

Benefit of risk-based breast cancer screening is still unclear

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The Austrian Institute for Health Technology Assessment (AIHTA) has analyzed whether risk-based breast cancer screening has advantages over the conventional age-based screening program. The central result: the

current prediction models cannot satisfactorily predict the individual breast cancer risk.

Only large studies which are currently in progress will provide robust data on whether [women](#) can expect health advantages compared to conventional practice. "In any case, such a system needs extensive preparation. Simply assessing risk factors in women without thinking about further consequences has no benefit for women," says Ingrid Zechmeister-Koss, deputy director of the AIHTA.

Worldwide, [breast carcinoma](#) is the most common cancer among women. In Austria, there were 5,682 new cases and 1,643 deaths in 2019. Therefore, an age-based [screening](#) program is offered in most countries. Its goal is both to diagnose cancer as early as possible and to reduce surgical procedures such as removal of the entire breast (mastectomy) and the number of breast cancer deaths. However, to date there is no consensus on the age and intervals at which mammography should be performed.

While most European countries recommend mammograms at two- or three-year intervals for women aged 50–69, in the U.S. annual or biennial screening is done for women aged 45–74. In Austria, a population-based breast cancer screening program was implemented in January 2014, inviting women aged 45–69 for mammograms every two years.

Given that research results on the benefits and harms of such population-based breast cancer screening are contradictory, a long-running debate about the accuracy of such programs has taken place. "There is no doubt that mammography can lead to false-negative results as well as false-positive suspected breast cancer cases, resulting in unnecessary biopsies and therapies," says Ingrid Zechmeister-Koss from AIHTA.

Now the Austrian Health Insurance Fund (ÖGK) and the Medical Association are considering making changes to the existing breast cancer screening program—for example, offering a risk assessment. The AIHTA was therefore asked to examine the quality of risk prediction models and the benefit of risk-based screening in a [systematic review](#). In addition, the organizational requirements for the introduction of such a program were also determined.

Several risk factors to consider

In distinction to age-based early breast cancer detection, risk-based screening considers several risk factors in addition to age, such as family history of breast cancer, breast density, hormonal factors, body mass index or genetic markers. With the help of so-called risk prediction models, the probability of a woman developing breast cancer in a certain period of time is estimated.

The resulting screening strategy, for example the frequency of mammograms, is determined according to that risk. The aim is to detect breast cancer earlier or at least equally well as with an age-based program and to reduce the disadvantages of conventional screening. For example, through less frequent mammograms for women with a low risk of breast cancer or more frequent mammograms and other diagnostic options for women with an increased risk.

No completed randomized controlled trials yet

In total, the AIHTA identified 107 studies from eight systematic reviews that examined the prognostic quality of the risk prediction of seven prediction models. Those models failed to predict the individual breast cancer risk adequately in the observational studies. Even when more information about other risk factors—such as breast density—was added, quality of predictions didn't sufficiently increase.

Completed randomized control trials showing the benefit-harm ratio of a risk assessment compared to conventional breast cancer screening do not exist yet. In the currently ongoing randomized-controlled MyPeBS trial, risk-based screening is being compared with conventional breast cancer screening strategies in several European countries. The results are expected in 2026 at the earliest.

Systematic implementation and additional resources needed

Before a transition to risk-based screening can be performed, not only substantiated data on the benefit-harm ratio is needed, but also detailed preparations have to be implemented prior to the introduction: For example, it is necessary to define in advance which and how many risk factors will be collected and to what extent. "It is not enough for the physician to ask about a few risk factors. A standardized tool is needed, with which the individual [risk factors](#) can be systematically recorded. If, for instance, breast density is being considered as a risk factor, a standardized method for measuring breast density should be defined," explains Zechmeister-Koss.

It must also be determined in advance who will conduct the risk assessment. These could be [general practitioners](#), gynecologists, specially trained nurses or the woman themselves. In addition, it must be clarified before implementation which prediction model is supposed to be used. According to the AIHTA report, it should be taken into account that not every model is suitable for every population. Many of the models that were analyzed only have been validated for certain age groups or populations.

Based on the [risk assessment](#), the applied model calculates a risk score that indicates the probability of getting breast cancer in a given period of time. "However, the risk score alone has no benefit for the women. Thresholds must be set at which five-, ten- or lifetime risk a woman falls

into a high-, medium- or low-risk group. Women need to be well informed about the meaning of a ten percent risk. Those women with a low risk must be explained in detail and in a well-founded way that a longer screening interval does not mean that they are deprived of a service. Rather, it is to their health advantage because it can prevent overdiagnosis, false positives and unnecessary radiation exposure. This also means that a lot of training for physicians on professional counseling and educational campaigns are necessary," explains study leader Irmgard Frühwirth.

The successful use of a risk-based screening strategy, in addition to the prognostic quality of the predictive models, relies significantly on "whether the risk-based screening recommendations and preventive interventions are effective, appropriate, accessible, feasible and acceptable," the AIHTA report concludes.

More information: Risk-based breast cancer screening in Austria: a systematic analysis of predictive models to assess individual breast cancer risk, their utility and applicability in a breast cancer screening programme. HTA-Projektbericht 145. eprints.aihta.at/1402/

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