment," he said.

The international research group is the first in the world to quantify this connection.

Nevertheless, doctors at St. Olavs believe that more research must be

done to get better answers. They want the findings to be verified with the help of other, independent studies.

"We hope this can help save more lives," Norvik said.

Even if a cardiac arrest occurs in a hospital, there's only a 25% chance of survival, the doctors said.

If you were to witness a cardiac arrest, Norvik and his colleagues have some good advice.

"Then there are two things that are very important. First you call for help, then you start CPR, with 30 cardiac compressions followed by two breaths. This is how you continue until help arrives, or someone fetches a defibrillator," Norvik said.

Because for someone to survive a cardiac arrest, someone has to see it—and do something about it.

More information: A. Norvik et al, Heart rate and QRS duration as biomarkers predict the immediate outcome from pulseless electrical activity, *Resuscitation* (2023). DOI: 10.1016/j.resuscitation.2023.109739

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