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Community Outreach

Predictors of Disruptions in Breast Cancer Care for Individuals with Schizophrenia

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Abstract

Background. Patients with schizophrenia experience markedly increased breast cancer mortality, yet reasons for this disparity are poorly understood. We sought to characterize disruptions in breast cancer care for patients with schizophrenia and identify modifiable predictors of those disruptions.

Materials and Methods. We performed a medical record review of 95 patients with schizophrenia and breast cancer treated at an academic cancer center between 1993 and 2015. We defined cancer care disruptions as processes that interfere with guideline-concordant cancer care, including delays to diagnosis or treatment, deviations from stage-appropriate treatment, and interruptions in treatment. We hypothesized that lack of psychiatric treatment at cancer diagnosis would be associated with care disruptions.

Results. Half of patients with schizophrenia experienced at least one breast cancer care disruption. Deviations in stage-appropriate treatment were associated with breast cancer recurrence at 5 years ($p = .045$). Patients without a documented psychiatrist experienced more delays ($p = .016$), without documented antipsychotic medication experienced more deviations ($p = .007$), and with psychiatric hospitalizations after cancer diagnosis experienced more interruptions ($p < .0001$). Independent of stage, age, and documented primary care physician, lack of documented antipsychotic medication (odds ratio [OR] = 4.97, 95% confidence interval [CI] = 1.90, 12.98) and psychiatric care (OR = 4.56, 95% CI = 1.37, 15.15) predicted cancer care disruptions.

Conclusion. Disruptions in breast cancer care are common for patients with schizophrenia and are associated with adverse outcomes, including cancer recurrence. Access to psychiatric treatment at cancer diagnosis may protect against critical disruptions in cancer care for this underserved population. ***The Oncologist*** 2017;22:1374–1382

Implications for Practice: Disruptions in breast cancer care are common for patients with schizophrenia, yet access to mental health treatment is rarely integrated into cancer care. When oncologists documented a treating psychiatrist and antipsychotic medication, patients had fewer disruptions in breast cancer care after adjusting for age, cancer stage, and access to primary care. Addressing psychiatric comorbidity at breast cancer diagnosis may increase the likelihood that patients with schizophrenia receive timely, stage-appropriate cancer treatment. Comanagement of schizophrenia and breast cancer at cancer diagnosis may be one key strategy to decrease inequities in cancer treatment and improve cancer survival in this underserved population.

Introduction

Approximately 2.5 million people are living with schizophrenia in the U.S. [1]. Individuals with schizophrenia die 15–25 years earlier than the general population; 80% of that morality gap is due to medical illness, and cancer is the second leading cause of death [2–4]. Patients with schizophrenia are more than twice as likely to die from breast, colorectal, lung, and oral cancers, in part due to differences in receipt of stage-appropriate treatment [5–8]. Despite recent policy statements from the American Society of Clinical Oncology and Institute of Medicine calling for research examining inequities in cancer outcomes [9–11], disparities in cancer mortality experienced by individuals with schizophrenia are frequently unrecognized and relatively understudied. Patients with schizophrenia are commonly excluded from cancer clinical trials [12].

Although women with schizophrenia have the same incidence of breast cancer as women without mental illness, they experience two- to threefold greater breast cancer mortality [5, 7]. Women with schizophrenia undergo mammography at

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lower rates, are diagnosed with more advanced stage cancer [13–15], and are less likely to receive stage-appropriate treatment [6, 8, 13, 16]. Patient, provider, and systems-based factors contribute to inequities in treatment and survival. High rates of smoking, medical comorbidity, and poverty impact cancer outcomes but do not account fully for disparities in cancer survival [7, 16, 17]. Severe psychiatric symptoms, including cognitive deficits and disorganization, can make it challenging to understand a cancer diagnosis and urgently start treatment, leading to delays. Given mental health care is segregated from cancer care, oncologists may need to make treatment decisions without a complete medical and psychiatric history.

While the delivery of oncology care for patients with schizophrenia presents distinct challenges, studies have not identified remediable drivers of inequities in their cancer treatment. Prior studies have involved small samples. Researchers from the U.S. Department of Veterans Affairs reported high rates of treatment refusal and patient behaviors that could disrupt breast cancer care in their predominately male population. They recommended psychiatric consultation and advocated for use of mastectomy for early-stage breast cancer given anticipated nonadherence with radiation [18, 19]. In contrast, a U.K. study conducted at an academic cancer center found no need to alter breast cancer treatment or exclude patients with schizophrenia from clinical trials. Interestingly, all patients in the U.K. study were prescribed antipsychotic medications [20]. Previous research has not elucidated which factors contribute to cancer care disruptions for individuals with schizophrenia.

