

Lean Practices for Resource Use, Timeliness, and Coordination of Care in Breast Cancer Navigation

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BACKGROUND: Cancer care is described as insufficiently patient-centered, requiring improved accessibility and coordination. Breast oncology nurse navigators may help provide timely patient care by improving care coordination.

OBJECTIVES: This study evaluated a breast cancer navigation (BCN) program in a large ambulatory healthcare system. It examined measures related to quality and value, including timely service delivery, appropriate use of resources, and care coordination.

METHODS: Using Lean methods, a BCN program focused on women receiving a breast biopsy was developed at a pilot site and later implemented throughout the healthcare system. Study data evaluated timely disclosure of biopsy results, prompt scheduling of initial consultations, outpatient use of cancer specialists, and coordination between primary care and oncology practices.

FINDINGS: After implementing the BCN program, more timely biopsy results were delivered to patients. Patients were more likely to complete an initial consultation within two weeks of biopsy and made fewer outpatient visits. Referrals to cancer specialists within a month of biopsy increased, and primary care encounters with patients decreased.

KEYWORDS

nurse navigation; care coordination; Lean quality improvement; breast cancer

DIGITAL OBJECT IDENTIFIER

10.1188/22.CJON.503-509

CANCER CARE CAN BE DESCRIBED AS A SYSTEM in crisis because of secular trends, rising costs, and persistent challenges in delivering high-quality, high-value care (Institute of Medicine, 2001). Cancer care can lack a patient-centered focus, which requires improved accessibility and coordination (National Cancer Policy Forum, 2013). Patient-centered care is defined as care that respects and responds to individual patient needs, values, and preferences, ensuring that the patient's values guide clinical decisions (Institute of Medicine, 2001). Health systems can address inadequate staffing, increase patient coordination, and measure clinical outcomes, which can build incentives and efficiencies to improve patient-centered cancer care delivery. These improvements require healthcare providers to systematically organize and execute complex workflows ranging from cancer screening and treatment to patient follow-up.

First developed at Toyota in the 1980s (Ohno, 1988; Shingo, 2008), Lean management, or Lean, involves a set of principles, practices, and tools to assess and redesign work processes for quality improvement. When applied to a healthcare setting, Lean aims to create a culture of continuous improvement while standardizing best practices to address healthcare-specific challenges, including rising costs, concerns about patient safety and care quality, and wasted time and resources (Womack & Jones, 2003). A key principle of Lean is maximizing value while minimizing waste. Value in health care is defined as anything that achieves desired outcomes for patients, such as increasing access to care and expediting service delivery. Waste is defined as anything that does not provide value to patients, such as long wait times for appointments, delays in time from door to diagnostic evaluation or treatment, failure to receive follow-up care, or dissatisfaction with care received (Tlapa et al., 2020).

Only a few studies to date have examined the use of Lean in oncology (Duncan et al., 2021). One area that remains unexplored is the use of Lean workflow redesigns to support care navigation. Navigation for patients with cancer has been shown to improve access to services, disease management, and care experiences, while reducing health disparities (Bush et al., 2018; McKeivitt et al., 2018). Nurses or lay navigators can manage care provided by multiple clinicians and cancer care specialists. For complex illnesses such as breast cancer, coordinated care relies on highly standardized work processes to enhance the effectiveness of treatment and increase survival rates (Riley & Riley, 2016; Rocque et al., 2017). The purpose of this study was to evaluate the quality and value of care in a breast cancer navigation (BCN) program, measuring timely delivery of services and appropriate use of medical resources.

Methods

Program Setting and Design

This study examined a BCN program in an ambulatory health-care system serving nearly one million patients in Northern California. The program was launched in one pilot site before being expanded to three geographic regions of the system. The BCN program focused on early care for women diagnosed with breast cancer using Lean methods such as A3 thinking, which require quality improvement strategies to be summarized on a single sheet of A3-sized paper (Shook, 2008). Other Lean methods used to design the BCN program included value stream mapping, a technique used to compare current and ideal work processes (Rother & Shook, 1998) by visually mapping pathways between all clinicians, settings, and resources needed to provide a cancer diagnosis and follow-up care. Lean methods helped to identify opportunities to improve patient care, particularly in the days and weeks following a breast biopsy. Identified needs were more centralized, timely disclosures of biopsy results; less time from the communication of a positive biopsy result to initial consultation with a cancer specialist; and ongoing follow-up and coordination of care.

