HHS Public Access

Author manuscript

Gynecol Oncol. Author manuscript; available in PMC 2024 May 01.

Published in final edited form as:

Gynecol Oncol. 2023 May ; 172: 106–114. doi:10.1016/j.ygyno.2023.03.016.

Outcomes of the BRCA Quality Improvement Dissemination Program: An initiative to improve patient receipt of cancer genetics services at five health systems

A full list of authors and affiliations appears at the end of the article.

Abstract

Objective: A quality improvement initiative (QII) was conducted with five community-based health systems' oncology care centers (sites A–E). The QII aimed to increase referrals, genetic counseling (GC), and germline genetic testing (GT) for patients with ovarian cancer (OC) and triple-negative breast cancer (TNBC).

Methods: QII activities occurred at sites over several years, all concluding by December 2020. Medical records of patients with OC and TNBC were reviewed, and rates of referral, GC, and GT of patients diagnosed during the 2 years before the QII were compared to those

Corresponding author Erica Bednar, MS, MPH, CGC, Postal address: 1155 Herman P. Pressler, Houston, TX 77030, Telephone: 832-294-4473, Fax: 713-563-0017, embednar@mdanderson.org, Twitter handle: @embosu.

Author contributions

Conceptualization: E.M.B., M.T.W., K.H.L.; Data curation: E.M.B., M.C., A.L.E., J.H., H.G.C., C.Y., R.K., B.H., M.H., S.B.G., A.A., N.A.M., E.B., E.W., J.N.C., K.T., B.F.G., B.L., K.M., A.M.K., R.A.P., R.L.C., J.M.S., A.K.V., K.L.; Formal analysis and Visualization: E.M.B., M.C.; Funding Acquisition: M.T.W., K.H.L.; Investigation: E.M.B., A.L.E., M.H.K., K.T., B.H., J.H., H.G.C., D.D., W.S., C.Y., R.K., S.B.J., J.J.M., C.G., F.G., T.M., L.D.N., B.H., M.H., S.B.G., A.A., C.J., N.A.M., E.B., E.W., J.N.C., P.K.R., K.T., B.F.G., B. L., K.M., K.Z., M.K., J.S., C.O., A.B., A.M.K., R.A.P., M.B., M.R., R.L.C., J.M.S., A.K.V., K.L.; Supervision: M.T.W., K.H.L., E.B., T.A.G., D.H., K.R., G.G., L.M.; Writing original draft: E.M.B., M.C.; Review and editing: All authors.

Conflict of interest

The following authors report no conflict of interest: Erica M. Bednar, Minxing Chen, Michael T. Walsh, Jr., Amanda L. Eppolito, Molly H. Klein, Kelly Teed, Brittany Hodge, Jordan Hunter, Dillon Davis, Wilshauna Serchion, Cara Yobbi, Sandra B. Jenkinson, Jennifer J. Moore, Cassandra Garcia, Christina Johnson, Fatimaeliza Gonzalez, Towanna Murray, Linda D. Nielsen, Brenda Ho, Megan Haas, Sarah B. Greenzweig, Abby Anderson, Nichole A. Morman, Elizabeth Bowdish, Emaline Wise, Julia N. Cooper, Pauline Kefalas Russ, Katelyn Tondo-Steele, Buonarotti F. de Gracia, Brooke Levin, Kristin Mattie, Molly Kalasinski, Kathryn Zarnawski, Jennifer Stone, Caitlin O'Brien, Alexa Bream, Aidan M. Kennedy, Rachel A. Paul, Michelle Bilbao, Maureen Romero, Anna K. Vercruyssen, Kaycee Leon, Banu K. Arun, Andrew V. Grainger, David P. Warshal, Erin Bowman, Timothy A. Goedde, Deepa Halaharvi, Kellie Rath, Generosa Grana, Lida Mina, Karen H. Lu.

The following authors disclose potential conflicts of interest: Han Gill Chao is an employee at Fulgent Genetics and received restricted stock units as part of compensation, and Rebecca L. Carr is a full-time salaried employee of Ambry Genetics however, Han Gill Chao and Rebecca L. Carr were not employed by these organizations during their participation in the study. Rebekah Krukenberg received payment from Ambry Genetics for educational speaking opportunities and reimbursement of travel to educational speaking events. Jennifer Siettmann holds an unpaid, elected leadership position with Arizona Genetics Alliance.

Ethics declaration

The program described in this manuscript was approved as a non-research, quality improvement activity by the MD Anderson Cancer Center Quality Improvement Assessment Board and the Institutional Review Boards at Piedmont Health, Community Health Network, OhioHealth, Cooper University Health Care, and Banner Health. Patient data were subject to data transfer agreements and were de-identified prior to analysis, and no patient informed consent was required.

Prior Presentations: Preliminary results were presented as posters at the American Society of Clinical Oncology (ASCO) Annual Meeting in June 2022 and the National Society of Genetic Counselors (NSGC) Annual Conference in November 2022.

diagnosed during the QII. Outcomes were analyzed using descriptive statistics, two-sample t-test, chi-squared/Fisher's exact test, and logistic regression.

Results: For patients with OC, improvement was observed in the rate of referral (from 70% to 79%), GC (from 44% to 61%), GT (from 54% to 62%) and decreased time from diagnosis to GC and GT. For patients with TNBC, increased rates of referral (from 90% to 92%), GC (from 68% to 72%) and GT (81% to 86%) were observed. Effective interventions streamlined GC scheduling and standardized referral processes.

Conclusion: A multi-year QII increased patient referral and uptake of recommended genetics services across five unique community-based oncology care settings.

Introduction

Cancer genetics services, including genetic counseling (GC) and germline genetic testing (GT) for hereditary predisposition to cancer, is often recommended for patients following the National Comprehensive Cancer Network (NCCN) guidelines.[1,2] Efforts to increase patient access to cancer genetics services in the U.S. have included clinical quality improvement (QI) initiatives, alternative service delivery models, research programs, and public awareness campaigns; with most published efforts occurring in academic medical centers.[3] One effort increased the rates of referral, GC, and GT among patients with ovarian cancer at a tertiary care oncology center by implementing clinical QI interventions following the Model for Improvement.[4–6] The initiative was adapted and implemented in a safety-net oncology care setting, resulting in similarly improved outcomes.[7] Further dissemination of the initiative, called the "BRCA Quality Improvement Dissemination Program" (BQIDP), was undertaken in 2017.