Using clinical data from a large health system, which included a National Cancer Institute (NCI)-designated cancer center and comprehensive psychiatric treatment, we aimed to (a) examine the proportion of patients with schizophrenia who received stage-appropriate breast cancer care, (b) identify and categorize care processes that may interfere with receiving stage-appropriate care defined as care disruptions, and (c) determine potentially modifiable predictors of care disruptions. We hypothesized that patients with schizophrenia who were engaged in psychiatric treatment at cancer diagnosis would have fewer disruptions in cancer care.

Materials and Methods

Study Design

We conducted a retrospective cohort study of patients with schizophrenia and breast cancer diagnosed between 1993 and 2015 and treated at the Dana-Farber/Harvard Cancer Center (DF/HCC) and the Partners Healthcare System (PHS), including Massachusetts General Hospital, Dana-Farber Cancer Institute, Brigham and Women's Hospital, and community affiliates. Patients were identified through the PHS's Research Patient Data Registry (RPDR), a centralized data warehouse that aggregates inpatient and outpatient records. This study was approved by the DF/HCC Institutional Review Board.

Sample

We queried the RPDR for the ICD-9 diagnoses of schizophrenia spectrum disorder, including schizophrenia, schizoaffective disorder, and schizophreniform disorder (295.0–295.9), and invasive breast cancer (174, 175.0, and 175.9). Inclusion criteria included: schizophrenia spectrum disorder diagnosed at least 1 year prior to breast cancer, first invasive breast cancer diagnosed between 1993 and 2015 confirmed by pathology or oncologist documentation, and at least one oncology note describing cancer care at cancer diagnosis. Since treatment with tamoxifen for 5 years became standard of care in the early 1990s [21], we included patients with breast cancer diagnosed after 1993.

Study Measures

Patient Characteristics

Demographic and clinical variables were extracted from the electronic health record (EHR) at cancer diagnosis, including age, race, marital status, housing, insurance type, medical comorbidity measured by the Charlson Comorbidity Index (CCI), body mass index, and smoking status. When oncology consultation notes were not available in the EHR, we obtained paper records. Breast cancer characteristics included breast mass size, hormone and HER2/neu receptor status, stage, and grade. We recorded breast cancer treatment recommended to and received by the patient, including details of cancer recurrence.

Mental Health Treatment and Systems Factors

First, we recorded whether there was any note from a psychiatrist or primary care provider (PCP) in the PHS EHR prior to cancer diagnosis. Next, we assessed documentation of psychiatric treatment in the PHS EHR at cancer diagnosis. This EHR review included documentation of a psychiatrist, antipsychotic medication, and psychiatric hospitalizations from the following sources: notes from primary care, mental health, and/or oncology clinicians in outpatient, inpatient, and emergency settings within the PHS. Finally, we assessed oncologist documentation of mental health factors at cancer diagnosis. To do so, we reviewed initial medical, radiation, and surgical oncology consultation notes for documentation of (a) mental illness, (b) psychiatric care, (c) consideration of mental illness when planning cancer treatment, and (d) consultation of psychiatry. We defined consideration of mental illness in cancer treatment planning as the oncologist's documentation of adapting, adjusting, or maintaining the cancer treatment plan considering the patient's schizophrenia. For example, regarding the decision not to recommend chemotherapy, one medical oncologist wrote, "the benefit to chemotherapy in this situation is measured in single digits and after discussion with her family and caregivers, we felt it would [be] difficult for her to go through, therefore, will probably not recommend it" (oncology consultation note in the EHR).

Breast Cancer Care

An interdisciplinary team of two psychiatrists who specialize in psycho-oncology (KEI, WFP) and a medical oncologist and radiation oncologist who specialize in breast cancer (JAS, AGT) established criteria to evaluate stage-appropriate breast cancer care. These criteria were informed by national guidelines for optimal cancer care including the National Comprehensive Cancer Network, the Quality Oncology Practice Initiative, and the National Quality Forum, and accounted for changes in breast cancer treatment during the study period (supplemental online Appendix) [22–24]. Given oncologists may weigh the implications of medical and psychiatric comorbidities such as

schizophrenia in cancer treatment planning, we used conservative criteria for guideline-concordant cancer treatment, which may have led to underestimating care disruptions.

To assess screening, we examined whether female patients age ≥42 had a documented screening mammogram within the 2 years prior to diagnosis. To assess timeliness of diagnosis and treatment, we examined the intervals from (a) positive screening mammogram to biopsy, (b) biopsy to initial treatment (surgery or neoadjuvant chemotherapy), (c) time between different treatment modalities received (surgery, chemotherapy, radiation), and (d) diagnosis to endocrine therapy.

