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Reexamining Time From Breast Cancer Diagnosis to Primary Breast Surgery

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Invited Commentary

Supplemental content

IMPORTANCE Although longer times from breast cancer diagnosis to primary surgery have been associated with worse survival outcomes, the specific time point after which it is disadvantageous to have surgery is unknown. Identifying an acceptable time to surgery would help inform patients, clinicians, and the health care system.

OBJECTIVE To examine the association between time from breast cancer diagnosis to surgery (in weeks) and overall survival and to describe factors associated with surgical delay. The hypothesis that there is an association between time to surgery and overall survival was tested.

DESIGN, SETTING, AND PARTICIPANTS This was a case series study that used National Cancer Database (NCDB) data from female individuals diagnosed with breast cancer from 2010 to 2014 (with 5-year follow-up to 2019). The NCDB uses hospital registry data from greater than 1500 Commission on Cancer–accredited facilities, accounting for 70% of all cancers diagnosed in the US. Included participants were females 18 years or older with stage I to III ductal or lobular breast cancer who underwent surgery as the first course of treatment. Patients with prior breast cancer, missing receptor information, neoadjuvant or experimental therapy, or who were diagnosed with breast cancer on the date of their primary surgery were excluded. Multivariable Cox regression was used to evaluate factors associated with overall survival. Patients were censored at death or last follow-up. Covariates included age and tumor characteristics. Multinomial regression was performed to identify factors associated with longer time to surgery, using surgery 30 days or less from diagnosis as the reference group. Data were analyzed from March 15 to July 7, 2022.

EXPOSURES Time to receipt of primary breast surgery.

MEASURES The primary outcome measure was overall survival.

RESULTS The final cohort included 373 334 patients (median [IQR] age, 61 [51-70] years). On multivariable Cox regression analysis, time to surgery 9 weeks (57-63 days) or later after diagnosis was associated with worse overall survival (hazard ratio, 1.15; 95% CI, 1.08-1.23; $P < .001$) compared with surgery between 0 to 4 weeks (1-28 days). By multinomial regression, factors associated with longer times to surgery (using surgery 1-30 days from diagnosis as a reference) included the following: (1) younger age, eg, the adjusted odds ratio (OR) for patients 45 years or younger undergoing surgery 31 to 60 days from diagnosis was 1.32 (95% CI, 1.28-1.38); 61 to 74 days, 1.64 (95% CI, 1.52-1.78); and greater than 74 days, 1.58 (95% CI, 1.46-1.71); (2) uninsured or Medicaid status, eg, the adjusted OR for patients with Medicaid undergoing surgery 31 to 60 days from diagnosis was 1.35 (95% CI, 1.30-1.39); 61 to 74 days, 2.13 (95% CI, 2.01-2.26); and greater than 74 days, 3.42 (95% CI, 3.25-3.61); and (3) lower neighborhood household income, eg, the adjusted OR for patients with household income less than $38,000 undergoing surgery 31 to 60 days from diagnosis was 1.35 (95% CI, 1.02-1.07); 61 to 74 days, 1.21 (95% CI, 1.15-1.27); and greater than 74 days, 1.53 (95% CI, 1.46-1.61).

CONCLUSIONS AND RELEVANCE Findings of this case series study suggest the use of 8 weeks or less as a quality metric for time to surgery. Time to surgery of greater than 8 weeks may partly be associated with disadvantageous social determinants of health.

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Delay in breast cancer surgery is a topic receiving national attention in the US, given that some prior studies have observed worse survival outcomes with longer times from breast cancer diagnosis to surgical treatment.[1-5] However, the specific time point after which it is disadvantageous to have surgery is unknown. Understanding this time point has major implications for breast cancer care. Surgical treatment planning can frequently involve additional imaging, genetic testing, and consultations with plastic surgeons and/or radiation oncology. Although this additional workup can be time intensive,[6] these steps are necessary to support and inform patients trying to make the best personal decision regarding surgery type and treatment course.[7,8] Rushing patients to surgery, possibly at the expense of these visits, might jeopardize patient satisfaction with their care decisions and contribute to decisional regret.[8-10] Knowing exactly how long is acceptable to wait between diagnosis and surgery would help guide patients and their surgeons in these discussions.