The BQIDP focused on patients with invasive, epithelial ovarian, fallopian tube, and primary peritoneal cancers (OC) and triple-negative breast cancer diagnosed at age 60 years or younger (TNBC). The NCCN guidelines have recommended GC and GT since 2007 for patients with OC and since 2011 for patients with TNBC, and with an estimated 15–25% of these cancer types due to a hereditary predisposition (primarily pathogenic variants in *BRCA1* and *BRCA2*), it was determined that current reported rates of cancer genetics services (12–53% in patients with OC and 38–58% in patients with TNBC) indicated an opportunity for improvement.[8–16] The BQIDP aimed to improve the rates of referral, GC, and GT, and time to receive cancer genetics services, among patients with OC and TNBC. The tertiary care oncology center ("lead site"; LS) implemented the BQIDP in partnership with genetic counselor-led teams at five non-academic, community-based health systems' oncology care centers (participating sites A-E). Herein, we evaluate the impact of the BQIDP on patient receipt of cancer genetics services.

Methods

The BQIDP QI protocol was developed by the LS, approved by the LS's Quality Improvement Assessment Board, and approved as a non-research clinical activity by each participating site's Institutional Review Board. Contextual elements were considered prior to implementation using a previously reported environmental scan to identify site capacity

for QI efforts, existing barriers, and opportunities for QI intervention.[17] Environmental scans informed the creation of a cancer genetics process flow diagram to reflect practice patterns at participating sites.[17] An implementation evaluation of the BQIDP, including detailed description of resources used, activities performed, and precursor outcomes has also been reported.[18] As previously reported, genetic counselors were intentionally positioned as leaders of BQIDP efforts at their site, in partnership with a physician, given their experience and depth of knowledge of the clinical care processes relevant to the BQIDP aims and goals.[18] Site teams were composed of members of the oncology care team, administrative staff, and volunteers. The framework used for reporting BQIDP outcomes was The Revised Standards for Quality Improvement Reporting Excellence, version 2.0 (Table 3).[19]

Participating Site Patient Population

Eligible patients were retrospectively identified from each site's cancer registry. Patients were included if they were 18 years of age or older with newly diagnosed OC and/or TNBC and completed at least one outpatient oncology clinic appointment at the participating site. The typical practice pattern at participating sites was for patients with OC to receive care from Gynecologic Oncology and other specialty services as needed, and for patients with TNBC to receive care from Breast Medical Oncology, Radiation Oncology, Breast Surgery, and other specialty services as needed. The patient's pathology report date was used as the diagnosis date. Patients were assigned to pre-BQIDP (diagnosis date in the 2 years prior to their site's BQIDP start date), or post-BQIDP (diagnosis date during the site's BQIPD implementation).

Participating Site QI Outcome Data Collection

Patients' medical records were reviewed by participating site team members for documentation of recommendation or referral for genetics services ("referral"), GC appointment, and GT results. Pathology reports were reviewed to confirm histologic subtype, and for TNBC; the results of estrogen receptor, progesterone receptor, and HER2/neu analysis. The dates of diagnosis, completed GC, and GT results were used to calculate time between diagnosis and receipt of genetics services. Reasons for no GC or GT, if noted in the medical records were collected. Patients were considered to have completed GT if it included evaluation for hereditary predisposition to cancer, and minimally included the *BRCA1* and *BRCA2* genes. Patients without a copy of GT results available for verification, but with results mentioned in clinic notes, were reported separately. All data was input into a centralized REDCap database created by the LS.[20] Data collection was completed at the end of December 2021, allowing at least 1 year between the last possible diagnosis date and final data collection. De-identified data were reviewed by the LS team, and entries were flagged for missing information, potential data entry errors, and "pending" GC or GT status. All flagged items were returned to the participating site teams for resolution, and the updated data set was used for analysis.

Participating Site QI Interventions

The Model for Improvement approach was used for BQIDP efforts at all sites, whose initial interventions targeted issues identified during their environmental scan.[4,5] The length of Plan-Do-Study-Act cycles for each intervention varied, as interventions were discussed

every 2 months during project meetings between the site team and the LS facilitator, which resulted in intervention continuation; discontinuation; adaptation/change (“version 2”); or maintenance (part of standard clinical process without further data monitoring). Intervention measures included start date, end date, number of patients included (reported in meetings and marked in REDCap), and relevant outcomes such as referrals or GC appointments. The number of patients included, and the effort required for site teams to implement each intervention were mapped using an impact effort diagram. All QI interventions are described briefly in Table 2, and in full detail in the Supplemental Table following the Template for Intervention Description and Replication framework.[21]

Data Analysis

Descriptive statistics were used to characterize the sites, patients, QI, and intervention outcomes. Referral, GC, and GT status were compared between patients in the pre-BQIDP and post-BQIDP groups using the two-sample test of proportions and logistic regression. The two-sample t-test was used to examine whether the average time between diagnosis date and GC or GT completion date decreased significantly from pre-BQIDP to post-BQIDP by cancer type, by site. Patients without a GC appointment date or completed GT date and those with GC or GT dates >30 days prior to diagnosis date were excluded from the timeliness analysis. Intervention outcomes were assessed using chi-squared test to compare the rates of referral, GC, and GT between the patients who were marked as having any intervention and those with no intervention; the two-sample t-test was used to assess whether the average time between diagnosis date and GC or GT completion date was significantly shorter among patients with at least one intervention than among those with no intervention. A p-value of 0.05 was used as the cutoff to determine statistical significance. All analyses were performed using Stata/SE 16.1.[22]

Results

A total of 2157 patients, 1079 with OC (538 pre-BQIDP and 541 post-BQIDP) and 1078 with TNBC (559 pre-BQIDP and 519 post-BQIDP), were included in the analysis. Patient characteristics and participating site features, including location, hospital size, and site team composition, are reported in Table 1.

QI Outcomes for Patients with OC

The rates of referral, GC, and GT by cancer type and participating site are shown in Figure 1. Overall, the rate of referral for patients with OC increased from 70.4% (379/538) to 79.1% (428/541), with statistically significant improvement at site B. Site E achieved a 100% referral rate; however, there was only one patient in the post-BQIDP group owing to loss of gynecologic oncology services shortly after the launch of the BQIDP.

The rate of GC increased from 43.7% (235/538) to 60.6% (328/541). All sites improved GC rates, with statistically significant improvement at sites A, B, C, and D. The increase in the rate of GC among patients with OC was greater than the increase observed among patients with TNBC (OR 1.6, p=0.010). For the 516 patients with OC who did not complete GC,

the most frequently documented reasons were “lack of referral” (57.9%, 299/516) and “GC never scheduled” (13.0%, 67/516).