The BCN program featured a breast oncology nurse navigator (BONN) as the primary point of contact for women receiving a breast biopsy. Standardized workflows were developed for BONNs to guide patients from biopsy to initial consultation and treatment. For women with positive biopsy results, the BONN provided brief education, outlined the next steps in care, scheduled consultations and follow-up appointments with cancer specialists, and provided additional support as needed. To avoid the distress some women report experiencing when receiving a positive breast cancer diagnosis via an unexpected telephone call (Cantril et al., 2019), the BONN's default workflow revolved around an in-person appointment scheduled in advance of the biopsy. If the biopsy result was positive, the BONN would confirm the upcoming appointment, where the result would then be delivered to the patient in person. If the biopsy result was negative, the BONN would call the patient to deliver this result and cancel the appointment.

Study Design and Measures

This study of a BCN program was approved by the organization's institutional review board. Because of the phased approach to implementation, the study used a multiple baseline design, which allows for multiple start points and sites of intervention (Sanson-Fisher et al., 2014). The organization's electronic health record (EHR) system provided longitudinal data to examine changes in timeliness of care, specialist resource use, and coordination between primary care providers (PCPs) and cancer specialists. Timeliness of care was defined as (a) disclosure of the biopsy result, measured in days from the biopsy service date to the patient's first encounter with the BONN, or the ordering physician or the radiologist in the case of data gathered before

“Breast cancer navigation programs can leverage nurse navigators to create value for patients.”

the implementation of the BCN program; and (b) whether initial consultation with an oncologist or breast surgeon occurred within two weeks or within one month of a positive biopsy.

Based on care patterns in the health system, specialist resource use was measured as the average number of office visits made to an oncologist or breast cancer surgeon within seven weeks as well as within three months by a patient following a positive biopsy result. Indicators of appropriate care coordination and transition were measured as the average number of referrals made by PCPs to oncologists or surgeons within one, three, and six months of a positive biopsy result. Ongoing PCP workload involving newly diagnosed patients was also measured according to the number of patient encounters with PCPs and BONNs (e.g., office visits, phone calls, electronic messages) within one, three, and six months of the biopsy before and after the implementation of the BCN.

Study Period

All EHR-derived measures were extracted between July 1, 2015, and July 31, 2019. After the BCN program was implemented at the pilot site, it was expanded to additional regions of the healthcare system over the next two years. At the pilot site, there were 1.5 years of baseline data (preimplementation) and three years of BCN data (postimplementation). Among sites in the remaining regions of the health system, there was a maximum of 3.5 years of baseline data and minimum of nine months of BCN data.

Study Cohorts and Data Analysis

All women who underwent breast biopsies during the study period were identified using Current Procedural Terminology service codes 19081–19086 as documented in the EHR. The date of the breast biopsy procedure and PCP location were used to categorize each patient into one of the three regions of the healthcare system where the BCN program had been implemented. Patients were then categorized into pre- or postimplementation study cohorts based on biopsy service dates. Women with a preexisting diagnosis of breast cancer prior to the study period were excluded from analysis. Descriptive analyses summarized the study variables, including patient demographic and clinical features, such as

race and ethnicity, marital status, language spoken, and Charlson Comorbidity Index score, a weighted index predicting risk of death within one year of hospitalization for patients with certain

comorbid conditions. Differences between pre- and postimplantation cohorts were then compared using independent sample t tests for continuous variables and chi-square tests for categorical

TABLE 1.
SAMPLE CHARACTERISTICS (N = 3,058)

CHARACTERISTIC	POSITIVE BIOPSY					NEGATIVE BIOPSY				
	PRE (N = 843)		POST (N = 536)		p	PRE (N = 1,229)		POST (N = 450)		p
	\bar{X}	SD	\bar{X}	SD		\bar{X}	SD	\bar{X}	SD	
Age (years)	58.1	12.8	59	13	0.2	48.2	11.9	50.1	11.3	0.003
CCI score	1.42	1.82	1.97	1.87	0.001	0.3	0.8	0.32	0.87	0.97
CHARACTERISTIC	n	%	n	%	p	n	%	n	%	p
Race and ethnicity	–	–	–	–	0.22	–	–	–	–	0.96
Asian	279	33	149	28	–	481	39	174	39	–
Black	20	2	11	2	–	21	2	10	2	–
Hispanic	45	5	26	5	–	116	9	39	9	–
White	398	47	291	54	–	408	33	154	34	–
No data collected	103	12	59	11	–	203	17	73	16	–
Marital status	–	–	–	–	0.001	–	–	–	–	0.28
Married	528	63	393	73	–	804	65	288	64	–
Single	117	14	55	10	–	169	14	72	16	–
Divorced	52	6	28	5	–	31	3	18	4	–
No data collected	146	17	60	11	–	225	18	72	16	–
Language spoken	–	–	–	–	0.28	–	–	–	–	0.28
English	782	93	506	94	–	1,070	87	406	90	–
Spanish	4	1	4	1	–	24	2	6	1	–
No data collected	57	7	26	5	–	135	11	38	8	–
CCI score										
0	372	44	141	26	–	992	81	360	80	–
1	82	10	30	6	–	165	13	61	14	–
2	260	31	254	47	–	49	4	20	4	–
3	66	8	54	10	–	10	1	3	1	–
4 or greater	63	7	57	11	–	13	1	6	1	–