However, it is also critical to consider the factors that lead to delayed surgery outside of the acceptable window (ie, when it may negatively affect survival). For example, patients who experience challenges in accessing care may have worse outcomes because of the delayed care itself and/or the underlying factors that lead to the delay.[11] A patient can face additional barriers to navigating the complex multidisciplinary care of breast cancer if they do not have insurance when diagnosed, have difficulty finding transportation to clinic visits, or cannot easily arrange time away from work. Socioeconomic factors like these may be independently associated with worse outcomes and may contribute to some of the disparities in cancer outcomes observed for resource-limited patients due to delayed care. Understanding these factors will inform efforts to improve care delivery and potentially reduce disparities in outcomes.

It is necessary to identify a specific safe interval to surgery to better understand how we might balance allowing adequate time for decision-making and identifying potential detrimental delays that may disproportionally affect patients. Our objective was to examine the association between time from diagnosis to surgery (in weeks) and overall survival to determine whether there is a time-interval delay associated with worse survival. We also sought to identify factors associated with longer time periods of surgical delay.

Key Points

Question What is the association between time from breast cancer diagnosis to primary breast surgery (measured in weeks) and overall survival?

Findings This case series study using the data of 373 334 patients from the National Cancer Database found that time to surgery of greater than 8 weeks (57 days or greater) was associated with worse overall survival. Most patients underwent surgery before this time point.

Meaning Results suggest that tracking of patients with delays in surgery greater than 8 weeks can help to identify modifiable factors that may be acting as barriers to timely surgery and negatively affecting outcomes.

Methods

Data Source

This case series study was exempt from approval by the University of Wisconsin institutional review board due to the use and analysis of deidentified patient data. In addition, the requirement of patient informed consent was waived. This study used the National Cancer Database (NCDB) to identify female individuals (as defined by the NCDB) with breast cancer diagnosed between 2010 and 2014 with follow-up through 2019. The NCDB contains hospital registry data from greater than 1500 Commission on Cancer–accredited facilities and accounts for roughly 70% of all cancer cases in the US.[12] This time frame was chosen to ensure complete ERBB2 (formerly HER2) data, which was only collected from 2010 onward, and to ensure complete follow-up information.

Study Inclusion/Exclusion Criteria

Our study included adult female patients (≥18 years) with stage I to III breast cancer diagnosed between 2010 and 2014. Patients who identified with the following race and ethnicity categories were included: Black, Hispanic, non-Hispanic, White, other (includes more than 26 races), and unknown. We excluded patients with prior breast cancer, those with nonductal or lobular histologies, and those with missing hormone receptor or ERBB2 status. Patients who did not undergo surgery or who had unknown surgery were excluded. We also excluded patients who received other or unknown treatment, patients who underwent neoadjuvant radiation or systemic therapy, patients who had unknown timing of radiation and systemic therapy, and patients for whom the receipt of systemic therapy was unknown (given inability to rule out neoadjuvant treatment). Patients who had a time to surgery of 0 days were excluded as this represents a unique group having excisional biopsies or incidentally discovered cancers.

