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Background

- European study using Artificial Intelligence (AI) to predict radiotherapy side effects in breast cancer.
- Side effects: skin ulceration, breast atrophy, arm lymphedema, and heart damage.
- Current methods use limited statistical models, lacking full use of complex imaging/genomic data.
- PRE-ACT's goal: improve prediction accuracy and support patient-physician decision-making.



Figure 1: Severe cases of late toxicity after radiotherapy for breast cancer (left: breast atrophy, centre: fibrosis, right: arm lymphedema)

Methods

- Funded by Horizon Europe (2022-2027).
- Team includes experts in AI, radiation oncology, medical physics, genetics, psychology and health economics.
- Integrates data from three breast cancer cohorts (REQUIRE, CANTO, HypoG-01; N=8,924).

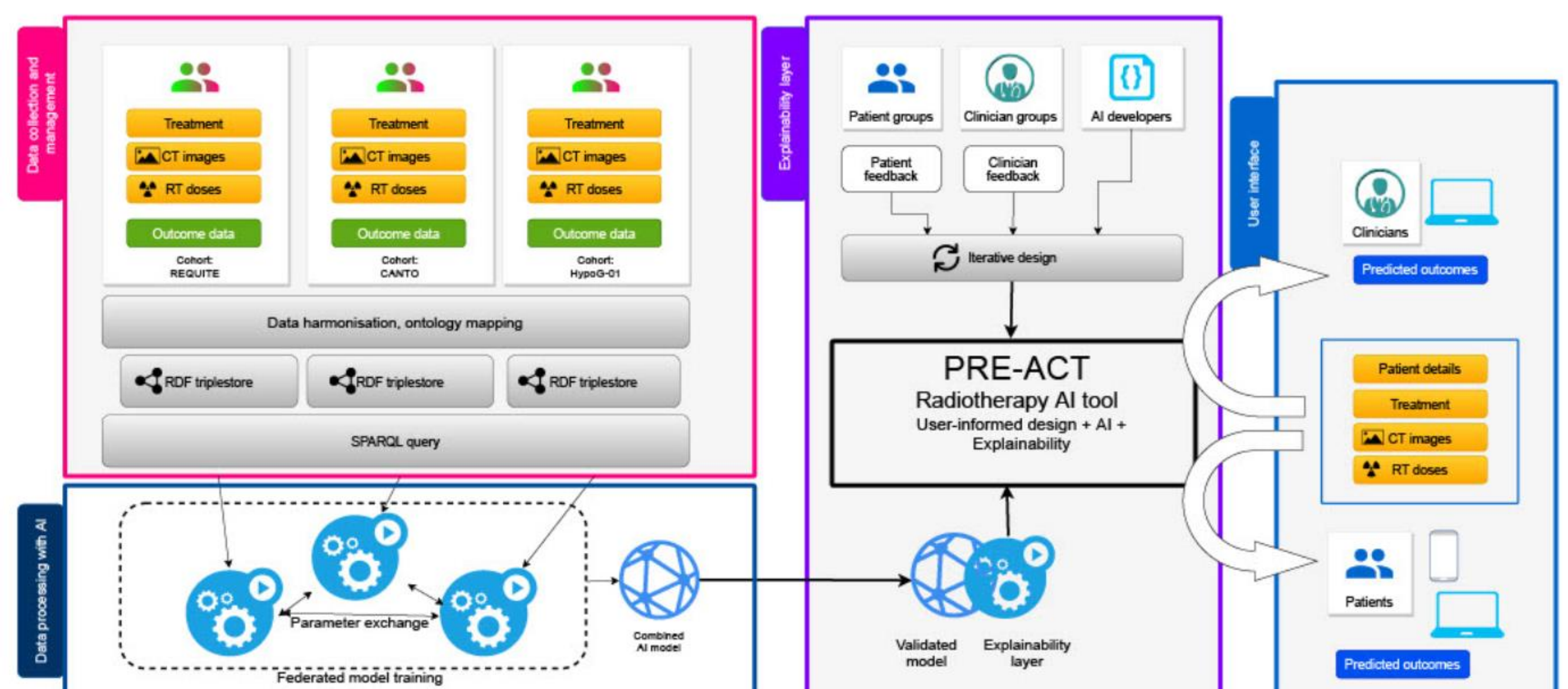


Figure 2: Concept and structure of PRE-ACT

Results

- Developed machine learning model predicts arm lymphedema with high accuracy (ROC AUC = 0.82).
- Model powers an AI-based app explaining side effects post-regional nodal irradiation (RNI).
- PRE-ACT-01 trial: tests personalized risk sharing's impact on lymphedema rates, support use, and quality of life.
 - Test arm: physicians and patients receive risk predictions.
 - Standard arm: risk predictions are not communicated.

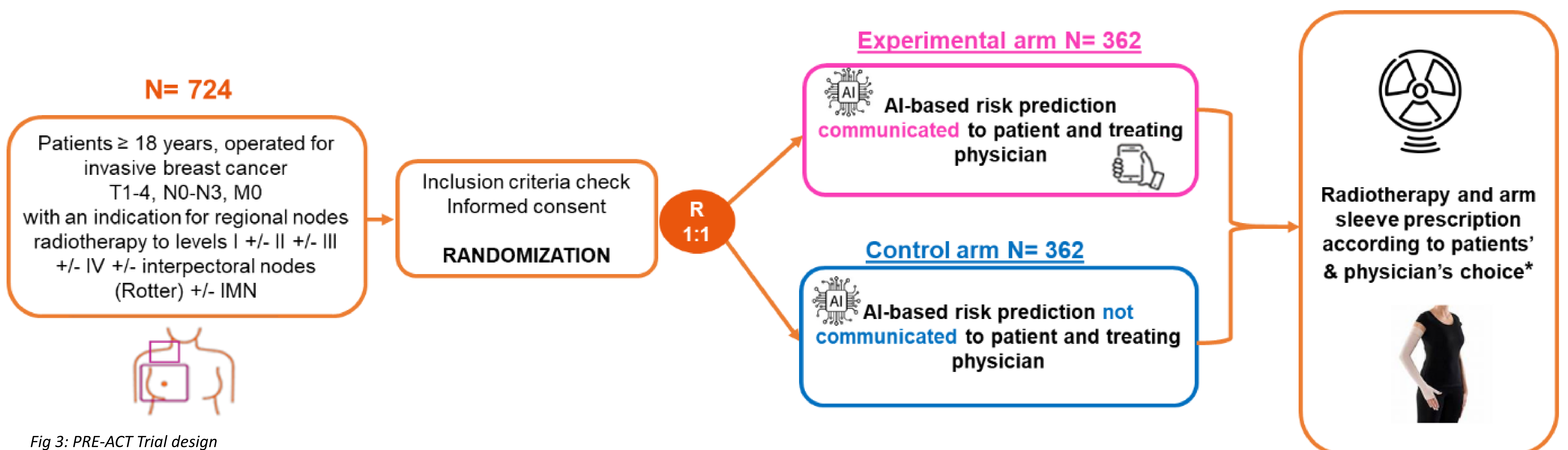


Fig 3: PRE-ACT Trial design

Conclusions

- PRE-ACT empowers patients for shared decision-making with AI-predicted side effects.
- Project outcomes will advance personalized radiotherapy toward clinical implementation.