The rate of GT increased from 53.9% (290/538) to 62.1% (336/541) overall, with statistically significant improvement at site D. Of the 626 patients who completed GT, 94.6% (592/626) had results documented and verified, and 21.5% (127/592) had a pathogenic or likely pathogenic variant result, with 70 of these in *BRCA1* or *BRCA2*. Of the 34 patients with GT results unavailable for review, 11 were noted to have a pathogenic variant. Of the 453 patients with OC who did not complete GT, the majority had no reason documented; however, “patient lost to follow-up” (n=48) and “patient declined testing” (n=30) were the most often reported.

Sites A-D saw decreased average time between diagnosis and completion of GC and GT, as shown in Figure 2. The decrease in average time to GC was statistically significant for sites A (346 days pre-BQIDP to 109 days), C (291 days to 117), and D (342 days to 132). The decrease in average time to GT was statistically significant for sites A (from 329 days to 127), B (254 days to 129), C (299 days to 137), and D (381 days to 165).

QI Outcomes for Patients with TNBC

Overall, the rate of referral for patients with TNBC increased from 89.8% (502/559) to 92.9% (482/519), with significant improvement at sites A and B, as shown in Figure 1. The overall rate of GC increased from 68.0% (380/559) to 72.4% (376/519). Of the 322 patients who did not complete GC, the most frequently documented reason was “lack of referral” (57.1%, 184/322).

Overall, the rate of GT increased from 80.7% (451/559) to 85.5% (444/519), with statistically significant improvement at sites A and B. Of the 895 patients who completed GT, 92.6% (829/895) had results documented and verified, 146 (17.6%) had a pathogenic or likely pathogenic variant result, with 110 of these in *BRCA1* or *BRCA2*. Of the 66 patients with GT results unavailable for review, 16 were noted to have a pathogenic variant. Of the 183 patients who did not complete GT, the majority had no specific reason documented; however, the most common reasons provided were, “patient lost to follow-up” (n=19) and “patient declined testing” (n=15).

Sites A-D saw reductions in the average time between diagnosis and completion of GC and GT, as shown in Figure 2, however only the decrease in average time to GT at site A was statistically significant (p=0.014).

Intervention Outcomes

A total of 432 patients were included in at least one intervention, and a subset of patients (n=80) from sites A and C were included in more than one intervention. Patients included in more than one intervention did not have significantly different rates of referral, GC, or GT compared to those included in a single intervention.

Most interventions (n=9) focused on referring patients not previously identified (“missed patients”), shown in Table 2. Process changes to referral, scheduling, and GC delivery were

also frequent foci of interventions. Ten interventions were maintained, primarily (n=6) those that changed referral and scheduling processes.

Figure 3 shows site C's "optimized scheduling" intervention was "best" because it included the largest number of patients (n=235) and required low effort to implement. Other high-impact interventions included site A's "chemo teach" and "chemo teach version 2" and site C's "infusion suite GC"; however, these required greater implementation effort. Intervention outcomes were achieved at high rates in site A's "chemo teach" interventions (91.3–100% referred); site C's "Infusion GC" intervention (98.0% completed GC); site C's "OC case finding" intervention (90.9% referred), and site D's "missed OC recontact" intervention (90.5% referred), as detailed in the Supplemental Table.

Site C patients included in interventions had higher referral rates (92.4%) than patients without intervention (68.7%, $p<0.001$), with similar trends noted for rates of GC (78.0% versus 52.2%, $p<0.001$) and GT (76.5% versus 53.8%, $p<0.001$). The opposite trend was observed at sites A and B, where rates of GC and/or GT were significantly lower for patients included in an intervention. Similarly, patients without intervention at sites A, B, and D had significantly ($p<0.001$) fewer average days to GC, and patients without intervention at sites A, B, C, and D had significantly fewer average days to GT. Lower rates and fewer average days for patients without intervention reflect the sites' interventions which were not highly effective but included large numbers of patients not previously completing GC/GT or who had been "missed," including those with pre-BQIDP diagnosis dates.

Discussion

The BQIDP was a successful multi-year QI effort coordinated across five unique, community-based oncology care clinics. All five sites improved patient receipt of recommended cancer genetics services with statistically significant improvements observed most often for patients with OC. Sites with longer duration of BQIDP activities (A-C) saw more statistically significant improvements, consistent with outcomes from single-institution efforts that implemented interventions targeting patient identification, referral, GC, and GT processes over several years.[3,6,7] Since the BQIDP sites achieved referral rates between 74% and 95%, and the LS's prior QI initiatives' referral rates were between 81% and 87%, a benchmark of 80% referral rate appears to be reasonable goal for improvement efforts in breast and gynecologic cancer patient populations.[6,7]

Although the NCCN recommendations for patients with OC and TNBC remained consistent throughout the entire pre- and post-BQIDP period, and although PARP inhibitor therapy for patients with OC has been hypothesized to increased rates of GT for patients[23], patients with TNBC required less time to complete GC and GT, and had higher rates of referral, GC, and GT than patients with OC. Research into the root causes of this difference between OC and TNBC is needed, as diagnostic processes; greater initial focus on symptom management due to burden of disease for OC; greater number of providers involved in TNBC oncology care (e.g., medical oncology, breast surgery, plastic surgery, and radiology) compared to OC; and the "Angelina Jolie effect" on awareness of hereditary breast cancer may contribute to these differences.[24,25] Despite lower rates among patients with OC, a notable outcome of

the BQIDP was the decreased time between OC diagnosis and receipt of genetics services. Prompt delivery of genetics services for patients with OC may be a critical QI goal given the evolving timing and use of GT-informed PARP inhibitor therapy following diagnosis.[26,27]

We found that QI interventions that standardized GC referral processes for oncology providers had the greatest impact on patients' receipt of genetics services. Compared to previously published interventions, the benefits of "embedding" or "integrating" GC within oncology clinics is further supported by the results of the "infusion suite GC" intervention at site C, which had a high rate of GC completion.[3,6,7] However, tumor board interventions at sites B, D, and E saw few patients referred, compared to previously described interventions which improved access to genetics services.[28] Similarly, interventions to request referrals for patients ("assisted genetic counseling referral") during the LS's QI efforts resulted in high referral rates (79–97%), but not in the BQIDP "missed patient" interventions.[6,7] All participating site teams were led by genetic counselors, which was an expectation of BQIDP participation; however, not all oncology care settings in the U.S. have genetic counselors serving their oncology clinics. While interventions such as "infusion suite GC" focused on existing GC services, most other effective QI interventions focused on improving and standardizing processes to identify eligible patients, refer, and schedule them for genetics services. BQIDP interventions that targeted processes up-stream of GC could be applied or adapted in various clinical settings whereby other approaches are used to deliver GC and GT, such as oncology care teams who refer patients to other local or regional GC clinics, triage patients to nationwide remote telegenetics companies, or who leverage other healthcare providers such as physicians and advanced practice providers to facilitate patient GT. Interventions in the BQIDP often required more than a single team member to implement, as shown in the Supplemental table, and as such, identifying and building a team of relevant process experts, stakeholders, and champions for improvement support successful implementation of QI in any clinical setting.[29]