Statistical Analysis

Descriptive statistics were used to characterize the cohort. Overall survival was estimated using the Kaplan-Meier method. Patients were censored at death or last follow-up, whichever came first. Multivariable Cox regression was used to evaluate the association between time to surgery and overall survival within 5 years. We chose the primary predictor variable to be time in weeks from breast cancer diagnosis to first breast surgery using the following groupings: 0 to 4 weeks (1-28 days), 5 weeks (29-35 days), 6 weeks (36-42 days), 7 weeks (43-49 days), 8 weeks (50-56 days), 9 weeks (57-63 days), 10 weeks (64-70 days), 11 weeks (71-77 days), 12 weeks (78-84 days) and more than 12 weeks (>84 days). We chose to use first breast surgery to define the primary predictor variable as it represents the time that surgeons first bring a patient to the operating room for planned care. We chose week-long intervals after the first month (as opposed to the monthly intervals used in prior studies)[3,4] to allow more granular insight into the association between time to surgery and overall survival. In this analysis, age was included as a linear variable. Tumor characteristics known to affect survival were used as control variables (ie, receptor status risk group, grade, tumor size, node positivity). We categorized receptor status risk groups as follows: estrogen receptor positive (ER+) or progesterone receptor (PR)+ and ERBB2+; ER negative (−), PR−, and ERBB2+; ER+ or PR+ and ERBB2−; and ER−, PR−, and ERBB2−. An additional model was estimated with interaction terms for time to surgery and receptor status risk groups to assess whether the association between time to surgery and survival differed for patients in differing receptor status groups.

We performed multinomial regression to determine patient characteristics associated with longer times to surgery. We created a categorical variable based on time to surgery percentiles, using 30 days or less from diagnosis as the reference. This time point represents the 50th percentile of time to surgery. The comparator time groups included 31 to 60 days (51-90th percentile of patients), 61 to 74 days (91-95th percentile of patients), and more than 74 days (>95th percentile of patients). Analyzing the data this way allowed us to evaluate the relative importance of the different factors associated with time to surgery in more delayed time windows. In this analysis, age was considered as a categorical variable with the oldest age group as the reference. Categorical age and surrogates for socioeconomic factors (insurance status, census tract median household income) were the predictor variables. We grouped insurance status as follows: no insurance, private, Medicaid, Medicare or other government insurance, and unknown. Tumor characteristics known to affect survival, rural-urban residence, and treatment facility type were control variables. We considered including adjuvant therapy into the model, as this would be expected to be associated with survival. However, breast cancer adjuvant therapy is highly personalized and varied, making modeling of appropriate adjuvant therapy use challenging. We opted to leave it out of the model rather than make assumptions about which patients received appropriate therapy.

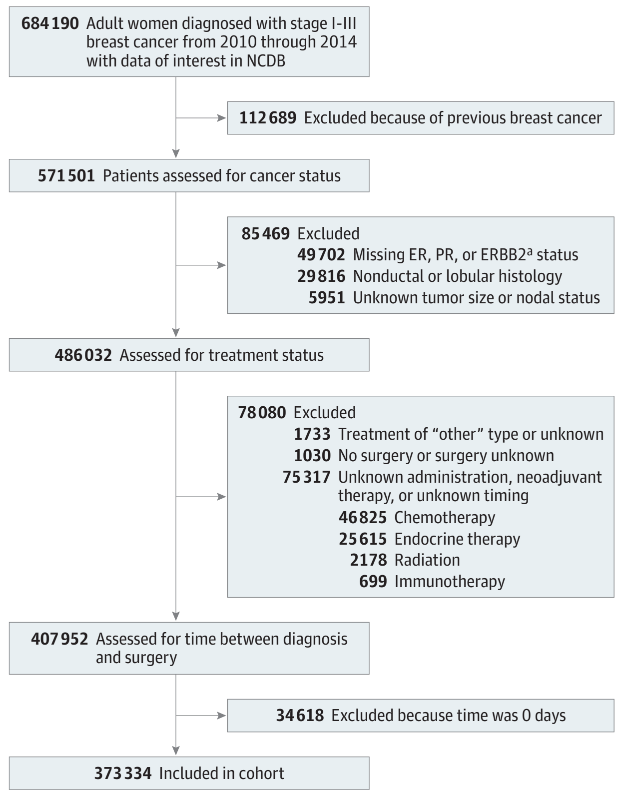
As an exploratory analysis, we used descriptive statistics to characterize time to surgery by receipt of reconstruction and type of reconstruction. We anticipated that reconstruction may be associated with longer times to surgery given the additional time needed to coordinate care. Stata software, version 15 (StataCorp) was used for all statistical analysis with 2-sided *P* values < .05 considered statistically significant. Data were analyzed from March 15 to July 7, 2022.

