Short-term outcomes of the implementation of a computer-based breast cancer risk assessment program during screening mammography

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Background Barriers to assessing a patient's risk for breast cancer include the inadequate documentation of family history, the complexity of risk calculation and model selection, and a lack of awareness of risk on the part of the patient and/or provider. We have established computer-based, real-time assessment of a patient's risk for breast cancer at the time of having a mammogram.

Objective To facilitate identification of high-risk patients who need genetic counseling and testing and magnetic resonance imaging screening based on the results of the risk assessment.

Methods Since November 23, 2010, all mammogram patients have completed questionnaires using a wireless tablet. On the basis of a real-time calculation for a patient's risk of BRCA1/BRCA2 mutation (Myriad, Tyrer-Cuzick, BRCAPRO) and lifetime risk of breast cancer (Gail, Claus, Tyrer-Cuzick, BRCAPRO) using Hughes riskApps, patients were categorized as *high risk* (≥ 10% BRCA mutation or ≥ 20% lifetime breast cancer risk) or *average risk* and received a risk assessment letter. The risk data was integrated into our mammography information system (PenRad) at the same time. High-risk patients were contacted to facilitate evaluation.

Results As of June 30, 2012, a total of 24,213 unaffected patients completed the risk assessment. There were 2,196 patients (9.1%) identified as high risk: 1,051 (4.3%) had a BRCA mutation risk, 1,570 (6.5%) had lifetime breast cancer risk, and 425 (1.8%) had risk for both. Of the high-risk patients, 416 (18.7%) were evaluated by our APN and/or genetic counselor. Of the 231 who were evaluated by a genetic counselor, 97 had genetic testing and 9 (8.3%) were BRCA positive. Annual MRI screening was recommended to 254 patients.

Conclusions We have successfully implemented breast cancer risk assessment through our screening mammography service. Results suggest that 9.1% of our patients can benefit from risk assessment, 4.3% should consider genetic testing, and 6.5% may benefit from screening MRI. We strive to improve compliance through patient education.

Women with the highest risk of breast cancer include those with a family history of breast cancer and those with a history of atypia or lobular carcinoma in situ on a breast biopsy. Other contributing risk factors include age, race, early age at menarche, pregnancy history, and number of breast biopsies. Numerous models exist for calculating lifetime risk of breast cancer as well as risk of a mutation in the BRCA1 and BRCA2 genes. Major barriers to breast cancer risk assessment include inadequate documentation of family history, complexity of risk calculation and model selection, and lack of awareness of risk on the part of the patient and/or provider.

A 2011 study of 64,659 women who presented for mammographic screening at a high-volume clinic estimated what proportion of the women was at an elevated lifetime risk for breast cancer.[1] For patients who reported a first-degree maternal relative with breast cancer and who had at least a 20% lifetime risk on the Gail model, the radiologist's report included a recommendation that the woman's primary care physician refer her for a breast screening with magnetic resonance imaging (MRI). The investigators exam-

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ined records to find out how many of the at-risk women had the recommended MRI at the clinic within 1 year of the initial risk assessment. They found that 1,246 (1.9%) of the patients had a lifetime risk of breast cancer of 20% or greater, and 436 (0.7 %) had a lifetime risk of breast cancer 25% or greater. Of those at elevated risk, 173 (13.9%) had the recommended breast MRI screening at the clinic within a year. The researchers recommended that the effectiveness of matching screening intensity to risk on cancer detection, biopsy rate, and cost needed to be further evaluated at multiple clinics and using multiple risk assessment tools.

We have established a high-risk breast cancer assessment program at the Jacqueline M Wilentz Comprehensive Breast Center in Long Branch, New Jersey, using a computer-based, real-time, risk calculation at the time of screening mammography. The objectives of our program are to facilitate the identification of high-risk patients who need high-risk clinic evaluation, genetic counseling and testing, and MRI breast screening.

Methods

Since November 23, 2010, all patients who come to our clinic for a mammogram complete a self-reported risk assessment using a wireless tablet before they receive their screening mammogram. We use software from Hughes riskApps, an open source application available for download from the Web that supports the Myriad, Tyrer-Cuzick, and BRCAPRO models for the real-time calculation of a woman's risk of carrying a BRCA mutation as well as her lifetime risk of breast cancer (Gail, Claus, Tyrer-Cuzick,

