The radiologist's role in personalised breast cancer risk assessment and imaging

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Mammograms are the primary method of breast cancer screening. However, mammographic, or breast density, present in 40% of Australian women, decreases mammographic sensitivity and is a significant risk factor for breast cancer. Radiologists play a crucial role in personalised breast cancer risk assessment by measuring and reporting breast density and advising on supplemental imaging.

Personalised risk assessment allows for tailored imaging and risk-reducing strategies

Personalised breast cancer risk assessment evaluates an individual's likelihood of developing breast cancer. It is based on family and personal medical history, including breast density and breast biopsy results, lifestyle factors, and genetic testing results. Risk assessment is used to tailor imaging and risk-reducing strategies with the goal of prevention or early detection of cancer, resulting in improved outcomes for women. It enables informed, shared decision-making and efficient use of healthcare resources.

> "A significant proportion of breast cancers are diagnosed through mammographic screening in women who are asymptomatic. Assess a woman's individualised risk to see whether a personalised screening regimen may be appropriate."
>
> —Cancer Council Victoria and Department of Health Victoria, Optimal care pathway for people with breast cancer, 2nd edn[1]

Risk assessment tools

Three commonly used tools in Australia are iPrevent, CanRisk (BOADICEA v6), and IBIS (Tyrer-Cuzick v8). iPrevent is designed to facilitate prevention and screening discussions between women and their doctors. CanRisk uses the BOADICEA v6 model to calculate breast and ovarian cancer risk and requires health professional registration. IBIS calculates breast cancer risk by combining familial risk with classic risk factors. The latest version incorporates mammographic density. Tyrer-Cuzick v8 or later is considered the "clinically relevant evaluation algorithm" for risk estimation to support rebate eligibility for high-risk breast MRI (MBS item 63464).[2]

Refer to ***Breast cancer risk assessment tools*** for a comparison of the tools.

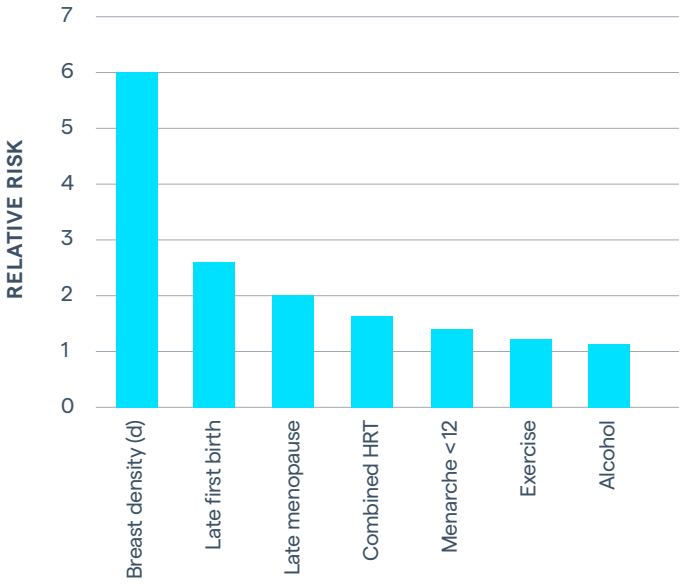
Breast cancer risk categories

Cancer Australia defines risk categories according to population risk (up to age 75).[3] The current risk of being diagnosed by age 85 in Australia is 13%.[4] A more practical approach, used by the Cancer Institute NSW eviQ,[5,6] follows the lifetime risk (LTR) categories defined by the National Institute of Clinical Excellence (NICE).[7]

Risk categories	Cancer Australia[3]	eviQ[5,6] (based on NICE)[7]
Average risk	< 1.5 times population risk	11% LTR
Moderate risk	1.5 to 3 times population risk	≥ 17 but < 30% LTR
High risk	> 3 times population risk	≥ 30% LTR

Key breast cancer risk factors

There are multiple known risk factors for breast cancer. Being female, increasing age, and inherited genetic mutations are the highest risks and are the basis of previous risk stratification models and current screening practices. The chart shows the relative risk[8] of some of the key factors evaluated by current risk assessment models.



Relative risk factors for breast cancer[8] (excluding age and genetic mutations)

Dense breasts are a significant breast cancer risk

- Approximately 40% of Australian women have dense breasts, including 12% with extremely dense breasts.[9]
- 71% of breast cancers occur in dense breasts.[10]
- Women with extremely dense breasts:
  - are 4–6x more likely to get breast cancer than those with fatty breasts[11] and,
  - are more likely to develop an interval breast cancer (4.4/1000 for extremely dense compared to 0.7/1000 for fatty breasts).[12]
- If diagnosed with breast cancer, women with dense breasts have almost a two-fold increased risk of developing contralateral breast cancer.[13]

Dense breast imaging facts (including results of the DENSE trial)[14]

- Mammographic sensitivity decreases from 85.7% in fatty breasts to 61% in extremely dense breasts.[12]
- Supplemental imaging with ultrasound (US),[15] contrast enhanced mammography (CEM),[16] and/or magnetic resonance imaging (MRI)[14] has been proven to find significantly more cancers in dense breasts. The increase in cancer detection rates (CDR) following a negative mammogram are:
  - US: 2/1000
  - CEM: 14.3/1000
  - MRI first round: 16.5/1000
  - MRI second round: 5.8/1000
- Second round MRI screening in extremely dense breasts results in a decreased false positive rate of 26.3 per 1000 screening exams vs 79.8 per 1000 in the first round.[14]
- MRI-detected cancers in the second round were early stage (0–I) and node negative.[14]

Australian breast cancer risk management recommendations

Current evidence-based guidelines for the prevention and early detection of breast cancer are lacking. iPrevent and eviQ provide recommendations based on previous guidance,[3] relevant literature (but not including the DENSE trial), and MRI rebate criteria. Refer to ***Australian breast cancer risk management recommendations – screening and risk reducing strategies*** for guidance.

Summary

Breast cancer is the most diagnosed cancer in women in Australia, with an estimated 20,428 new cases and 3,178 deaths in 2022.[4] The BreastScreen Australia program is available free to women aged 40 and over, with those aged 50–74 actively invited to screen. Risk assessment tools enable personalised breast cancer risk assessment for all women, including those under 40. This allows for tailored imaging and risk-reducing strategies to improve opportunities for prevention and early detection, resulting in improved outcomes.

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