Results

During the 2010 to 2014 period, a total of 684 190 adult female patients with a diagnosis of stage I to III breast cancer were identified. After exclusions for prior breast surgery (n = 112 689), nonductal or lobular histology (n = 29 816), missing hormone receptor or ERBB2 status information (n = 49 702), unknown tumor size or nodal status (n = 5951), the performance of no or unknown surgery (n = 1030), receipt of unknown treatment (n = 1733), the inability to rule out neoadjuvant treatment (75 317), and time to surgery of 0 days (n = 34 618), a total of 373 334 patients (median [IQR] age, 61 [51-70] years) were included in the final cohort (**Figure 1**). Cohort demographics are reported in **Table 1**.[13] Study participants identified with the following race and ethnicity categories: 37 776 Black (10.1%), 17 352 Hispanic (4.7%), 355 982 non-Hispanic (95.4%), 317 050 White (84.9%), 15 583 other (4.2%), and 2925 unknown (0.8%). Data regarding the specific race categories included in other race are listed in eTable 1 in Supplement 1. The overall 5-year survival was 90.1% (95% CI, 90%-90.3%), with a median (IQR) follow-up of 41 (28-57) months. The median (IQR) time to surgery was 30 (20-43) days, 336 000 of 337 334 patients (90th percentile) underwent surgery within 60 days (**Figure 2**). Demographics of patients who were excluded due to missing or incomplete data are presented alongside included cohort demographics in eTable 2 in Supplement 1.

On Cox regression, there was no statistically significant association between time to surgery and overall survival for any of the time to surgery groups until 9 weeks after diagnosis (57-63 days or later). This group had a significantly higher rate of death within 5 years relative to the earliest time to surgery group, with a hazard ratio (HR) of 1.15 (95% CI, 1.08-1.23; *P* < .001) compared with surgery between 0 to 4 weeks (1-28 days) (**Table 2**). As expected, tumor characteristics such as larger tumor size (>2 cm to ≤5 cm: HR, 1.80; 95% CI, 1.75-1.85; *P* < .001; >5 cm: HR, 2.62; 95% CI, 2.50-2.75; *P* < .001) and

Figure 1. Flowchart of Study Inclusion and Exclusion



ER indicates estrogen receptor; NCDB, National Cancer Database; PR, progesterone receptor.

[a] Formerly HER2.

Table 1. Cohort Demographics

Demographic characteristics	Cohort, No. (%)[a] (N = 373 334)
Age, y	
≤45	43 840 (11.7)
46-55	85 985 (23.0)
56-65	106 449 (28.5)
66-75	86 688 (23.2)
>75	50 372 (13.5)
Charlson-Deyo Comorbidity Index[13]	
0	309 959 (83.0)
≥1	63 375 (17.0)
Race	
Black	37 776 (10.1)
White	317 050 (84.9)
Other	15 583 (4.2)
Unknown	2925 (0.8)
Ethnicity	
Hispanic	17 352 (4.7)
Non-Hispanic	355 982 (95.4)
Insurance	
Private	200 197 (53.6)
None	6476 (1.7)
Medicaid	22 039 (5.9)
Medicare or other government	140 771 (37.7)
Unknown	3851 (1.0)
Census tract median household income	
≥$63 000	140 570 (37.7)
$48 000-$62 999	100 936 (27.1)
$38 000-$47 999	78 716 (21.1)
<$38 000	52 218 (14.0)
Census tract–based percentage of population older than 25 y without high school degree, %	
<7	111 220 (29.8)
7%-12.9	125 344 (33.6)
13%-20.9	86 306 (23.2)
≥21	49 698 (13.3)
Rural-urban county of residence	
Metropolitan	313 379 (86.1)
Rural	5751 (1.6)
Urban	44 696 (12.3)
Tumor characteristics	
Receptor status[b]	
ER+ or PR+, ERBB2−	291 607 (78.1)
ER and PR−, ERBB2−	37 551 (10.1)
ER+ or PR+, ERBB2+	32 133 (8.6)
ER and PR−, ERBB2+	12 043 (3.2)
Grade	
Well differentiated	85 386 (22.9)
Moderately differentiated	165 805 (44.4)
Poor/undifferentiated	104 215 (27.9)
Unknown	17 928 (4.8)

