Breast cancer prediction models and tools

Many interventions for prevention or treatment of breast cancer do not work for everyone. Providing individuals with personalised interventions enables clinicians to help those most likely to benefit from a specific course of treatment, whilst reducing the risk of harms. Successful targeting depends on being able to predict a person's risk level or, if they have breast cancer, their likely response to treatment. This in turn depends on effective risk prediction tools developed from reliable prediction models.

Prediction models

Several factors impact on risk of developing breast cancer and on outcomes from the disease.

By analysing the data on these factors we can build predictive models which are applied to data from individuals to estimate their likelihood of developing specific outcomes, i.e. risk of developing disease or treatment response.

Such models need to be tested thoroughly using several patient datasets to see if they provide reliable estimates. This is a technically challenging and time-consuming process.

Models may evolve as they integrate information on novel risk factors. This ensures their robustness and can improve prediction capabilities.

Prediction tools

Transforming predictive models into prediction tools makes the models suitable for use by individuals and clinicians.

Tools are therefore the mechanism by which risk models are utilitsed to enable health predictions for an individual (e.g. her risk of developing breast cancer over a 10-year period). Tools may require development of both "front-end" as well as "back-end" components.

These could comprise a digital interface where clinicians input individuals' data, an algorithm based on the underlying model applied to this data and a mechanism for providing feedback to the user.

The problem

Several models that predict risk of developing breast cancer or outcomes in those with the disease exist, each using a different set of risk factors.

The lack of validated risk models is one barrier to developing user-friendly tools and their use in clinical practice.

Confusion around which models are best suited to which clinical scenario also presents an obstacle.

Tools differ in the format of the information they provide, the degree to which they have been validated and the populations they are applicable in.

Integrating tools into clinical practice

The development of prediction models and tools are dynamic and interlinked processes. Models evolve to incorporate information on novel risk factors and as they do, associated tools need to be adapted to incorporate these changes. Engagement between stakeholder groups, from model developers (researchers, statisticians, epidemiologists) to end users (health-care professionals and patients) enables identification of the most suitable risk models and transforming them into clinically meaningful tools for early prediction and prognosis.

Authors: Dr Sowmiya Moorthie, PHG Foundation and Dr Proteeti Bhattacharjee, The Netherlands Cancer Institute

phgfoundation.org/explainer/breast-cancer-risk-models-and-tools

B-CAST

B-CAST Understanding the determinants of risk and prognosis of molecular breast cancer subtypes.

phg foundation
making science work for health