Unexpected challenges occurred at several sites, which may have impacted intervention effectiveness and outcomes. First, a best practice alert for referral of patients with OC was added to the medical record system at Site B, separate from site team involvement and BQIDP interventions, which may have impacted referral rates. Additionally, challenges related to lower-than-expected patient engagement occurred at site A (informational poster and URL) and site B (information flier), and oncology provider staffing changes disrupting tumor board meetings at sites B and E. Site E's loss of gynecologic oncology clinical services shortly after the start of BQIDP activities impacted interventions, but also shifted the focus of QI interventions to patients with TNBC, whose rates of referral, GC, and GT were high pre-BQIDP, which reduced the opportunity for improvement. Figure 1 shows a reduction in the rates of referral (98.4% to 95.6%) and GT (93.8% to 85.3%) for patients with TNBC at site D, however these differences were not statistically significant, remained above 80%, and continued to exceed post-BQIDP rates for patients with OC at site D. Decreased rates of GT completion among patients with TNBC at site D may reflect the focus of site QI interventions on patients with OC, patients with TNBC deferring or declining GT, or other factors not identified during the course of the BQIDP. As reported previously, some sites experienced more staffing changes during the BQIDP than others, which may have introduced additional barriers to QI intervention implementation.[30]

Other events beyond the control of the BQIDP may have impacted outcomes, such as the COVID-19 pandemic, which began during the final year of BQIDP activities, changed clinical processes and service delivery models, and resulted in several sites adapting interventions. The flexibility to adjust and adapt interventions as a function of QI methods supported the continued efforts at all sites despite these unexpected challenges. Intervention effectiveness can vary by implementation environment and adaptations, an experience not unique to that of the BQIDP; however, evaluation of interventions applied in different clinical settings adds to the growing evidence base and is relevant to future improvement efforts.

One limitation of this study was that the LS performed data analysis without direct access to participating sites' medical records, although the risk of missing or inaccurate data was minimized by preliminary data review and updates from the participating sites, as described in the Methods. As included in the Methods, eligible patients were retrospectively identified from each site's cancer registry, as this was an accurate and complete data source present at all participating sites; however, due to time required for registries to collect new cases and confirm diagnosis information, data is not typically available in real-time. Some sites identified approaches to semi-prospectively identify new patients (i.e., "OC case finding" interventions at sites A and C), however retrospective data collection was the most pragmatic and accessible approach, allowing full participation across sites and consistent data collection approaches for the BQIDP. Delays in identifying newly diagnosed OC and TNBC patients for inclusion in QI interventions may have resulted from retrospective data collection processes. Additionally, participating site's electronic medical records were used as the source of information regarding patient referral, GC, and GT however these records may not include or show care received by patients at outside hospitals. Patient demographic information was limited to the data needed to determine BQIDP inclusion and QI outcomes, and therefore, patient race, ethnicity, health insurance status, and other potentially relevant factors were not available. Investigating associations between BQIDP patient demographic and socioeconomic factors and their receipt of referral, GC, and GT may be an opportunity for future research by the participating sites. Additionally, sites may consider future research to evaluate GT ordering patterns when various healthcare providers are involved in coordination of testing for patients. There were also limitations associated with the use of the pathology report date as the patient's "diagnosis date," as patients were excluded when they were without a pathology-based diagnosis, and when oncology care was initiated within the BQIDP period, but the pathology report occurred later. Intervention data from BQIDP meeting notes occasionally reflected different patient numbers than REDCap data (Supplemental Table), in part due to potential underreporting of patient inclusion in interventions in REDCap, and overinclusion of patients in interventions. For example, site E's "BCBS" intervention included patients with breast cancer, not only TNBC. The risk of REDCap data entry discrepancies was minimized by all sites using a shared data input instruction guide and having access to the LS facilitator. Finally, pre-BQIDP rates may be overestimates due to inclusion of patients diagnosed near the end of the pre-BQIDP period who may have encountered BQIDP interventions during treatment, and due to "missed patient" interventions at sites A-D which intervened on the pre-BQIDP cohort; however,

impact of these interventions is likely minimal since a small number of patients were subsequently referred.

In conclusion, a multi-year, facilitated QI effort led by teams of genetic counselors across five non-academic, community-based health systems' oncology care centers improved patient receipt of guideline-recommended cancer genetics services. The BQIDP may serve as a template for similar efforts at integrated health systems and exemplifies how existing partnerships can be leveraged to improve delivery of genetics services. Application of the BQIDP approach in other settings may require additional resources to support data entry and rapid intervention assessment, particularly if there are larger patient volumes and/or rapid progression of disease. Future research should evaluate this QI approach in other clinical environments, such as clinics with fewer GC staff and resources, and in other patient populations.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Authors

Erica M. Bednar[1], Minxing Chen[1], Michael T. Walsh Jr[1], Amanda L. Eppolito[2], Molly H. Klein[2], Kelly Teed[2], Brittany Hodge[2], Jordan Hunter[2], Han Gill Chao[2], Dillon Davis[2], Wilshauna Serchion[2], Cara Yobbi[3], Rebekah Krukenberg[3], Sandra B. Jenkinson[3], Jennifer J. Moore[3], Cassandra Garcia[3], Fatimaeliza Gonzalez[3], Towanna Murray[3], Linda D. Nielsen[3], Brenda Ho[3], Megan Haas[3], Sarah B. Greenzweig[3], Abby Anderson[3], Christina Johnson[3], Nichole A. Morman[4], Elizabeth Bowdish[4], Emaline Wise[4], Julia N. Cooper[4], Pauline Kefalas Russ[4], Katelyn Tondo-Steele[4], Buonarotti F. de Gracia[4], Brooke Levin[5], Kristin Mattie[5], Kathryn Zarnawski[5], Molly Kalasinski[5], Jennifer Stone[5], Caitlin O'Brien[5], Alexa Bream[5], Aidan M. Kennedy[5], Rachel A. Paul[5], Michelle Bilbao[5], Maureen Romero[5], Rebecca L. Carr[6], Jennifer M. Siettmann[6], Anna K. Vercruyssen[6], Kaycee Leon[6], Banu K. Arun[1], Andrew V. Grainger[4], David P. Warshal[5], Erin Bowman[2], Timothy A. Goedde[3], Deepa Halaharvi[4], Kellie Rath[4], Generosa Grana[5], Lida Mina[6], Karen H. Lu[1]