(continued)

Table 1. Cohort Demographics (continued)

Demographic characteristics	Cohort, No. (%)[a] (N = 373 334)
Breast cancer size, cm	
≤2	250 899 (67.2)
>2 and ≤5	107 853 (28.9)
>5 or Diffuse	14 582 (3.9)
Breast cancer lymph node positivity	
0	262 278 (70.3)
1-3	78 209 (21.0)
4-9	17 636 (4.7)
>9	8114 (2.2)
No nodes examined	7097 (1.9)
Treatment characteristics	
Treatment facility type	
Academic	35 361 (9.9)
Comprehensive	173 157 (48.3)
Community	108 977 (30.4)
Integrated	41 010 (11.4)
Breast surgery type	
Partial mastectomy/lumpectomy	228 828 (61.3)
Mastectomy alone	90 892 (24.4)
Mastectomy with reconstruction	53 614 (14.4)
Time to surgery	
0-4 wk (1-28 d)	174 532 (46.8)
5 wk (29-35 d)	57 546 (15.4)
6 wk (36-42 d)	43 448 (11.6)
7 wk (43-49 d)	30 743 (8.2)
8 wk (50-56 d)	21 181 (5.7)
9 wk (57-63 d)	14 236 (3.8)
10 wk (64-70 d)	9407 (2.5)
11 wk (71-77 d)	6153 (1.7)
12 wk (78-84 d)	4167 (1.1)
>12 wk (>84 d)	11 921 (3.2)

Abbreviations: ER, estrogen receptor; PR, progesterone receptor.

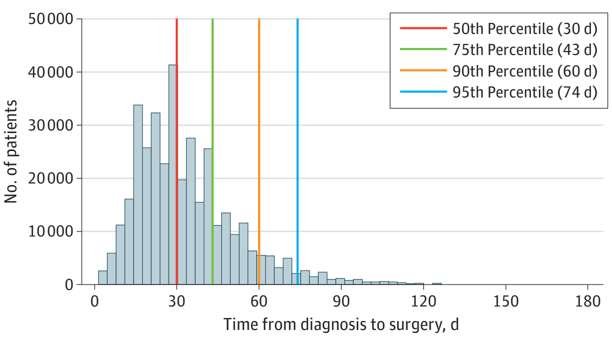
[a] Percentage estimates may not add to 100% due to rounding.

[b] ERBB2 was formerly referred to as HER2.

higher grade (moderate: HR, 1.10; 95% CI; 1.06-1.15; $P < .001$; poor/undifferentiated: HR, 1.70; 95% CI, 1.63-1.78; $P < .001$; unknown: HR, 1.31; 95% CI, 1.23-1.41; $P < .001$) were associated with poorer survival. Additionally, receptor subtype was associated with survival (ER−, PR−, and ERBB2−: HR, 2.03; 95% CI, 1.96-2.10; $P < .001$; ER−, PR−, and ERBB2+: HR, 1.20; 95% CI, 1.13-1.29; $P < .001$). There was not a statistically significant interaction between time to surgery, receptor status risk group, and survival.

The multinomial logistic regression model that assessed factors associated with longer times to surgery demonstrated that younger age was significantly associated with later times to surgery relative to surgeries performed within 30 days of diagnosis (**Table 3**). For example, when compared with patients undergoing surgery within 1 to 30 days of diagnosis, age 45 years or younger was associated with an OR of 1.32 (95%

Figure 2. Histogram of Time From Breast Cancer Diagnosis to Surgery With Percentile Overlays of Patients Receiving Surgery by Each Time Point in the Overall Cohort



Patients receiving surgery 180 days or longer were excluded from the figure.

