AI model could suggest better treatment plans for breast cancer patients

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At a time when some industries are shying away from and questioning the use of AI in daily work, those in the medical field are leaning into the support the technology can provide to doctors.

Mohamed Tageldin has worked at the intersection of artificial intelligence and pathology, the study and diagnosis of diseases, for six

years.

Tageldin, a resident physician at Northwestern University's McGaw Medical Center, is part of a team of researchers that has developed an artificial intelligence model to more precisely predict long-term outcomes for breast cancer patients.

"There's almost too much excitement," Tageldin said of attitudes toward AI in the medical field.

The team hopes the new model, designed specifically for breast cancer, will aid patients with more personalized recommendations and agency in their choice of treatment plans. It may also spare patients unnecessary chemotherapy treatments, according to a report published in late November.

Researchers found that with current prognosis methods used by pathologists, some patients are placed into higher-risk categories when, in reality, the patients could undergo shorter and less intense treatment plans.

"For those people we recategorize, we could reduce the duration or intensity of their chemotherapy, and hopefully, achieve the same clinical outcome with less side effects," said study co-author Lee Cooper.

Cooper, an associate professor of pathology at Northwestern University Feinberg School of Medicine, said the algorithm assesses patients differently from human pathologists and previous models by studying both cancerous and noncancerous cells—such as immune cells—in a prognosis.

Noncancerous cells can attack and inhibit cancer growth and provide shape around a tumor, which can lead to better long-term outcomes for a

patient. But noncancerous cells are hard to analyze with the human eye, making it difficult for doctors to predict if a patient needs an aggressive form of treatment like chemotherapy.

The AI model is not meant to replace the role of pathologists in providing the best care to patients, Cooper stressed. Rather, it is to help pathologists—who are tasked with grading how cancer cells appear and predicting how they'll grow—feel more confident about the grade they send to the oncologist, who then determines a treatment plan with the patient.

Lauren Teras, senior scientific director of epidemiology research at the American Cancer Society, said the algorithm is promising for breast cancer patients because the current treatment options are brutal, with often strenuous side effects that affect day-to-day life. She said doctors should avoid using harsh treatments when possible.

"We need to have tools to help doctors identify which women are at the highest risk of dying from their cancers and need more aggressive treatments," Teras said. "But also, we need to identify women who do not need these treatments."

There are more cancer survivors in the United States than ever, Teras said, partly due to advancements in treatment plans.

As of Jan. 1, 2022, there were more than 18 million cancer survivors nationally, according to the most recent ACS Cancer Treatment & Survivorship report. Women with a history of invasive breast cancer made up the largest subgroup, with more than 4 million survivors recorded.

The Cancer Society says one in eight women in the United States will receive a breast cancer diagnosis in their lifetime.

When Cooper began the research, the original AI model would study an image given to it and produce a prediction. That output did not provide any reasoning behind the prediction, which was a simple number, or grade. The updated model gives more information to doctors, including the steps the AI took to determine its prognosis, which addresses a main concern of AI for pathologists.

With the new model, doctors would acquire tissue from the patient during a surgery or biopsy. They would then use the tissue to produce a digital image slide for the AI model to view, identify the different cells and, ultimately, examine the cells' relationship to one another.

Researchers used sample tissue from 3,177 breast cancer patients through a partnership with the ACS Cancer Prevention Studies program, where people sign up to donate their cancer tissue before they are diagnosed with the disease. When they donate, a high-resolution digital image is taken of their removed tissue and saved in the data set.

Markups and images of breast cancer tissue were studied by a team of around 40 doctors, residents and researchers around the world to train the algorithm on how to analyze the cells, Tageldin said.

Tageldin said he was grateful for the thousands of volunteers, as the model would not have been possible without the people who donated their body tissue and time to train the algorithm.

Using the ACS data means the algorithm is exposed to a more diverse set of patient tissues in its training stages since the ACS collects data from a variety of medical clinics, including community centers in low-income and rural areas. Most other public data originates in academic medical institutions and can have a select set of patient profiles, Cooper said.

"By building a model on this (ACS) data, we're better able to capture the

true spectrum of disease in the United States," Cooper said.

With comprehensive and diverse training, the AI could also largely benefit patients in lower-income areas where the model could aid doctors who are not specialized pathologists in providing grades and treatment care options.

"If you can make a slide and you have a microscope with a camera and an internet connection, we could probably find a way to deliver these assessments anywhere in the world, really," he said.

The use of digital images in medical practice has increased in recent years, with Northwestern Medicine transitioning to digital imaging over the next three years.

Next, researchers will need to evaluate the model using data from clinical trials, tackle operational challenges and ensure predictions are generated on time for pathologists. Cooper said if the model is approved for clinical use, he could see the same template applied to other cancers as well.

Teras said the ACS is "cautiously optimistic" about AI in the cancer research field, adding that the organization is taking steps forward with models but "not moving too quickly." However, she emphasized that doctors will not be replaced by AI innovation.

"Patients will always need doctors, but this tool can help doctors help patients," she said.