Affiliations

[1]The University of Texas MD Anderson Cancer Center, Houston, TX

[2]Piedmont Oncology at Piedmont Healthcare, Atlanta, GA

[3]Community Health Network, Indianapolis, IN

[4]OhioHealth, Columbus, OH

[5]MD Anderson Cancer Center at Cooper University Health Care, Camden, NJ

[6]Banner MD Anderson Cancer Center, Gilbert, AZ

Acknowledgments:

We acknowledge generous philanthropic support from Pam and Wayne Garrison; program investment from Lyda Hill Philanthropies; and other donations to MD Anderson's Moon Shots Program in support of the Cancer Prevention and Control Platform. Minxing Chen is supported by the NIH/NCI award number P30CA016672 and used the Biostatistics Resource Group. Rachel Paul and Aidan Kennedy were supported by a 2018 Shari Widmayer Memorial Research Grant through the Teal Tea Foundation. We also acknowledge all MD Anderson staff and team members involved in the initial BQIDP design and environmental scan process; members of the MD Anderson Impact Evaluation Core; Gary Chisholm who provided REDCap support; MD Anderson Legal Services who supported the legal pathway for site collaboration; Dr. Lara Bashoura who provided guidance from the MD Anderson Quality Improvement Assessment Board; leadership of the MD Anderson Cancer Network; and all team members, clinic staff, patients, and supporters of the BQIDP effort at Piedmont Oncology, Community Health Network, OhioHealth, MD Anderson Cancer Center at Cooper University Health Care, and Banner MD Anderson Cancer Center. We thank Emily Seyl and Stephanie Deming, Research Medical Library, MD Anderson Cancer Center, for editing the manuscript.

Data availability statement

Data used in this manuscript are not in a data repository, and future use and accessing of deidentified data is limited to existing legal agreements between collaborating institutions. Individual inquiries regarding data sharing may be directed to the corresponding author.

References

1. The National Comprehensive Cancer Network. Genetic/Familial High-Risk Assessment: Colorectal. In. NCCN Clinical Practice Guidelines in Oncology (NCCN Guidelines). Vol version 1.2022. www.nccn.org: National Comprehensive Cancer Network, Inc.; 2022.
2. The National Comprehensive Cancer Network. Genetic/Familial High-Risk Assessment: Breast, Ovarian, and Pancreatic. In. NCCN Clinical Practice Guidelines in Oncology (NCCN Guidelines). Vol version 2.2022. www.nccn.org: National Comprehensive Cancer Network, Inc.; 2022.
3. Bednar EM, Nitecki R, Krause KJ, Rauh-Hain JA. Interventions to improve delivery of cancer genetics services in the United States: A scoping review. Genetics in medicine : official journal of the American College of Medical Genetics. 2022;24(6):1176–1186. [PubMed: 35389342]
4. Crowl A, Sharma A, Sorge L, Sorensen T. Accelerating quality improvement within your organization: Applying the Model for Improvement. J Am Pharm Assoc (2003). 2015;55(4):e364–374; quiz e375–366. [PubMed: 26163594]
5. Langley GJ, Moen RD, Nolan KM, Nolan TW, Norman CL, Provost LP. The improvement guide: A practical approach to enhancing organizational performance. 2 ed. San Francisco, CA: Jossey-Bass; 2009.
6. Bednar EM, Oakley HD, Sun CC, et al. A universal genetic testing initiative for patients with high-grade, non-mucinous epithelial ovarian cancer and the implications for cancer treatment. Gynecol Oncol. 2017;146(2):399–404. [PubMed: 28610746]
7. Bednar EM, Sun CC, Camacho B, et al. Disseminating universal genetic testing to a diverse, indigent patient population at a county hospital gynecologic oncology clinic. Gynecol Oncol. 2019;152(2):328–333. [PubMed: 30528888]
8. Norquist BM, Harrell MI, Brady MF, et al. Inherited Mutations in Women With Ovarian Carcinoma. JAMA oncology. 2016;2(4):482–490. [PubMed: 26720728]
9. Sharma P, Klemp JR, Kimler BF, et al. Germline BRCA mutation evaluation in a prospective triple-negative breast cancer registry: implications for hereditary breast and/or ovarian cancer syndrome testing. Breast Cancer Res Treat. 2014;145(3):707–714. [PubMed: 24807107]
10. Couch FJ, Hart SN, Sharma P, et al. Inherited mutations in 17 breast cancer susceptibility genes among a large triple-negative breast cancer cohort unselected for family history of breast cancer. J Clin Oncol. 2015;33(4):304–311. [PubMed: 25452441]
11. Emborgo TS, Saporito D, Muse KI, et al. Prospective Evaluation of Universal BRCA Testing for Women With Triple-Negative Breast Cancer. JNCI Cancer Spectr. 2020;4(2):pkaa002. [PubMed: 32211581]