CI, 1.28-1.38) for surgery 31 to 60 days after diagnosis, an OR of 1.64 (95% CI, 1.52-1.78) for surgery 61 to 74 days after diagnosis, and an OR of 1.58 (95% CI, 1.46-1.71) for more than 74 days from diagnosis. In addition, insurance type and census tract median household income were both associated with time to surgery. Medicaid insurance or uninsured status were associated with longer times to surgery (Table 3). For example, Medicaid status was associated with an OR of 1.35 (95% CI, 1.30-1.39) for surgery 31 to 60 days after diagnosis, an OR of 2.13 (95% CI, 2.01-2.26) for surgery 61 to 74 days after diagnosis, and an OR of 3.42 (95% CI, 3.25-3.61) for surgery more than 74 days after diagnosis. Similarly, residence in neighborhoods with lower household income was increasingly associated with later times to surgery. Residence in a census tract with the lowest median household income (<$38,000 per year) had an OR of 1.05 (95% CI, 1.02-1.07; *P* <.001) of having surgery 31 to 60 days from diagnosis, an OR of 1.21 (95% CI, 1.15-1.27) of having surgery 61 to 74 days from diagnosis, and an OR of 1.53 (95% CI, 1.46-1.61; *P* <.001) of having surgery more than 74 days after diagnosis. Tumor characteristics known to affect survival, rural-urban residence, and treatment facility type were control variables and are included in eTable 3 in Supplement 1.

We performed exploratory analyses examining time to surgery for patients undergoing breast reconstruction compared with those who did not. Patients undergoing breast reconstruction had longer median (IQR) times to surgery (38 [27-53] days) compared with all patients who did not undergo reconstruction (29 [20-42] days). Times to first surgery were not markedly different by type of reconstruction. Patients with tissue-based reconstruction had a median (IQR) time to surgery of 39 (27-54) days, implant-only reconstruction had a median (IQR) time to surgery of 38 (27-52) days, and combined implant and tissue reconstruction had a median (IQR) time to surgery of 37 (26-53) days.

Table 2. Results From Multivariable Cox Regression Analysis of Overall Survival in Patients Undergoing Primary Surgery for Breast Cancer, Controlling for Age and Tumor Characteristics (N = 373 334)

Characteristic	Hazard ratio (95% CI)	*P* value
Time to surgery		
0-4 wk (1-28 d)	1 [Reference]	
5 wk (29-35 d)	0.97 (0.93-1.01)	.11
6 wk (36-42 d)	1.00 (0.96-1.04)	.93
7 wk (43-49 d)	1.00 (0.95-1.05)	.90
8 wk (50-56 d)	1.03 (0.98-1.10)	.24
9 wk (57-63 d)	1.15 (1.08-1.23)	<.001
10 wk (64-70 d)	1.16 (1.07-1.26)	<.001
11 wk (71-77 d)	1.19 (1.08-1.31)	.001
12 wk (78-84 d)	1.32 (1.18-1.48)	<.001
>12 wk (>84 d)	1.47 (1.39-1.57)	<.001
Age	1.06 (1.06-1.06)	<.001
Receptor status[a]		
ER+ or PR+, ERBB2−	1 [Reference]	<.001
ER and PR−, ERBB2−	2.03 (1.96-2.10)	
ER+ or PR+, ERBB2+	0.95 (0.91-1.00)	
ER and PR−, ERBB2+	1.20 (1.13-1.29)	
Grade		
Well differentiated	1 [Reference]	<.001
Moderately differentiated	1.10 (1.06-1.15)	
Poor/undifferentiated	1.70 (1.63-1.78)	
Unknown	1.31 (1.23-1.41)	
Tumor size, cm		
≤2	1 [Reference]	<.001
>2 and ≤5	1.80 (1.75-1.85)	
>5 or Diffuse	2.62 (2.50-2.75)	
Node positivity		
None	1 [Reference]	<.001
1-3	1.52 (1.47-1.57)	
4-9	2.36 (2.26-2.47)	
>9	3.50 (3.33-3.69)	
No nodes examined	2.47 (2.34-2.61)	

Abbreviations: ER, estrogen receptor; PR, progesterone receptor.

