Integrating a Breast Cancer Risk Model into a Clinical Workflow

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Introduction

- Geisinger, a health system headquartered in central Pennsylvania, implemented a Breast Cancer Risk Estimator (BCRE) machine learning model that uses structured electronic health record (EHR) data like demographics, vitals, procedure history, diagnoses and laboratory tests to support early detection of patients at high-risk for developing breast cancer.
- We applied a user-centered design approach to integrate the BCRE model into a clinical workflow that enables outreach to high-risk patients overdue for screening.

Methods

- Design and implementation involved collaboration with a multi-disciplinary team consisting of clinicians, nurse coordinators, data scientists, product managers, and EHR developers.
- The objective of the workflow design was to:
  1. Reach unscreened patients quickly and minimize patient touchpoints.
  2. Streamline the process and integrate the model with current clinical and operational workflows through the EHR (Epic Corp., Verona, WI). Epic build included Smart Data Elements (SDE), SmartText and a SmartSet for documentation to track call outcomes and outreach status done by nurses.
  3. Enable monitoring of patient progress throughout their care. The screening program's pilot is ongoing, and the parameters were determined by analyzing operational capacity and population needs.

Results

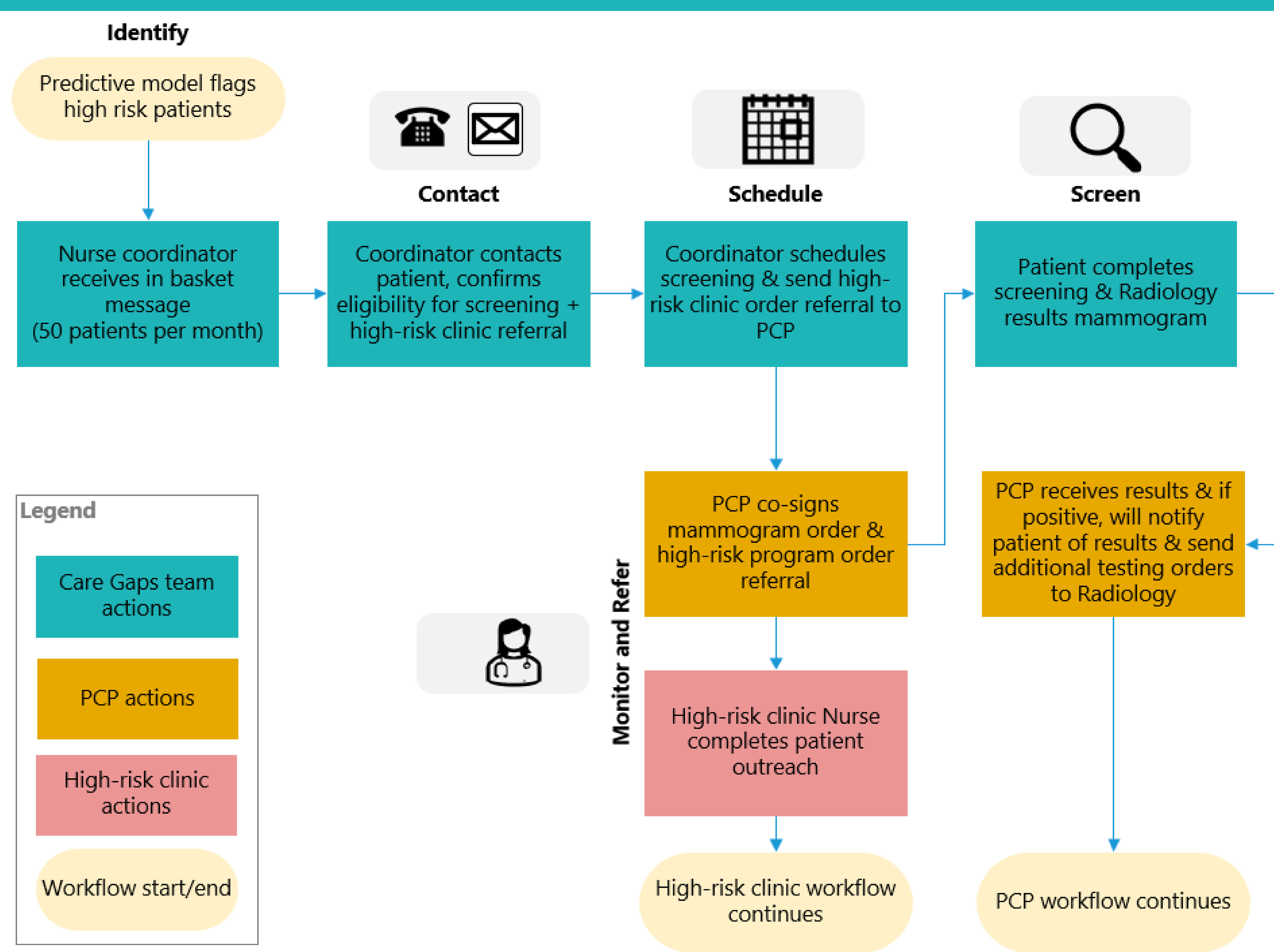


Figure 1. Simplified BCRE Clinical Workflow

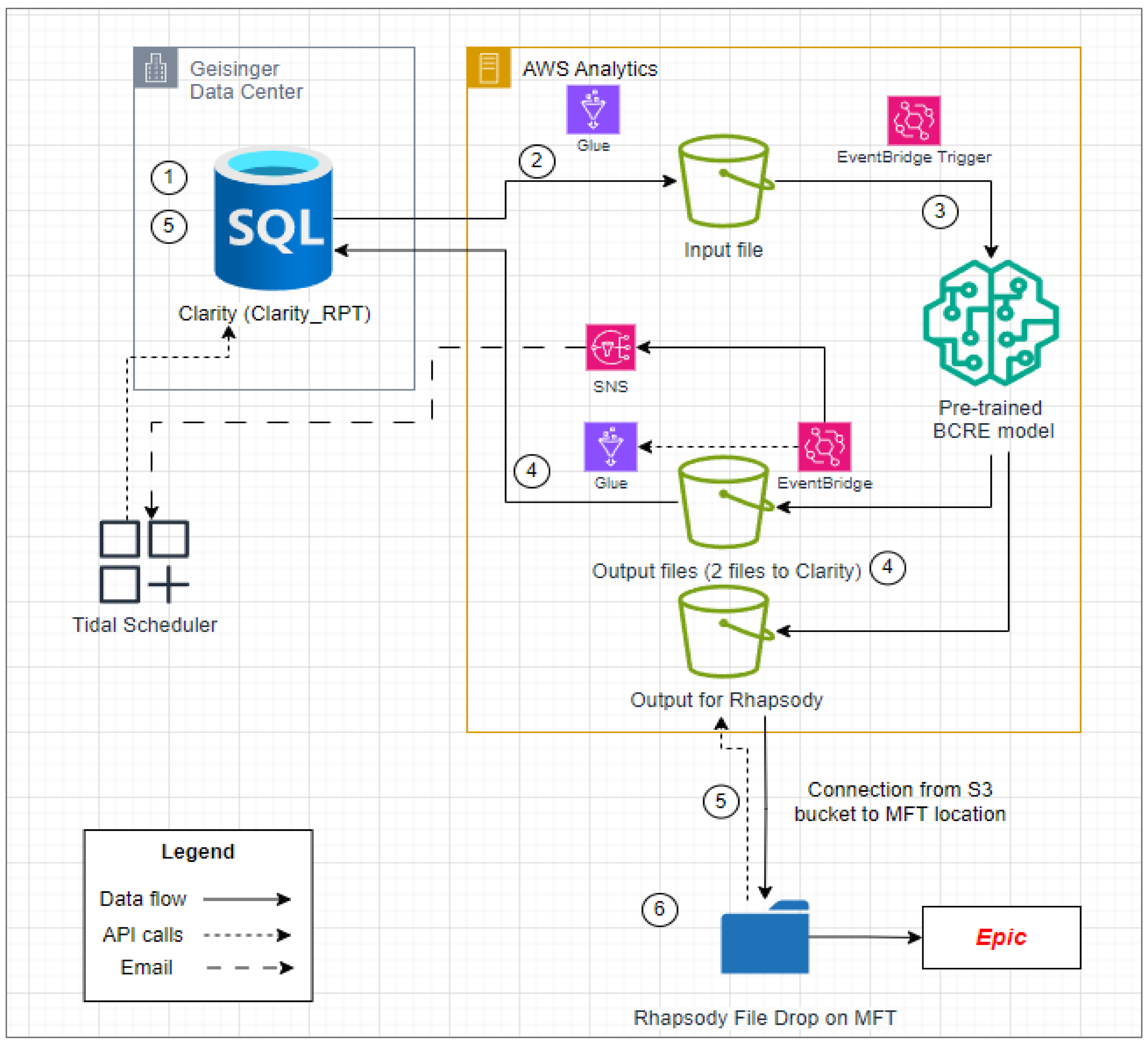
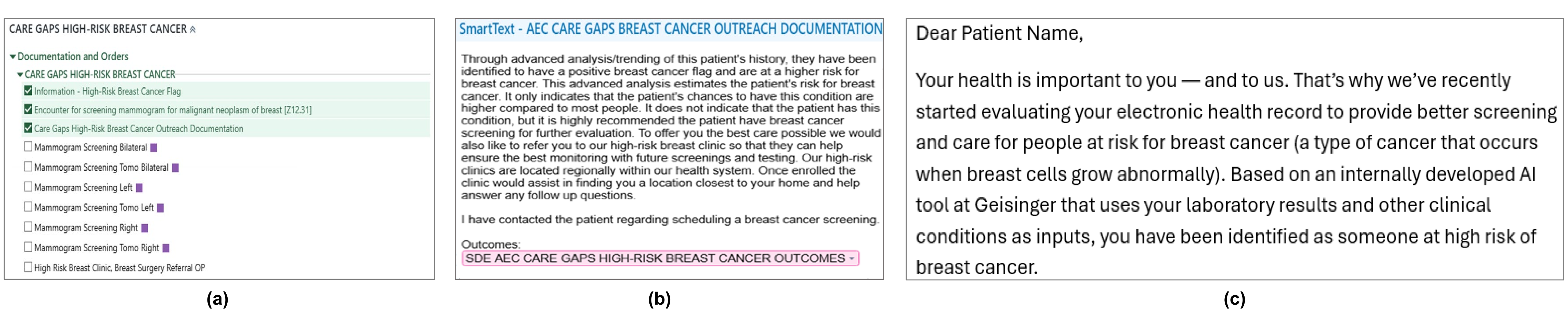


