

AI tool predicts risk of side effects after surgery and radiotherapy in breast cancer patients

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A team of international researchers has developed an artificial intelligence (AI) tool that can predict which breast cancer patients may be at risk of side effects after surgery and radiotherapy.

Dr. Tim Rattay told the [14th European Breast Cancer Conference \(EBCC14\)](#) in Milan that the tool will be tested in a clinical trial that will start recruiting in the last quarter of this year in three countries: France, The Netherlands and the UK.

"It is an explainable AI tool, which means that it shows the reasoning behind its decision-making. This makes it easier not only for doctors to make decisions, but also to provide data-backed explanations to their patients," said Dr. Rattay, who is a consultant breast surgeon and Associate Professor at the Leicester Cancer Research Centre, University of Leicester (UK).

Some of the factors that increase the risk of side effects are already known, but the PRE-ACT project (Prediction of Radiotherapy side Effects using explainable AI for patient Communication and Treatment modification) aims to make more [accurate predictions](#) for each individual patient, as well as providing easily understandable explanations for doctors and patients.

"Thankfully, long-term survival rates from breast cancer continue to increase, but for some patients, this means having to live with the side effects of their treatment. These include skin changes, scarring, lymphoedema, which is a painful swelling of the arm, and even heart damage from radiation treatment. That's why we are developing an AI tool to inform doctors and patients about the risk of chronic arm swelling after surgery and radiotherapy for breast cancer. We hope this will assist doctors and patients in choosing options for radiation treatment and reduce side effects for all patients," said Dr. Rattay.

The researchers from six European countries used information from three European and French datasets (REQUITE, Hypo-G and CANTO) on 6,361 [breast cancer patients](#) to train different machine learning algorithms to predict arm swelling up to three years after surgery and

radiotherapy.

Speaking before EBCC14, Dr. Guido Bologna, Associate Professor at the University of Applied Sciences and Arts of Western Switzerland in Geneva and co-investigator on the project, explained, "The final, best-performing model makes predictions using 32 different patient and treatment features, including whether or not patients had chemotherapy, whether [sentinel lymph node biopsy](#) under the armpit was carried out, and the type of radiotherapy given."

Significant lymphoedema occurred in 6% of patients in the three datasets. The AI tool correctly predicted lymphoedema in an average of 81.6% of cases and correctly identified patients who would not develop it in an average of 72.9% of cases. The overall predictive accuracy of the model was 73.4%.

Dr. Rattay said, "Patients identified at higher risk of arm swelling could be offered additional supportive measures, such as wearing an arm compression sleeve during treatment, which has been shown to reduce arm swelling in the long-term. Clinicians may also use this information to discuss options for lymph node irradiation in patients, where its benefit may be fairly borderline. We will test the effect of the prediction model on clinician and patient behavior and use of the prophylactic arm sleeve in the proposed clinical trial."

The researchers will incorporate the current AI model into software that can provide evaluations and predictions to doctors and patients. This will be tested when the PRE-ACT-01 clinical trial starts later this year. They are also developing the tool further so that it can predict other side effects, such as skin and heart damage. As part of the trial, the researchers will collect data on [genetic markers](#) and imaging data to improve the accuracy of the AI tools, although these will not be used to make predictions in the PRE-ACT trial.

"We hope to recruit approximately 780 patients by early 2026, with a follow-up period of two years," said Dr. Rattay.

Professor Michail Ignatiadis from the Institut Jules Bordet in Brussels, Belgium, is Chair of the 14th European Breast Cancer Conference and was not involved in the research. He said, "The PRE-ACT project is a nice example of how [international collaboration](#) between researchers is harnessing the potential of AI to make it easier for clinicians to predict and try to prevent arm lymphoedema and to explain the options to their patients in an understandable way."

More information: Abstract no: 23, "Development of an explainable AI prediction model for arm lymphoedema following breast cancer surgery and radiotherapy", Thursday 21 March, Poster in the Spotlight session, 11:00-11:30 hrs CET, Exhibition Hall.

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