Treating and Preventing Breast Cancer Using an Automated Screening Tool as Part of Risk Assessment: A Model of Academic-Community Collaboration to Address Rural Disparities

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BACKGROUND

Risk modeling for breast cancer screening is a standard of care in many areas. Overall, an American woman's lifetime risk of breast cancer (BC) is 12.5%. However, due to different environmental and genetic variables, women have differing relative risk profiles. Currently, breast experts define moderate risk as 15-20% lifetime risk, and "high risk" as >20%. Rurally, strategies for BC screening are often based on the patient's age alone and fail to incorporate a multi-factorial risk model. Since 2018, the Outer Banks Hospital (TOBH) has implemented a BC radiology screening program based on the Tyrer-Cuzick model version 8b, which was shown to be 6x more accurate at predicting breast cancer than the current age-based practice we use in NC. This model uses ~20 patient variables to estimate the patient's risk of BC over their lifetime and gives an age-adjusted estimate for comparison. However, while this model is effective, the current system in place to get these results to the patients at TOBH are mostly manual and involve many successive steps of team communication. Due to this, we anticipate that we are not identifying most women who qualify for high risk and referring them appropriately due to errors in getting the screening results to patients. We also hypothesize a program that depends on multiple layers of human communication with the patient is inherently inefficient, as we plan to develop an EMR-based platform that automates this process for the provider and the patient.

PROJECT AIM

To highlight the outcomes of patients identified as being at high-risk for breast cancer and identify the weaknesses in our process that an automated solution could address in the future

PROJECT DESIGN/STRATEGY

We looked at patients screened for BC at TOBH for 6 months for this project to obtain a recent estimate of our successes and failures in documenting high risk women. 2000 women underwent screening mammography from January 1 to June 1, 2023. Typically, TOBH screens 4500-5000 women a year on average. Average age for screening is 60 years, with ranges from 40 to 86 years of age. We obtained copies of the names of all women routinely screened for cancer. Patients undergoing diagnostic images were excluded for this study since we after the effects of this tool in screening risk, not in women presenting with a known mass or abnormality. N=2000 women met criteria for screening at TOBH.

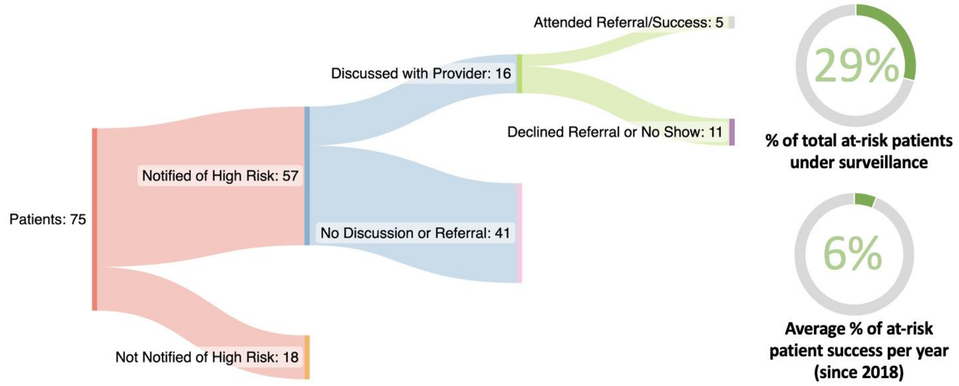
Once high-risk patients were identified, we tracked and documented every effort to get them referred to proper high-risk screening/treatment. The whole process from mammogram to attended referral was split into 3 stages:

1. notification of high risk
2. discussion and offered referral
3. attended high-risk clinic

Success and failure at each stage were recorded to determine bottlenecks in our current manual process.