12. NCCN Clinical Practice Guidelines in Oncology Genetic/Familial High-Risk Assessment: Breast and Ovarian. National Comprehensive Cancer Network,; 2007.
13. Network NCC. NCCN Clinical Practice Guidelines in Oncology (NCCN Guidelines) In. Genetic/Familial High-Risk Assessment: Breast and Ovarian. Vol Version 1.2011. www.nccn.org: National Comprehensive Cancer Network, Inc.; 2011.
14. Hinchcliff EM, Bednar EM, Lu KH, Rauh-Hain JA. Disparities in gynecologic cancer genetics evaluation. Gynecol Oncol. 2019;153(1):184–191. [PubMed: 30711300]
15. Barcenas CH, Shafaee MN, Sinha AK, et al. Genetic Counseling Referral Rates in Long-Term Survivors of Triple-Negative Breast Cancer. Journal of the National Comprehensive Cancer Network : JNCCN. 2018;16(5):518–524. [PubMed: 29752326]
16. Hildebrand JR, Vohra NA, Wong JH, Meyer A, Muzaffar M. Genetic counseling rates for high risk breast cancer patients in Eastern North Carolina. Journal of Clinical Oncology. 2015;33(15):e12504–e12504.
17. Bednar EM, Walsh MT Jr., Baker E, et al. Creation and Implementation of an Environmental Scan to Assess Cancer Genetics Services at Three Oncology Care Settings. Journal of genetic counseling. 2018.
18. Bednar EM, Harper B, Walsh MT, Jr., et al. Implementation and outcome evaluations of a multi-site improvement program in cancer genetics. Journal of genetic counseling. 2022.
19. Ogrinc G, Davies L, Goodman D, Batalden P, Davidoff F, Stevens D. SQUIRE 2.0 (Standards for QUality Improvement Reporting Excellence): revised publication guidelines from a detailed consensus process. BMJ Qual Saf. 2016;25(12):986–992.
20. Harris PA, Taylor R, Thielke R, Payne J, Gonzalez N, Conde JG. Research electronic data capture (REDCap)--a metadata-driven methodology and workflow process for providing translational research informatics support. J Biomed Inform. 2009;42(2):377–381. [PubMed: 18929686]
21. Hoffmann TC, Glasziou PP, Boutron I, et al. Better reporting of interventions: template for intervention description and replication (TIDieR) checklist and guide. BMJ. 2014;348:g1687. [PubMed: 24609605]
22. Stata Statistical Software [computer program]. Version Release 16. College Station, TX: StataCorp LLC.; 2019.
23. Foo T, George A, Banerjee S. PARP inhibitors in ovarian cancer: An overview of the practice-changing trials. Genes Chromosomes Cancer. 2021;60(5):385–397. [PubMed: 33382149]
24. Evans DG, Barwell J, Eccles DM, et al. The Angelina Jolie effect: how high celebrity profile can have a major impact on provision of cancer related services. Breast Cancer Res. 2014;16(5):442. [PubMed: 25510853]
25. Chase DM, Neighbors J, Perhanidis J, Monk BJ. Gastrointestinal symptoms and diagnosis preceding ovarian cancer diagnosis: Effects on treatment allocation and potential diagnostic delay. Gynecol Oncol. 2021;161(3):832–837. [PubMed: 33814195]
26. LYNPARZA TM approved by the US Food and Drug Administration for the treatment of advanced ovarian cancer in patients with germline BRCA-mutations [press release]. https://www.astrazeneca-us.com/media/press-releases/2014/lynparza-approved-by-the-us-fda-20141219.html#!: AstraZeneca, December 19, 2014 2014.
27. National Cancer Institute Staff. PARP Inhibitors Show Promise as Initial Treatment for Ovarian Cancer. In. Cancer Currents Blog. Vol 2022. cancer.gov: National Cancer Institute; 2019.
28. Uyar D, Neary J, Monroe A, Nugent M, Simpson P, Geurts JL. Implementation of a quality improvement project for universal genetic testing in women with ovarian cancer. Gynecol Oncol. 2018;149(3):565–569. [PubMed: 29653687]
29. Dixon-Woods M, McNicol S, Martin G. Ten challenges in improving quality in healthcare: lessons from the Health Foundation's programme evaluations and relevant literature. BMJ Qual Saf. 2012;21(10):876–884.
30. Bednar EM, Harper B, Walsh MT Jr., et al. Implementation and outcome evaluations of a multi-site improvement program in cancer genetics. Journal of genetic counseling. 2022;In Press.

Highlights

- A coordinated quality improvement initiative was completed in five community-based health system oncology care centers.
- Referral, genetic counseling, and genetic testing improved for patients with ovarian and triple-negative breast cancer.
- Average time to completion of genetic testing for patients with ovarian cancer significantly decreased at almost all sites.
- The most effective quality improvement interventions standardized genetic counseling referral and delivery processes.

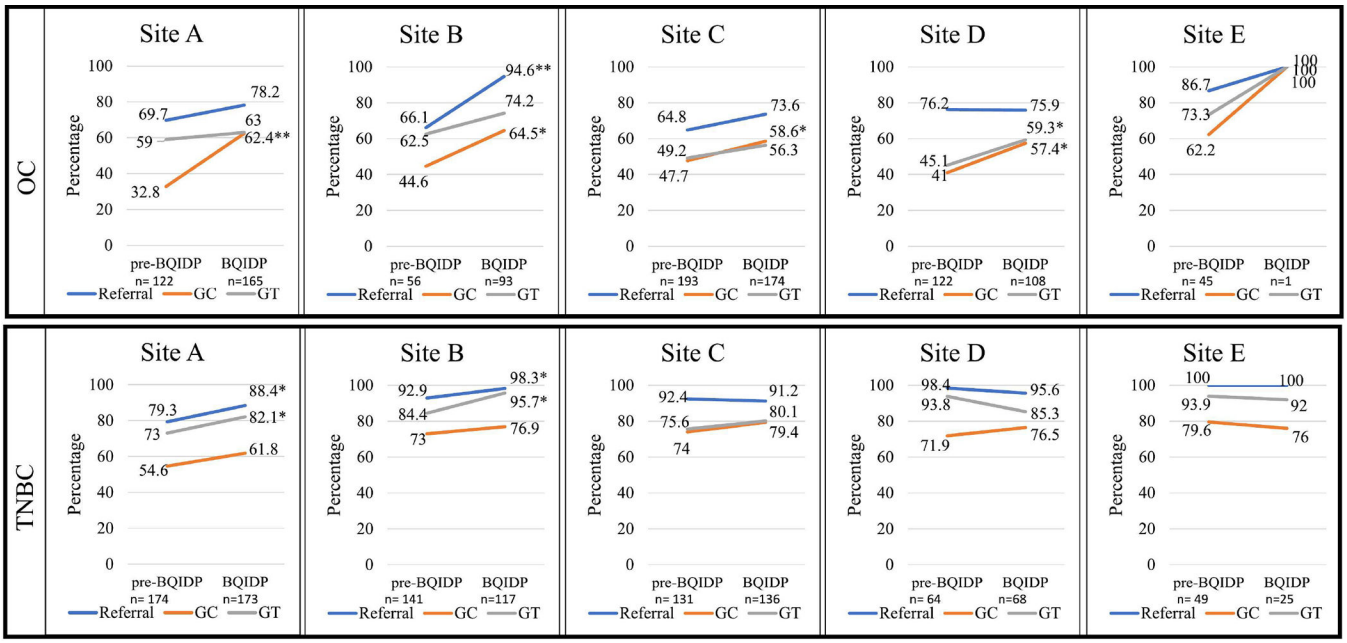


Figure 1.