Identification and Categorization of Care Disruptions

To understand the processes that can affect the delivery of breast cancer care for patients with schizophrenia, the interdisciplinary team reviewed a subset of charts ($n = 20$). First, the team identified the processes by which patients with schizophrenia did not receive timely, stage-appropriate breast cancer care, which we operationalized as care disruptions. Next, the team categorized the types of care disruptions, including (a) delays (lack of recommended screening, delays to diagnosis or initiation of treatment), (b) deviations (changes from stage-appropriate cancer treatment recommended by the oncologist or accepted by the patient or caregiver at the time of cancer diagnosis), and (c) interruptions (breaks in planned cancer treatment, including surgery, chemotherapy, radiation, or endocrine therapy). Examples of deviations include changes to surgery (e.g., mastectomy or avoiding a sentinel lymph node biopsy) and not recommending radiation, chemotherapy, and endocrine therapy.

Subsequently, all charts were independently coded by two members of the interdisciplinary team (psychiatrists [KEI, JBT] and trained research assistants [LEF, HPK]). Coders identified all patients with overall care disruptions (yes/no) with high inter-rater reliability (kappa = 0.86) and recorded the types of disruptions experienced. Patients could experience more than one type of disruption. To strengthen the clinical relevance of identified disruptions, all discrepancies were resolved by consensus review by an interdisciplinary team including a medical oncologist specializing in breast cancer (JAS). Additionally, an investigator (JBT) reviewed 20% of the charts comprehensively to ensure that all care disruptions were captured during the EHR review.

Statistical Analysis

Statistical tests were conducted in the Statistical Package for the Social Sciences (SPSS Version 22.0, IBM, https://www.ibm.com/analytics/us/en/technology/spss). We used measures of central tendency to describe the clinical and demographic characteristics of the sample and rates and types of disruptions in breast cancer care. Rates of oncologist documentation of mental health factors were compared using Fisher's exact tests. Patients were categorized based on whether they experienced disruptions in their cancer care (had disruptions vs. no disruptions). We used the following categories to conceptualize overall care disruptions: (a) delays, (b) deviations, and (c) interruptions. We used chi-square tests and point biserial correlations to examine univariate associations between patient characteristics and care disruptions.

We then conducted multivariate logistic regressions to examine whether lack of psychiatric treatment (documentation of a psychiatrist and/or antipsychotic medication) at cancer diagnosis was associated with disruptions after adjusting for potential confounding factors at diagnosis, such as age, cancer stage, health insurance type (Medicaid vs. other), and medical comorbidity (CCI dichotomized to 0 vs. ≥1).

Finally, we used Cox proportional hazards models [25] to examine associations between deviations from stage-appropriate care and disease-free survival, adjusting for stage of disease (early vs. advanced). This analysis was conducted in a subsample of patients with stage I–III breast cancer who were diagnosed between 1993 and 2011 and therefore had 5-year follow-up data. Patients who were deceased or lost to follow-up were censored using the date of last contact. All statistical tests were two-sided with a p value of .05 as the threshold for statistical significance.

Results

We retrieved 675 cases for review from the RPDR query for breast cancer and schizophrenia treated between 1993 and 2015. We excluded cases with no documentation of first invasive breast cancer between 1993 and 2015 ($n = 291$), no oncology notes at diagnosis ($n = 124$), and no diagnosis of schizophrenia spectrum disorder at least 1 year prior to cancer diagnosis ($n = 165$), yielding a final sample of 95 eligible cases.

Patient Characteristics

Patient characteristics are described in Table 1. The majority of patients in this sample were white (65.3%) and 17.9% were black, with an average age of 58.6 years of age (SD = 11.5; range = 34–84 years). Over half (54.7%) were unmarried; 18.1% lived in supportive housing (group home, assisted living, or nursing home), 6.3% had a history of homelessness, and 76.8% had Medicaid insurance. Half were obese, and more than a third were current smokers. Although 44.2% of patients were diagnosed with stage I breast cancer, 11.6% were initially diagnosed with metastatic cancer. Ninety percent of patients had hormone receptor-positive, HER2/neu receptor-negative disease.

Mental Health Treatment and Systems Factors

Prior to cancer diagnosis, 50.5% of patients had no primary care note in their EHR, and 83.2% had no note from a psychiatrist. At diagnosis, 23.2% of patients had no documented psychiatrist in their EHR and 20% were not documented to be on antipsychotic medication. Psychiatric hospitalizations after cancer diagnosis were documented in 40% of patients; 19% of those hospitalizations occurred within the first year after cancer diagnosis.

In their initial consultations, oncologists documented a history of mental illness for most patients with schizophrenia (77.9%–92.2%), yet less than one half of medical oncologists and less than one quarter of radiation oncologists documented a treating psychiatrist (Fig. 1). Medical oncologists were more likely than radiation ($p = .04$) or surgical oncologists ($p = .004$) to document a psychiatrist and document consideration of schizophrenia in cancer treatment planning (Fig. 1, $p < .0001$). Across specialties, oncologists rarely documented consulting psychiatry (1%–10%).