RESULTS

Results for Patients Identified as High Risk in 2023 (previous successes excluded)



	Stage 1: Notification of High Risk	Stage 2: Discussion and Referral	Stage 3: Attended High Risk Clinic
Summary:	• Determined by the inclusion of risk profile into patient chart or by letter correspondence	• Determined by any documentation of discussion with provider/nurse about high-risk options or referral	• Determined by if the patient accepted and attended any type of high-risk services
Results:	• Risk was commonly acknowledged in chart impressions for 72% of patients	• Over 50% of total patients lost at this stage, worst bottleneck for process	• 15% of total patients lost in this last stage, mostly due to refusals
Pitfalls:	• User error in forgetting to manually note risk into chart, loss of high risk trained nurse	• Discussions not occurring, providers/patients not aware of risk note, delay in risk notification	• Delayed risk discussion would occur weeks to months after mammogram leading to increased refusals
With Automation:	• Risk notification would occur instantly and at a 100% rate in a uniform manner on the chart	• Instant risk notification at check in would allow the provider to assess the patient's profile and discuss with them during the visit	• Discussions in person with providers and not weeks/months later with staff would lead to increase compliance

OUTCOMES

The total number of high-risk patients identified was 98. Of those 98, 23 had successfully been enrolled in high-risk care in the years prior since 2018. Among the remaining 75 patients, 57 advanced past Stage 1 because they received a notification detailing their risk profile within their chart or from a letter sent by the nurse navigator. However, 18 patients received absolutely no notice at all on their risk. In Stage 2, patients would advance in the process if they had a documented discussion with any staff about high-risk options or referrals. This stage was particularly unsuccessful, as we lost 41 patients and only 16 advanced. In Stage 3, patients advanced to a "success" if they accepted their referral and ultimately attended it. 11 patients either declined or failed to attend the appointment. Ultimately, in the first six months of 2023, only 5 high-risk patients of the possible 75 were captured into specialized care pipeline. The patients would go on to receive genetic testing, familial and lifestyle counseling, and more detailed and frequent imaging to monitor their risk profile.

Although the results look bleak, when it put into perspective of 2018 and onwards, the actual success rate of the total patients was around 29%, since 23 other high-risk patients were already received specialized care. Per year, the OBH averages capturing around 6% of their high-risk patients into these programs. In the first half of 2023, those 5 patients already account for 7% of the available people, which mean that if this trend continues then 2023 could be a very successful year. Additionally, the weaknesses in the current manual process are very visible and would all be improved with the incorporation of an automated tool.

LESSONS LEARNED

We found 6-7% of women being screened met criteria for "high risk" as defined by TC model, with lifetime BC risk 20% or higher. Communication of these results to patients was variable. Some results were included by the radiologist in the body of the mammogram report (for the primary care to see), and some reports included the number as a percentage but no note as to the relevance. Some women had already been captured by previous iterations of the screening process, since mammography is often a repeated screen every 1-2 years. We noted various correlations with success, and some correlations with failures of communication of this information, which we help to use in developing pathways for incorporating this information into an EMR based model later this year. Ultimately, if we learn how to repeat the successes, and improve the failures, we anticipate we will have better participation in our risk clinics once we roll out the automated model in 2024.

At Stage 1, the most common pitfalls were human error and staff layoffs, which would result in no interpretation of the risk profile to the patient. Additionally, due to delays in getting this data into the chart, providers lacked the proper information to conduct a discussion (Stage 2) with the patient while they were still in their office. This would result in them having to backtrack to call or send a letter to the patient weeks or months after the original. An automated process could instantly populate this value into the chart and notify the provider as soon as the patient enters that data into the questionnaire, which would vastly improve results for stages 1 and 2. Additionally, it's reasonable to project that capture rates at the final stage 3 would improve as patients would have an immediate discussion in-person with relevant hospital staff. This would carry significantly more weight with patients in conveying the importance of their risk profile than a letter that arrives weeks after.

NEXT STEPS

1. **Follow-up with "missed" high risk patients to verify results and confirm if they are unaware of their risk profile.**
2. **Use these results as a baseline for the current manual process.**
3. **After the automatic system has been implemented at TOBH (2024), complete another similar 6-month study of this population.**
4. **Compare results between the manual and automated processes in their abilities to identify, notify, and capture high-risk patients.**
5. **If improvements are noted, increase the scale of the automated tool to larger health system.**

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