[a] ERBB2 was formerly referred to as HER2.

Discussion

This case series study reexamines and contextualizes the question of "what is an acceptable time to breast cancer surgery?" We confirmed findings from other large observational studies that reported an association between surgical delay and survival[2-4] by demonstrating that surgery after 8 weeks (after 57 days) from diagnosis was associated with poorer survival. In addition, longer delays were associated with increasingly worse survival. In contrast to our study, which examined time to surgery at week intervals, prior studies used broad, month-based groupings to characterize surgical delay. This approach places patients getting surgery 31 days from diagnosis in the same risk group as patients getting surgery 59 days from diagnosis and limits surgeons' ability to use the data to inform treatment planning. By using time in weeks, our study provides a substantial contribution by reporting that a delay in surgery of up to 9 weeks (<57 days) does not appear to be negatively associated with survival. This is highly clinically relevant, as it supports current practices of allowing patients time to make thoughtful, shared decisions about their care.

Table 3. Results From Multinomial Logistic Regression Model Describing Factors Associated With Later Times From Breast Cancer Diagnosis to Surgery Compared With the Reference Group of Patients in the 0 to 50th Percentile (1-30 Days to Surgery)[a]

	Percentile of patients receiving surgery within time period, OR (95% CI)		
Characteristic	51-90th Percentile (31-60 d)	91-95th Percentile (61-74 d)	>95th Percentile (>74 d)
Age, y			
>75	1 [Reference][b]	1 [Reference][b]	1 [Reference][b]
66-75	1.04 (1.01-1.07)	1.03 (0.97-1.09)	1.00 (0.94-1.06)
56-65	1.09 (1.06-1.12)	1.24 (1.17-1.33)	1.26 (1.18-1.34)
46-55	1.18 (1.14-1.21)	1.42 (1.32-1.52)	1.40 (1.31-1.50)
≤45	1.32 (1.28-1.38)	1.64 (1.52-1.78)	1.58 (1.46-1.71)
Insurance			
Private	1 [Reference][b]	1 [Reference][b]	1 [Reference][b]
None	1.23 (1.16-1.31)	1.92 (1.73-2.13)	3.29 (3.01-3.59)
Medicaid	1.35 (1.30-1.39)	2.13 (2.01-2.26)	3.42 (3.25-3.61)
Medicare or other government	1.04 (1.02-1.06)	1.19 (1.13-1.25)	1.39 (1.32-1.46)
Unknown	1.03 (0.96-1.11)	1.39 (1.21-1.61)	1.61 (1.39-1.85)
Census tract median household income			
≥$63 000	1 [Reference][b]	1 [Reference][b]	1 [Reference][b]
$48 000-$62 999	1.00 (0.98-1.02)	1.04 (0.99-1.08)	1.12 (1.08-1.17)
$38 000-$47 999	1.00 (0.97-1.02)	1.06 (1.01-1.11)	1.18 (1.13-1.24)
<$38 000	1.05 (1.02-1.07)	1.21 (1.15-1.27)	1.53 (1.46-1.61)

Abbreviation: OR, odds ratio.

[a] The model also controlled for tumor characteristics (tumor size, grade, node positivity, receptor status risk group), rural-urban residence, and treatment facility type.

[b] $P \leq .001$.

Fortunately, we demonstrated that the majority of patients in the study cohort had timely surgery. The median time to surgery was 30 days, and 88% of patients underwent surgery before the 57-day time point after which we observed a survival detriment. We also observed that overall 5-year survival for our cohort was high at 90.1%. Further, later times to surgery and worse survival had a relatively modest association compared with the association between other tumor characteristics (ie, size, nodal status, receptor subtype) and survival. This highlights that tumor biology is the primary driver of patient's breast cancer outcomes.

