Computer simulation suggests risk-based breast screening could have benefits

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When it comes to breast cancer screening, there's a delicate balance between the benefits and harms.

Breast screening can save lives by picking up breast cancers at an earlier stage, when treatment is more likely to be successful. But it also picks up some cancers that would never have gone on to cause harm. This is called overdiagnosis. At the moment, we can't tell harmless and harmful cancers apart, so all women will be offered treatment, meaning many women will be treated unnecessarily.

For each woman whose life is saved by breast cancer screening, around three will be diagnosed with a cancer that would have caused any problems.

Scientists are looking for a way to minimise the harms of breast screening, tipping the balance towards the benefits. And adapting the NHS breast screening programme based on a woman's risk of breast cancer could do just that, according to new predictions.

Results from a study using computer simulations, published in the journal *JAMA Oncology*, suggests that only screening women deemed at a 'high risk' of breast cancer could help to reduce unnecessary diagnoses, and would be more affordable for the NHS.

While this is a promising start, the study was run entirely using computer programmes. Researchers used NHS figures to predict the impact of

adapting the NHS screening programme to only screen women who meet certain genetic risk criteria.

Professor Fiona Gilbert, a co-author of the study from the University of Cambridge, said: "We need to change the model of delivery of breast screening and recognise that women are individuals with different risks and lifestyles. They should be offered screening tailored to their own profile."

What did the study show?

- The current NHS breast screening programme invites all women aged 50-69 for a mammogram every three years.
- Researchers ran computer simulations on a hypothetical group of women. They compared three different approaches to screening:
- no screening programme
- the current age-based NHS screening programme
- a programme that calculated each woman's risk before screening began. Only those deemed to be a 'higher risk' of breast cancer were screened.

The researchers gave each woman a risk score based on their genes as well as their lifestyles. They then tried to predict what might happen if woman at different risks of breast cancer were screened.

Once the numbers were crunched, the team looked for a 'sweet spot' – the scenario that gave the best balance of benefits to harms. They found that not screening around a third of women with the lowest risk of breast cancer was that 'sweet spot'.

Not offering screening to these women could save the NHS money compared to the current screening programme. And there could be 27% fewer overdiagnosed cancers. In this hypothetical situation, screening

still saved lives from breast cancer. But the trade-off for less overdiagnosis was that there were 3% more breast cancer deaths.

A long way to go

Factoring risk into breast screening could help to minimise the harms, while maintaining benefits and making screening more cost-effective. But it's early days and there's a lot we still don't know.

Because researchers were modelling a hypothetical situation, they had to make a fair few assumptions. Studies like this are an excellent kicking off point when it comes to improving screening, but the results are merely predictions, and should be taken with a pinch of salt.

The big challenge is how to accurately identify women with a lower risk of breast cancer who might benefit from fewer breast screens in the real world.

Dr. Nora Pashayan, lead author from University College London says that there are over 300 gene variants that increase a woman's risk of breast cancer, so it may be feasible to create a more targeted screening programme in the future.

"However, we recognise implementing an initiative of this nature raises challenges – not least defining those women deemed low risk and making any screening based on risk acceptable to the public, health professionals and regulators."

For now, its important women who are offered breast screening understand both the benefits and harms when deciding if they want to take up the offer.

More information: Cost-effectiveness and Benefit-to-Harm Ratio of

Risk-Stratified Screening for Breast Cancer. *JAMA Oncology*. DOI: 10.1001/jamaoncol.2018.1901