

Various breast cancer risk prediction models (BCRPMs) exist to assess an individual's risk of developing malignancy and risk of having a mutation associated with hereditary risk of developing cancer. This article provides oncology nurses with current information on the available BCRPMs and highlights nursing implications. Oncology nurses' understanding of BCRPMs can help to ensure that patients are receiving accurate and useful information related to their risks.

#### AT A GLANCE

- Although BCRPMs are not diagnostic tools, they can provide valuable information concerning the risk of developing breast cancer or having a cancer susceptibility mutation.
- Because there is not a universal, standardized BCRPM that can be used for every patient, it is important to understand the purpose, strengths, and limitations of each model so that the proper models can be applied in each clinical situation.
- Oncology nurses familiar with BCRPMs can use the risk prediction values from these models to guide recommendations for cancer prevention and early detection, as well as identify patients who might benefit from referral for additional genetic evaluation and possibly genetic testing.

#### KEYWORDS

breast cancer; breast cancer risk prediction model; risk; genetics; genetic testing

#### DIGITAL OBJECT IDENTIFIER

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# Breast Cancer Risk Prediction Models

## Challenges in clinical application

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The high incidence of breast cancer (an estimated 266,120 women in the United States in 2018), coupled with women's desire to understand their risk of developing breast cancer, has led to the development of several breast cancer risk prediction models (BCRPMs) (National Cancer Institute [NCI], 2018). There are different models available to calculate breast cancer risk, as well as models to calculate the risk of carrying a pathogenic mutation associated with hereditary risk of developing malignancy. These models can be difficult to implement, interpret, and explain during a fast-paced clinical encounter (Cintolo-Gonzalez et al., 2017). First-generation screening models, including the Gail and Claus models, lack robust analysis and may insufficiently determine risk (Gail, 2015). However, newer generation models are more complicated and pose challenges in interpretation (Cintolo-Gonzalez et al., 2017). When applied correctly, BCRPMs can identify high-risk patients and allow providers an opportunity to have an in-depth conversation with the patient (Cintolo-Gonzalez et al., 2017). This article will present a synopsis of BCRPMs currently used (see Figure 1), with details on application and interpretation for providers as well as implications for oncology nursing practice.

### Models

#### Gail Model

The introduction of tamoxifen as a breast chemoprevention agent was the impetus

for the development of the Gail model to identify women who might benefit from chemoprevention (Gail et al., 1989). The original model was based on data collected from Caucasian women, but other races were included in subsequent research (NCI, 2018). The model is easy to implement, and results are understandable for providers and patients.

#### Gail Model 2/Breast Cancer Risk Assessment Tool

The Gail model 2, also known as the Breast Cancer Risk Assessment Tool (BCRAT), was created to enhance specificity for identifying risk of developing invasive breast cancer. Ten years after the Gail model was initiated, it was modified by adding a variable of "yes/no" for a positive breast biopsy of atypical hyperplasia (Constantino et al., 1999). A limitation of the Gail model 2/BCRAT is that it does not consider paternal relatives or second-degree relatives diagnosed with breast cancer, so it may underestimate risk in some families (National Comprehensive Cancer Network [NCCN], 2018a). The Gail model and Gail model 2/BCRAT are sometimes used interchangeably, although they are different models.

#### Claus Model

The Claus model was developed from greater awareness of the link between familial history and breast cancer risk. Sponsored by the Centers for Disease Control and Prevention and the National Institutes of Health, the Claus model examines patterns of risk based on the number