Artificial intelligence may speed heart attack diagnosis and treatment

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Technology incorporating artificial intelligence (AI) and electrocardiogram (EKG) testing for patients having a heart attack decreased the time to diagnose and send patients for treatment by almost 10 minutes, according to results of a late-breaking science study conducted in a hospital in Taiwan and presented today at the American Heart Association's Scientific Sessions 2023.

"Modern AI may now be as good as expert cardiologists in diagnosing serious heart attacks," said lead study author Chin-Sheng Lin, M.D., Ph.D., a professor, director of the Medical Technology Education Center and vice dean at the School of Medicine, at the National Defense Medical Center, in Taipei, Taiwan. "Hospitals can use AI tools more to help front-line doctors, especially those with less experience. This could lead to faster treatment and less mistakes when it comes to treating patients who are experiencing heart attacks."

During a heart attack, the heart is deprived of oxygen because the blood flow to the heart is reduced due to a blockage in a coronary artery. This may damage the heart muscle. Timely diagnosis and treatment are critical to restore blood flow and reduce injury to the heart muscle and to increase a person's chance of recovery after a heart attack, according to Systems of Care for ST-Segment–Elevation Myocardial Infarction: A Policy Statement From the American Heart Association.

EKG testing is a non-invasive diagnostic tool that shows the heart's electrical activity. It can also reveal if the cardiac episode is a more serious type of heart attack referred to as ST-elevation myocardial infarction or STEMI, which occurs when a coronary artery is completely blocked. A STEMI often warrants a trip to a cardiac catheterization lab for procedures to open blockages such as coronary angioplasty, or stenting.

This study investigated if using artificial intelligence with EKG testing could help health professionals diagnose STEMIs and get patients to the cardiac catheterization lab faster.

The trial involved more than 43,000 patients seen either in the emergency department or as inpatients at the largest military hospital in Taiwan, Tri-Service General Hospital, between May 2022 and April 2023.

The patients were almost equally divided into two groups: an intervention group, which included the AI-enabled EKG testing; and a control group, which received standard care with a health professional interpreting EKG results to determine if cardiac catheterization was needed. All patients who were diagnosed with STEMI had procedures in the cardiac catheterization lab to determine the size and location of the blockage.

The trial findings included:

- AI-enabled EKGs accurately diagnosed STEMIs patients with positive predictive value of 88% and negative predictive value of 99.9%.
- AI technology helped to reduce the treatment waiting time for patients with STEMI from about 52 minutes to 43 minutes.
- AI-enabled EKGs confirmed STEMI among seven hospitalized patients, while standard care confirmed STEMI in only one hospitalized patient.

"The difference in diagnosing STEMI in the ER wasn't as great between the two groups, however, the improved accuracy for diagnosis in hospitalized patients was astonishing," said Lin, who is also the director of medical education, a physician educator and a cardiologist at Tri-Service General Hospital, where the research was conducted. "This tells us that there's a lot we can do to improve how we diagnose STEMI in hospitalized patients."

"Due to the recent AI revolution, the accuracy of clinical decision support systems has improved significantly and doctors are becoming more trusting of this technology," he said. "Using low-cost tech tools can be valuable in everyday medical work. In the future, we might see more of these tech tools being used in new ways, like in ambulances or on wearable devices, which could change how we care for patients with

STEMI."

Study background and details:

- On average, the patients were 60 years old, and about half of them were male.
- The trial included 43,176 patients treated by 20 cardiologists.

The study's limitations include that it did not track long-term results, and the number of people studied might have been too small to see long-term outcomes. Additionally, because the study was done in just one hospital in Taiwan, the findings might not apply to other hospitals with different clinical processes.

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