Figure 2. Technical Infrastructure Integration



CARE GAPS HIGH-RISK BREAST CANCER

Documentation and Orders

CARE GAPS HIGH-RISK BREAST CANCER

- [x] Information - High-Risk Breast Cancer Flag
- [x] Encounter for screening mammogram for malignant neoplasm of breast [Z12.31]
- [x] Care Gaps High-Risk Breast Cancer Outreach Documentation
- [ ] Mammogram Screening Bilateral
- [ ] Mammogram Screening Tomo Bilateral
- [ ] Mammogram Screening Left
- [ ] Mammogram Screening Tomo Left
- [ ] Mammogram Screening Right
- [ ] Mammogram Screening Tomo Right
- [ ] High Risk Breast Clinic, Breast Surgery Referral OP

(a)

SmartText - AEC CARE GAPS BREAST CANCER OUTREACH DOCUMENTATION

Through advanced analysis/trending of this patient's history, they have been identified to have a positive breast cancer flag and are at a higher risk for breast cancer. This advanced analysis estimates the patient's risk for breast cancer. It only indicates that the patient's chances to have this condition are higher compared to most people. It does not indicate that the patient has this condition, but it is highly recommended the patient have breast cancer screening for further evaluation. To offer you the best care possible we would also like to refer you to our high-risk breast clinic so that they can help ensure the best monitoring with future screenings and testing. Our high-risk clinics are located regionally within our health system. Once enrolled the clinic would assist in finding you a location closest to your home and help answer any follow up questions.

I have contacted the patient regarding scheduling a breast cancer screening.

Outcomes:
SDE AEC CARE GAPS HIGH-RISK BREAST CANCER OUTCOMES

(b)

Dear Patient Name,

Your health is important to you — and to us. That's why we've recently started evaluating your electronic health record to provide better screening and care for people at risk for breast cancer (a type of cancer that occurs when breast cells grow abnormally). Based on an internally developed AI tool at Geisinger that uses your laboratory results and other clinical conditions as inputs, you have been identified as someone at high risk of breast cancer.

(c)

Figure 3. EHR *(Epic)* Integration Components (a) SmartSet for Nurse Documentation, (b) SmartText for Nurse Documentation and (c) Automated Patient Outreach Letter

References

1. Siegel RL, Kratzer TB, Giaquinto AN, Sung H, Jemal A. Cancer statistics, 2025. Ca. 2025 Jan 16;75(1):10.
2. Caswell-Jin JL, Sun LP, Munoz D, Lu Y, et al. Analysis of breast cancer mortality in the US—1975 to 2019. Jama. 2024 Jan 16;331(3):233-41.
3. Nicholson WK, Silverstein M, Wong JB, et al. Screening for breast cancer: US Preventive Services Task Force recommendation statement. Jama. 2024 Jun 11;331(22):1918-30.

Main Finding

Integration of a machine learning model into a clinical workflow can help identify high-risk breast cancer patients requiring mammogram screening.

Conclusion

- Effective screening is the first step in breast cancer detection.
- Integrating a clearly defined pathway within the EHR clinical workflow enables targeted outreach for high-risk breast cancer patients.
- Identifying high-risk patients early can help increase screening efficiency and help patients receive treatment sooner.