Rates of referral, genetic counseling (GC), and genetic testing (GT). BQIDP, BRCA Quality Improvement Dissemination Program; OC, ovarian cancer; TNBC, triple-negative breast cancer. *=p<0.05, **=p<0.001

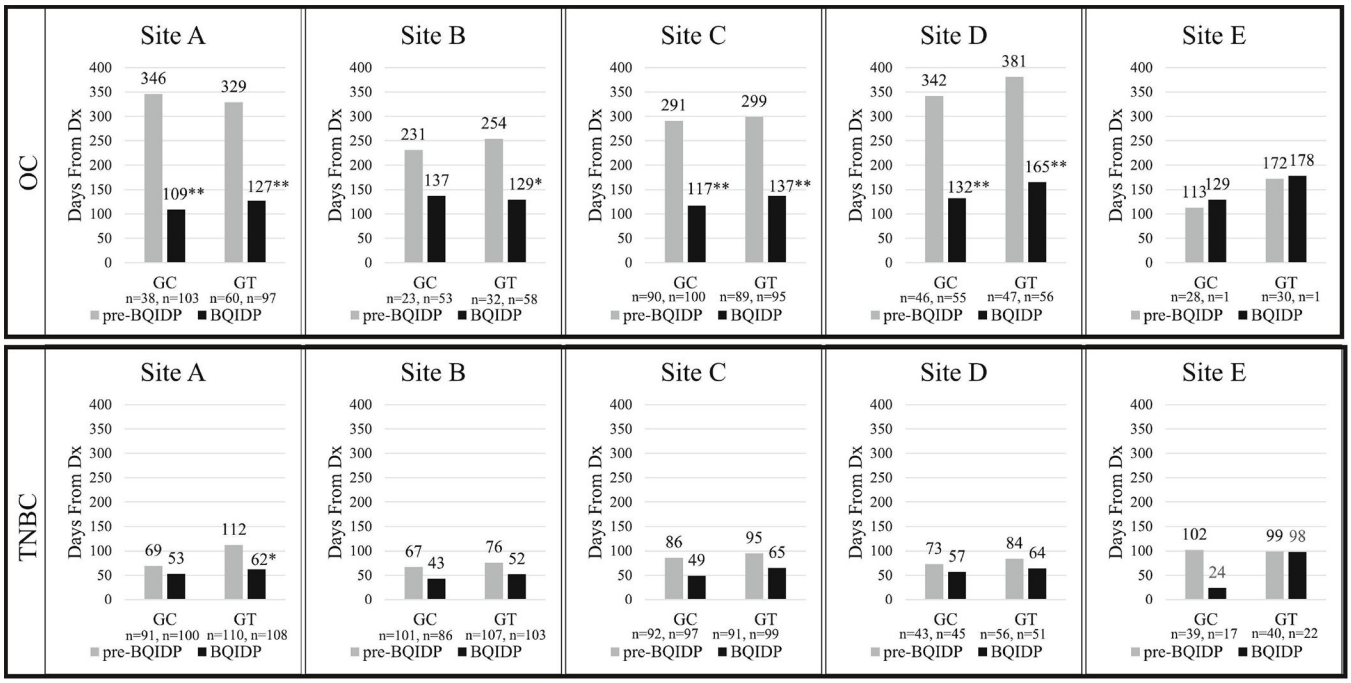
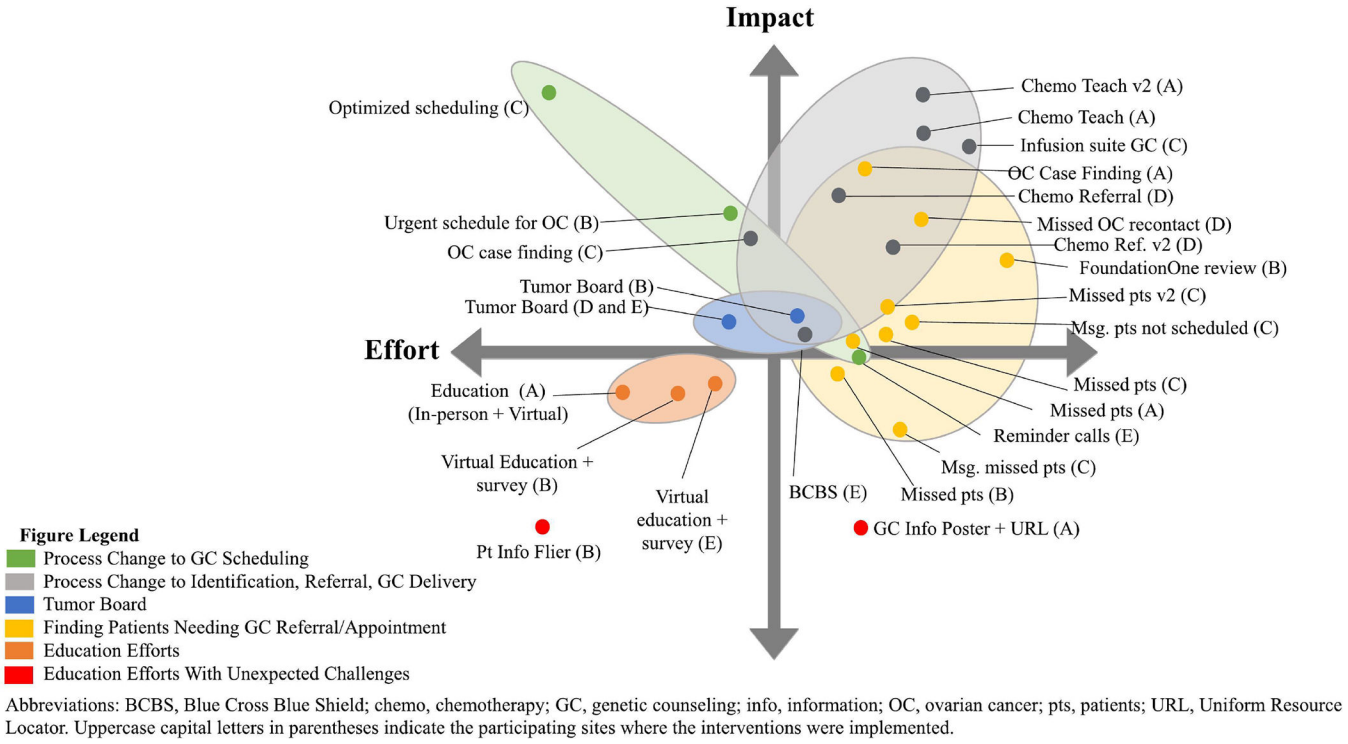


Figure 2.

