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# PRE-ACT-01: an international, multicenter, randomized study on communicating a personalized AI-based lymphedema risk to breast cancer patients

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**Topic**

Clinical: Breast

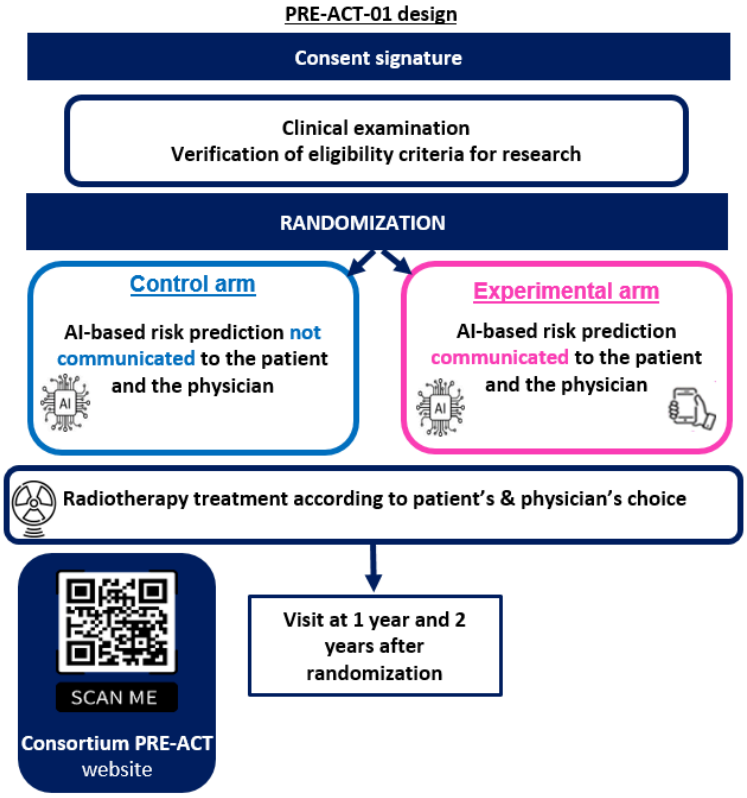
**Keywords**

breast cancer, lymphedema, AI-prediction

**Purpose/Objective**

PRE-ACT-01 (NCT05701085) is an innovative, international, multicenter, randomized-controlled pivotal study designed to assess the impact of communicating an individualized, explainable AI-driven risk prediction for arm lymphedema to breast cancer patients indicated for nodal radiotherapy. The primary objective is to demonstrate that sharing this personalized risk information is non-inferior to the current standard of care in terms of the 2-year incidence of arm lymphedema (defined as a ≥5% increase in arm circumference of the treated side from baseline, relative to the contralateral side). PRE-ACT-01 also evaluates the influence of the explainable AI-based communication on radiotherapy regimen choices, loco-regional events, quality of life, and the performance of the prediction model. We hereby report the design of the PRE-ACT-01 study.

The model was trained on a diverse dataset of n three major European cohorts: REQUITE (ISRCTN98496463), HypoG-01 (NCT03127995) 3498). The model classified as a non-CE-marked class IIa medical device generates a personaliz of lymphedema occurrence based on 28 features collected before randomization. Patie cer cT1-4, cN0-N3, M0 indicated for loco-regional radiotherapy are randomized 1:1. In t m, physicians utilize a dedicated web application to communicate the AI-predicted risk, empowered by personalized recommendations for lymphedema prevention based on AI prediction explainability, thus fostering shared decision-making with the patient. In the control arm, the predicted risk is blinded to both the patient and physician.




**Results**

PRE-ACT-01 is currently enrolling 724 patients across 35 centers in three European countries (29 in France, 3 in the Netherlands, and 3 in the UK), using a model with an estimated ROC-AUC of 0.83. The sample size is calculated to provide 80% power to detect a non-inferiority accepting up to a 6% increase in the 2-year lymphedema incidence, with a 5% significance level. The first patient was successfully enrolled in France on October 7, 2025, with recruitment planned over 14 months. The final analysis will be stratified by key prognostic factors, including BMI, surgery type, and nodal involvement.

**Conclusion**

By integrating an explainable AI-powered predictive tool into the clinical workflow, PRE-ACT-01 represents a significant step towards personalized AI-driven intervention in oncology. This innovative, large-scale study has the potential to establish a new standard of care, where early identification of high-risk patients enables targeted preventative strategies and empowers patients through shared decision-making, ultimately improving long-term outcomes for breast cancer survivors.

**References**

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