CCI—Charlson Comorbidity Index; pre—preimplantation; post—postimplantation

Note. The CCI is designed to predict risk of death within one year of hospitalization with comorbid conditions. Scores range from 0 to 37, with higher mean scores indicating higher risk of death.

Note. Because of rounding, percentages may not total 100.

variables. Changes in study measures within each phase of BCN implementation were examined and aggregated to the system level.

Results

Table 1 presents characteristics of participants in this study (N = 3,058). Postimplementation, patients who received negative biopsy results were slightly older, were more likely to be married, and had more comorbidities than those with positive biopsy results (p < 0.01). Table 2 shows that after implementation of the BCN program, there was an increase in timely communication with all patients and a shorter time to initiation of care for those with positive biopsy results. Patients received negative biopsy test results an average of 3.1 days sooner (2.4 days versus 5.6 days) and positive test results an average of 1.3 days sooner (3.4 days versus 4.7 days) (p < 0.0001).

Among women with positive biopsy results for breast cancer (N = 1,379), there was more timely completion of an initial consultation after the biopsy service date. Before BCN program implementation, the rate of patients completing an initial consultation within two weeks of positive biopsy results was 86.7%. Postimplementation, the rate was 89.2%. This shows a statistically significant improvement (p < 0.05). The rate of initial consultation within one month of positive biopsy results was 93.6% preimplementation and 96.5% postimplementation, which was not statistically significant.

Resource use was defined and measured as the total number of office visits that patients had with a cancer specialist within seven weeks or within three months of a positive diagnosis of breast cancer. Patient visits to breast cancer surgeons within seven weeks of diagnosis decreased from an average of 2.5 visits to an average of 2.3 visits postimplementation (p < 0.01). Patient visits to oncologists within seven weeks remained similar to preimplementation patterns. Patient visits to specialists within three

months, particularly to breast cancer surgeons, also decreased postimplementation (p < 0.01) (see Table 3).

Table 4 shows results of care coordination and efficient transitioning of newly diagnosed patients from primary care to oncology. Measures were referrals from PCPs to cancer specialists and PCP workload as indicated by encounters with patients with newly diagnosed breast cancer. Encounters between BONNs and patients were also assessed postimplementation. Less than one month after positive biopsy results, the average number of patient referrals from PCPs to cancer specialists increased from 91.1% preimplementation to 98.7% postimplementation (p < 0.05). Patient referral rates within three months of positive biopsy results increased from 94.8% preimplementation to 99.3% postimplementation (p < 0.05). Within six months of positive biopsy results, referrals increased from 95.3% preimplementation to 99.3% postimplementation (p < 0.05).

PCP workload was examined within one, three, and six months of positive breast cancer biopsy results. Workload was measured using patient encounter data such as office visits, emails, and phone calls as documented in the EHR. Postimplementation, PCPs experienced significantly fewer encounters with newly diagnosed patients. Within one month of biopsy, 80.4% of patients continued to interact with their PCP, compared with 94.8% preimplementation (p < 0.05). Among patients who interacted with their PCP within one month of biopsy, the average number of PCP encounters was 2.4 postimplementation compared with 3.4 before the BCN was implemented (p < 0.05). As the number of patient interactions with PCPs decreased, patient interaction with BONNs was high, with 93.1% of patients averaging 3.1 encounters with the navigator less than a month after biopsy. Within three and six months of biopsy, the number of patient encounters with PCPs continued to decrease, and the number of encounters with BONNs continued to increase.