Although our data set cannot provide direct insight into what specifically leads to longer times to surgery for patients, our analysis examining factors associated with later times to surgery highlighted 2 distinct categories. First, we found that age of 45 years or younger was uniformly associated with longer time to surgery. We speculate that this is related to increased rates of magnetic resonance imaging, genetics consultation, and consideration of reconstructive surgery in this group,[14-16] all of which can increase time to surgery due to added preoperative appointments and scheduling constraints. Although additional imaging and consultations can push back surgery, these adjuncts are very important for treatment and decision-making.[9,17] Especially for younger patients who will spend more of their lives as survivors, taking the necessary time to make the best decisions for these patients should be fully supported while also recognizing that a system of cancer care should enable timely imaging and genetics and plastics discussions. Discouraging full use of these resources in an attempt to rush surgery could disproportionately affect these patients without conferring a meaningful survival benefit.

We also identified measures of socioeconomic disadvantage as a second major category associated with longer times to surgery. In our study, progressively longer times to surgery were associated with Medicaid or uninsured status and lower neighborhood household incomes. We hypothesize that social determinants of health, represented by surrogate measures such as lower insurance status and neighborhood income, may negatively affect access to care and thus result in longer times to surgery. These findings are consistent with other studies reporting socioeconomic disadvantage to be associated with longer times to surgery.[18,19] Verdone et al[18] studied the NCDB to generate a nomogram for increased risk for surgical delay of greater than 60 days based on socioeconomic risk factors and found that Medicaid coverage was associated with increased risk of delay compared with private insurance. Looking at Medicaid expansion, Obeng-Gyasi et al[20] found that although the Affordable Care Act expansion increased breast conservation and reconstruction in Ohio, no difference in time to surgery was observed between those patients without insurance compared with those with Medicaid. Our study cannot address whether Medicaid/lack of insurance itself leads to delays or whether Medicaid/lack of insurance is representative of other factors more directly affecting access to care. Given the multifactorial impact of social determinants of health on breast cancer treatment and outcomes,[21] this issue warrants ongoing investigation. It is critical that we track patients with longer times to surgery beyond the 9-week mark, with the goal of identifying modifiable factors that may be acting as barriers to timely surgery and negatively impacting outcomes. This may help contribute to the long-term goal of reducing disparities in cancer outcomes.

Strengths and Limitations

A strength of our study is the large observational data set upon which the work is based. However, this also represents a limitation, in that the large sample size can identify statistically significant associations, which may have limited clinical significance. We minimized the risk of this by having a priori defined hypotheses to guide our analysis.[22,23] We also emphasize that our findings should be considered hypothesis generating. Decision-making surrounding breast cancer surgery is complex. A thoughtful approach is necessary when translating our observational findings to treatment guidelines in an effort to reduce potential harm to patients that require longer preoperative workup (those with medical complexity either cancer or comorbidity related) while working to improve timely care of patients with socioeconomic barriers to earlier surgery.

There are a few limitations related to the use of the NCDB data for the analysis.[24,25] First, the NCDB only reports death from any cause (as opposed to breast cancer–specific survival); it is possible that our findings may be different if only breast cancer deaths were considered. Further, the NCDB does not capture recurrence. Understanding how time to surgery is associated with recurrence is an important gap for future research. Finally, the NCDB does not include date of first surgical visit. Because of this, it is not possible to determine whether delays stem from issues that occur before the surgeon visit vs after (or both). This limits our ability to use this data to inform approaches to mitigate delays.

Conclusions

In this case series analysis of the NCDB, we observed that surgery before 8 weeks (56 days or less) was not associated with worse overall survival. Importantly, the majority of patients received surgery before this time point. To our knowledge, there are currently no national quality metrics for time to breast cancer surgery. Based on our findings, we recommend surgery before 8 weeks from breast cancer diagnosis. This time interval does not appear to have a detrimental association with cancer outcomes and allows for multidisciplinary care. Identifying 8 weeks as a goal for time to surgery allows tracking of those patients with prolonged delays and can target resources to identifying actionable delays possibly associated with socioeconomic factors. Prospective tracking of these patients and further examination are needed to identify unacceptable delays that may affect resource-limited patients.

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