Average time from diagnosis (dx) to genetic counseling (GC) and genetic testing (GT). BQIDP, BRCA Quality Improvement Dissemination Program; OC, ovarian cancer; TNBC, triple-negative breast cancer. *=p<0.05, **=p<0.001



Abbreviations: BCBS, Blue Cross Blue Shield; chemo, chemotherapy; GC, genetic counseling; info, information; OC, ovarian cancer; pts, patients; URL, Uniform Resource Locator. Uppercase capital letters in parentheses indicate the participating sites where the interventions were implemented.

Figure 3.

Intervention impact–effort diagram for participating sites. BCBS, Blue Cross Blue Shield; chemo, chemotherapy; GC, genetic counseling; info, information; OC, ovarian cancer; pts, patients; URL, Uniform Resource Locator. Uppercase capital letters in parentheses indicate the participating sites where the interventions were implemented.

Table 1:

Site and Patient Characteristics

	Site A	Site B	Site C	Site D	Site E
Participating Site Health System Characteristics					
Location (U.S. state)	Georgia	Indiana	Ohio	New Jersey	Arizona
Hospital beds (n) *	1028	1594	2504	635	177
Affiliated oncology clinics (n) *	4	5	7	3	4
Participating Site Team Members *					
No. of members	7	6	7	6	3
No. of genetic counselors	3	4	2	4	2
No. of physicians	3	1	4	1	1
BQIDP Timing					
Pre-BQIDP dates	1/1/2015–8/17/2017	1/1/2015–9/10/2017	1/1/2015–9/31/2017	1/1/2017–1/9/2019	1/1/2017–7/18/2019
BQIDP start date	8/18/2017	9/11/2017	10/1/2017	1/10/2019	7/19/2019
BQIDP end date	8/18/2020	9/11/2020	10/1/2020	12/31/2020	12/31/2020
BQIDP duration	3 years	3 years	3 years	2 years	1.5 years
Patient Characteristics					
Patients with OC (n)	287	149	367	230	46
Age at dx (mean, range), yr	64 (22–90)	63 (23–94)	64 (30–94)	64 (18–89)	68 (40–89)
Histology					
Serous (n, %)	176, 61.3%	86, 57.7%	262, 71.4%	145, 63.0%	38, 82.6%
Endometrioid (n, %)	27, 9.4%	19, 12.8%	38, 10.4%	24, 10.4%	3, 6.5%
Clear cell (n, %)	16, 5.6%	5, 3.3%	29, 7.9%	13, 5.7%	3, 6.5%
Adenocarcinoma / carcinoma (n, %)	60, 20.9%	28, 18.8%	16, 4.3%	13, 5.7%	2, 4.3%
Other(n,%)	8, 2.8%	11, 7.4%	22, 6.0%	35, 15.2%	0, 0.0%
Patients with TNBC (n)	347	258	267	132	74
Age at dx (mean, range), yr	48 (24–60)	48 (23–60)	48 (26–60)	50 (27–60)	48 (26–60)
Histology					
Invasive ductal (n, %)	302, 87.0%	242, 93.8%	256, 95.9%	110, 83.3%	73, 98.6%
Invasive lobular (n, %)	4, 1.2%	1, 0.4%	1, 0.4%	0, 0.0%	1, 1.4%
Invasive mammary (n, %)	11, 3.2%	1, 0.4%	0, 0.0%	5, 3.8%	0, 0.0%
Other(n,%)	30, 8.6%	14, 5.4%	10, 3.7%	17, 12.9%	0, 0.0%

* As reported at BQIDP start date.

Abbreviations: BQIDP, BRCA Quality Improvement Dissemination Program; dx, diagnosis; OC, ovarian cancer; TNBC; triple-negative breast cancer.

Table 2:

Overview of Interventions

Intervention Focus/Approach	Intervention Name(s)	What was included	Sites
Finding Patients Needing GC Referral or GC Appointment	Missed Patients	Review prior patients, message sent to oncology providers to request referral if none previously entered.	A, B, C
	OC case finding *	New OC patients identified, message to provider if referral to GC is needed.	A
	Foundation One *	Review of patients' records as prompted by Foundation One somatic genetic reports, message to provider if referral to GC is needed.	B
	Missed Patients v2	Review prior patients, adjust provider communication process.	C
	Message Missed Patients	Prior patients not referred were contacted and offered GC appointment.	C
	Message Patients not Scheduled	Prior patients referred but without GC appointment were contacted and offered GC appointment.	C
	Missed OC Recontact	Prior patients not referred were contacted and offered GC appointment.	D
Process Changes to Patient Identification, Referral, and GC Delivery	Chemo Teach and Chemo Teach v2 *	Create process with clinical team for patient identification, referral, and GC scheduling based on initiation of treatment or postsurgery appointments.	A
	Infusion GC *	Patients offered and provided GC while in chemo infusion suite.	C
	OC case finding *	New OC patients identified, auto-referral made if provider did not enter referral in two weeks.	C
	Chemo referral and Chemo referral v2 *	Create process with clinical team for patient identification, referral, and GC scheduling based on post-op and adjuvant chemo appointments.	D
	BCBS *	Create process to offer patients with BCBS insurance alternate GC referral and scheduling option.	E
Process Changes to GC Scheduling	Optimized Scheduling *	Removal of paperwork requirement from GC scheduling process.	C
	Urgent scheduling for OC *	Patients referred with OC were scheduled as "urgent" requests.	B
	Reminder calls	Patients scheduled for GC were called to remind them of upcoming appointment.	E
Tumor Board	Tumor board	Genetic counselor(s) attend tumor board meeting, supports patient identification and referral for GC and/or GT.	B, D *, E
Education	In-person Education	Providers attend in-person education event regarding GC referral indications.	A
	Virtual Education	Providers received brief education using online survey platform with included assessment questions.	A, B, E
	Patient Information Poster and URL	Patients in waiting room saw poster with information about GC, website link.	A
	Patient Information Flyer	Patients provided with information about GC in their new patient packet.	B

* Indicates an intervention that was maintained after conclusion of BQIDP activities. Abbreviations: GC, genetic counseling; GT, genetic testing; OC, ovarian cancer; Chemo, chemotherapy; v2, version 2; BCBS, Blue Cross Blue Shield;