TABLE 2.
TIMELINESS OF CARE (N = 3,058)

TIMELINESS MEASUREMENT	POSITIVE BIOPSY					NEGATIVE BIOPSY				
	PRE (N = 843)		POST (N = 536)		p	PRE (N = 1,229)		POST (N = 450)		p
	\bar{X}	SD	\bar{X}	SD		\bar{X}	SD	\bar{X}	SD	
Results disclosure (days from biopsy)	4.7	4.6	3.4	1.9	< 0.001	5.6	5.7	2.4	1.5	< 0.001
TIMELINESS MEASUREMENT	n	%	n	%	p					
First consultation in less than 2 weeks	731	87	478	89	0.04	–	–	–	–	–
First consultation in less than 1 month	789	94	517	96	0.22	–	–	–	–	–

pre—preimplementation; post—postimplementation
Note. Consultation was with an oncologist or a breast surgeon.
Note. Visits and appointments were measured as time since positive biopsy.

TABLE 3.
OUTPATIENT SPECIALIST RESOURCE USE (N = 1,379)

SPECIALIST VISITS	PREIMPLEMENTATION (N = 843)				POSTIMPLEMENTATION (N = 536)					
	CANCER SURGEON		ONCOLOGIST		CANCER SURGEON			ONCOLOGIST		
	\bar{X}	SD	\bar{X}	SD	\bar{X}	SD	p	\bar{X}	SD	p
Visits within 7 weeks	2.5	1.4	1.6	0.7	2.3	1.1	0.01	1.5	0.6	0.54
Visits within 3 months	3.4	2	1.5	0.6	3.1	1.6	0.007	2.4	1.1	0.37
SPECIALIST VISITS	n	%	n	%	n	%		n	%	
Appointment made within 7 weeks	783	93	653	77	514	96	–	477	89	–
Appointment made within 3 months	786	93	727	86	515	96	–	489	91	–

Note. Visits and appointments were measured as time since positive biopsy.

Discussion

This study of a BCN program examined timeliness of care delivery, specialist resource use, and coordination between primary care and cancer specialists. Study results confirm that the BCN program created value by using BONNs to improve patient communication, access to services, and appropriate transition to cancer care. By taking an active role to support patients, BONNs also reduced office visits to cancer surgeons and offset PCP workloads involving newly diagnosed patients. This study's findings about the effectiveness of a BCN program are consistent with other studies that examined nurse navigator-involved improvement in patient care from diagnosis to treatment (Basu et al., 2013; Gordils-Perez et al., 2017; Koh et al., 2011).

An objective of this BCN program was to enable timely communication of biopsy results to patients. Previous studies on cancer navigation have focused on time to treatment rather than on timely communication with patients (Bernardo et al., 2019; Bush et al., 2018; Gordils-Perez et al., 2017; McKeivitt et al., 2018). Results from this study confirmed significant improvements in disclosure of biopsy results, with the largest reduction in time to convey negative results. Prior to implementing the BCN program, the ordering physician or radiologist relayed biopsy results during a quick phone call to the patient. After implementing the BCN program, BONNs delivered positive biopsy results during an in-person appointment, which resulted in a more modest improvement in timely disclosure of positive results. This followed best practices around providing positive biopsy results in person to mitigate patient distress (Cantril et al., 2019).

Timely disclosure of biopsy results is critical to patients' ability to access and receive potentially lifesaving treatment. After implementing the BCN program, BONNs were responsible not only for conveying test results, but also for scheduling initial consultations. Previous studies evaluating cancer navigation programs suggest

mixed results for timely consultation, although these studies were based on limited data with small numbers of patients and relatively short follow-up periods (Basu et al., 2013; Gordils-Perez et al., 2017; Koh et al., 2011; McKeivitt et al., 2018). This study contains data on several thousand patients from multiple sites over an average two years of BCN program implementation at each site. Building on mixed results from previous studies, this study's results reported significant increased timeliness to initial consultations, particularly within two weeks of positive biopsy results.

Previous studies on cancer navigation have focused on inpatient resource use (Colligan et al., 2017; Rocque et al., 2017, 2018). This study contributes to knowledge about use of outpatient resources such as time spent with cancer specialists in office visits. After implementing the BCN program, there was a significant decrease in number of patient visits to breast cancer surgeons. This decrease may be the result of BONNs' following up with patients to provide support, reducing the need for patients to be scheduled for additional surgical consultation appointments to address routine questions about care.