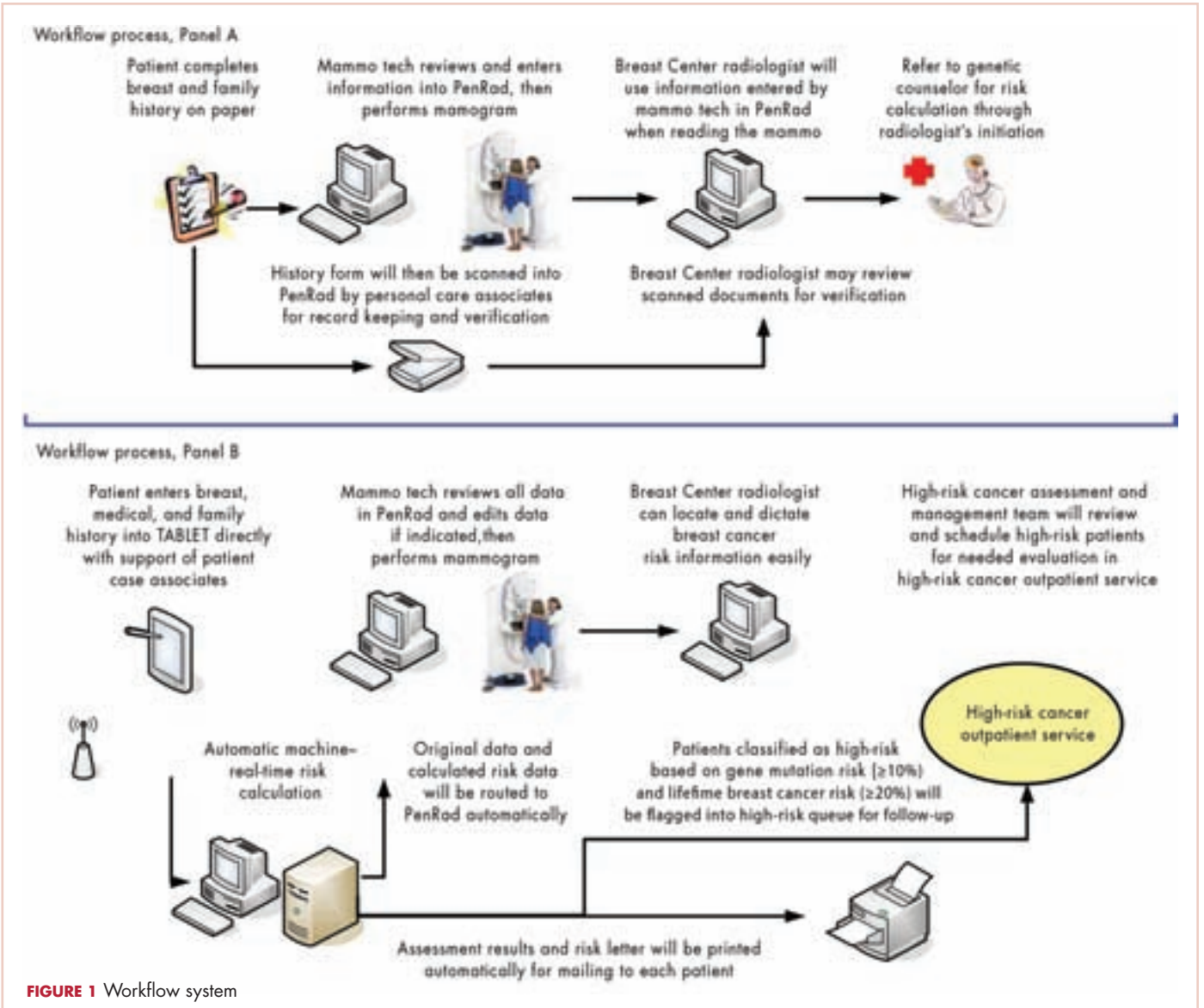

FIGURE 1 Workflow system

and BRCAPRO models). On the basis of the results of those calculations, patients are categorized as *high risk* (≥ 10% risk for BRCA mutation or ≥ 20% lifetime risk for breast cancer) or *average risk* and they receive a risk assessment letter based on their categorization.[1-3] The risk data are simultaneously integrated into our mammography information system (PenRad, Buffalo, MN); Figure I). A coordinator in our clinic contacts high-risk patients to facilitate a high-risk clinic evaluation.

Data from a pilot study of all patients who had screening mammography during 2009-2010, suggested that by implementing the risk assessment through the breast imaging center, we were able to identify that:

- 7% of the patients had a lifetime risk ≥ 20% and would benefit from having a screening breast MRI;
- 4% had a BRCA mutation risk ≥ 10% and needed to be evaluated by a genetic counselor;
- 50% of the patients evaluated by the genetic counselor were eligible for genetic testing; and
- 16% of patients who had genetic testing had a BRCA1 or BRCA2 mutation – much higher than the national average of 8%.

We then began the full project in 2011 with the following objectives:

- To increase the number of high-risk women evaluated at our high-risk outpatient service by 30% from the current 10%.
- To track outcomes (a-d) by following the model and process outlined in Figure 1:
  a. The percentage of patients at risk of BRCA mutation evaluated by a genetic counselor and requiring genetic testing;
  b. The percentage of patients who had genetic testing and who had positive results through the proposed process;
  c. The percentage of high-risk patients receiving annual screening breast MRI as per the American Cancer Society and NCCN guidelines;[4-7] and
  d. High-risk surveillance outcomes – use of prophylactic surgical procedures and chemoprevention, and so on.
- To use the study results to establish a high-risk breast cancer assessment and management model as a demonstration model for other breast imaging centers.

Results

As of June 30, 2012, 24,213 patients without a known personal cancer history had completed the risk assessment. The patients were our screening population. Of the total number of patients, 2,196 (9.1%) were identified as being high risk: 1,051 (4.3%) of those high-risk patients had a ≥ 10% risk for a BRCA mutation; 1,570 (6.5%) had a ≥ 20% lifetime risk of breast cancer; and 425 (1.8%) met both criteria. In all, 416 high-risk patients (18.9%) have been evaluated in the high-risk clinic; 231 (10.5%) were evaluated by our genetic counselor, 97 (4.4%) had genetic testing, and 9 (9.3%) of those tested were found to have a BRCA mutation. We have recommended annual screening breast MRI to 254 patients (16.2%) of the high–lifetime-risk group.

Conclusions

We have successfully implemented a breast cancer risk assessment program through our screening mammography service. The results of our study suggest that 9.1% of our patients can benefit from high-risk clinic assessment, and 4.3% should be considered for BRCA1/BRCA2 genetic testing. In addition, 6.5% of our patients may benefit from screening breast MRI. We strive to improve on the number of patients who proceed with high-risk clinic assessment by educating our patients about the benefits of screening and risk-reducing strategies. At this time, financial outcomes are not available.

Acknowledgment

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