According to recommendations for breast cancer treatment, timely transition from primary care to oncology is an appropriate next step after a cancer diagnosis (Lisy et al., 2021). BONNs can facilitate referrals to cancer specialists while assuming a more supportive role in patient care. Examples include answering patient questions, coordinating visits, and following up on care plans (Agarwal et al., 2020; Dossett et al., 2017). After implementing the BCN program, PCP referrals to cancer specialists increased, with corresponding decreases in PCP encounters with newly diagnosed patients. As interactions between patients and PCPs decreased, patient interactions with BONNs were comparable to patterns observed in PCP-patient interactions prior to program implementation. Thus, BONNs may have also reduced PCP workloads by supporting patients and referring them to cancer specialists.

Taken together with a related study showing high satisfaction with a BCN program among both physicians and patients (Dillon et al., 2021), this study’s findings suggest that navigators can assist all stakeholders in the early stages of cancer care.

Limitations

One study limitation was the lack of comparison groups, which could have enabled the study to better evaluate outcomes attributed to BONN involvement. However, with this limitation in mind, the health system’s planned rollout of the BCN program at different start times and in different locations may have allowed for a study design that accounted for confounding factors such as secular trends and site-specific features. Other limitations were lack of adjustment for differences in patient or provider characteristics, and findings based on patients that represent local, but not national, patient populations. In addition, this study did not collect socioeconomic information, level of education, or insurance type to determine whether certain demographic groups may benefit more from BCN intervention. A final limitation was that this study did not include telehealth as a mode for delivering cancer care. This study collected data prior to the COVID-19 pandemic, which has affected nurse navigator workflows with the addition of telehealth as a standard mode for delivering cancer care.

Implications for Nursing

This study suggests that BCN programs can play a key role in delivering patient-centered cancer care. BCN programs can leverage nurse navigators to create value for patients by decreasing wait times for test results and initial consultations. BCN programs

IMPLICATIONS FOR PRACTICE

- Create value for patients and physicians through a breast cancer navigation program with a breast oncology nurse navigator (BONN) as a primary point of contact to support timely, coordinated cancer care.
- Improve patient care coordination by having BONNs communicate with patients and facilitate access to care, including providing timely disclosure of biopsy results and scheduling initial consultations.
- Transition cancer-related responsibilities from primary care providers to cancer specialists to ensure appropriate care while also reducing primary care workload.

also create value for physicians by better coordinating resources and improving care transitions. Nurses can examine the cost-effectiveness and return on investment of BCN programs. BCN programs that support earlier consultations and timely treatment, particularly for newly diagnosed patients, may provide financial benefits, improved patient satisfaction, and positive clinical outcomes (i.e., timely, efficient, and personalized care delivery).

Conclusion

Results from this study of a BCN program confirmed that the BONN role can add quality and value to cancer care delivery, including timely service delivery, appropriate use of resources, and care coordination between PCPs and cancer care specialists. Among the features of an effective BCN program are timely disclosure of biopsy results, prompt scheduling of initial consultations, expedited outpatient referrals to cancer specialists, and clinical coordination between primary care and oncology practices. As this study’s results indicate, BCN programs can improve patient-centered care, improving accessibility and care coordination for newly diagnosed patients with breast cancer.

TABLE 4. PRIMARY CARE–ONCOLOGY COORDINATION AND TRANSITION OF CARE (N = 1,379)

CARE COORDINATION	PREIMPLEMENTATION (N = 843)				POSTIMPLEMENTATION (N = 536)					
	REFERRAL TO SPECIALIST		INTERACTION WITH PCP		REFERRAL TO SPECIALIST		INTERACTION WITH PCP		INTERACTION WITH BONN	
	\bar{X}	SD	\bar{X}	SD	\bar{X}	SD	\bar{X}	SD	\bar{X}	SD
Encounters in 1 month	–	–	3.4	2.6	–	–	2.4	2.4	3.1	2.2
Encounters in 3 months	–	–	5.2	4.2	–	–	3.9	4.2	4.4	3.6
Encounters in 6 months	–	–	7.3	6.1	–	–	5.6	6.2	4.8	4.2
CARE COORDINATION	n	%	n	%	n	%	n	%	n	%
Occurred within 1 month	768	91	799	95	529	99	432	81	501	93
Occurred within 3 months	799	95	819	97	532	99	477	89	511	95
Occurred within 6 months	803	95	824	98	532	99	500	93	512	96

BONN—breast oncology nurse navigator; PCP—primary care provider
 Note. Encounters and interactions were measured as time since positive biopsy.

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The authors take full responsibility for this content and did not receive honoraria or disclose any relevant financial relationships. The article has been reviewed by independent peer reviewers to ensure that it is objective and free from bias.

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