Breast Cancer Care

Thirty-two women with schizophrenia age ≥42 had a screening mammogram documented in the 2 years prior to breast cancer diagnosis (36.8% of overall sample vs. 49.1% of women with

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Table 1. Patient and clinical characteristics at cancer diagnosis

Patient characteristics ($N = 95$)	*n* (%)
Age, years, mean (SD)	58.6 (11.5)
Female gender	94 (98.9%)
Race/Ethnicity	
White	62 (65.3%)
Black	17 (17.9%)
Hispanic/Latino	6 (6.3%)
Other	4 (4.2%)
Unknown	6 (6.3%)
Marital status	
Single	52 (54.7%)
Divorced, separated, or widowed	28 (29.5%)
Married	15 (15.8%)
Housing	
Alone	36 (37.9%)
With family	32 (33.7%)
Supported housing (group home, assisted living, nursing home)	17 (17.9%)
Ever homeless	5 (5.2%)
Other	3 (3.2%)
Unknown	2 (2.1%)
Insurance type	
Medicare	6 (6.3%)
Private	15 (15.8%)
Medicaid	73 (76.8%)
Other	1 (1.1%)
Charlson Comorbidity Index	
0	60 (63.2%)
1	25 (26.3%)
≥ 2	10 (10.5%)
Body mass index	
<25	9 (9.9%)
25–30	19 (20.9%)
>30	46 (50.5%)
Unknown	21 (22.1%)
Smoking Status	
Current	35 (36.8%)
Former	21 (22.1%)
Never	37 (39%)
Unknown	2 (2.1%)
Primary care documentation in medical record	
No PCP documented at diagnosis	21 (22.1%)
No note from PCP in medical record	48 (50.5%)
Mental health care documentation in medical record	
No psychiatrist documented at diagnosis	22 (23.2%)
No note from psychiatrist in medical record	79 (83.2%)
Not prescribed antipsychotic medication	19 (20%)
Psychiatric hospitalizations	
Prior to cancer diagnosis	75 (78.9%)
After cancer diagnosis	38 (40%)
Breast cancer characteristics at diagnosis	
Cancer stage	
I	42 (44.2%)
II	28 (29.5%)
III	13 (13.7%)
IV	11 (11.6%)
Unknown stage	1 (1.1%)
Estrogen/progesterone receptor status	
Positive	84 (88.4%)
Negative	8 (8.4%)
Unknown	3 (3.2%)
HER2/neu receptor status	
Positive	12 (12.6%)
Negative	76 (80%)
Unknown	7 (7.4%)
Tumor size (cm), mean (SD)	2.4 (2.5)
Median tumor size	1.7 (IQ 0.9–2.8)

Abbreviations: IQ, interquartile range; PCP, primary care provider; SD, standard deviation.

PCPs within the PHS). The median time from positive screening mammogram to biopsy was 1.15 months (interquartile range 0.7–1.95); 24.6% had more than 2 months from screening mammogram to biopsy.

Ninety-six percent of patients with stage I–III disease underwent surgery, and 54.2% had mastectomies (Table 2). Fourteen percent of patients had surgery or neoadjuvant chemotherapy $>$90 days after diagnosis (Fig. 2). Nearly one third of patients had radiation $>$84 days after surgery or chemotherapy. Among the 40 patients who met criteria for radiation following lumpectomy or mastectomy, 32 (80%) started radiation, and 28/32 (87.5%) completed the recommended radiation course. Among the 26 patients who met criteria for chemotherapy, 20 (76.9%) received chemotherapy, and 16/20 (80%) completed treatment. Thus, a significant minority of patients did not complete recommended cancer treatment: 30% did not complete recommended radiation, and 39.5% of patients did not complete recommended chemotherapy. The majority of hormone receptor-positive patients (77%) were prescribed endocrine therapy $<$1 year from cancer diagnosis. Among stage I–III patients with 5 years of follow-up, 24/46 (52%) of patients completed the recommended 5 years of endocrine therapy. Oncologists documented worsening psychiatric symptoms as the most common reason for patients to self-discontinue endocrine therapy ($n = 7$). Regarding end-of-life care, 34 patients (35% of the overall sample) had died. Thirteen patients (38%) had palliative care consultations (all but one in the inpatient setting), and 15 patients (44%) had documented hospice referrals prior to their death.

Types and Rates of Disruptions in Cancer Care

One half of patients with schizophrenia and breast cancer experienced at least one disruption in cancer care. Specifically, patients frequently experienced (a) delays to diagnosis or treatment ($n = 22$, 23.4%), (b) deviations from stage-appropriate treatment ($n = 20$, 21.3%), and (c) interruptions in treatment

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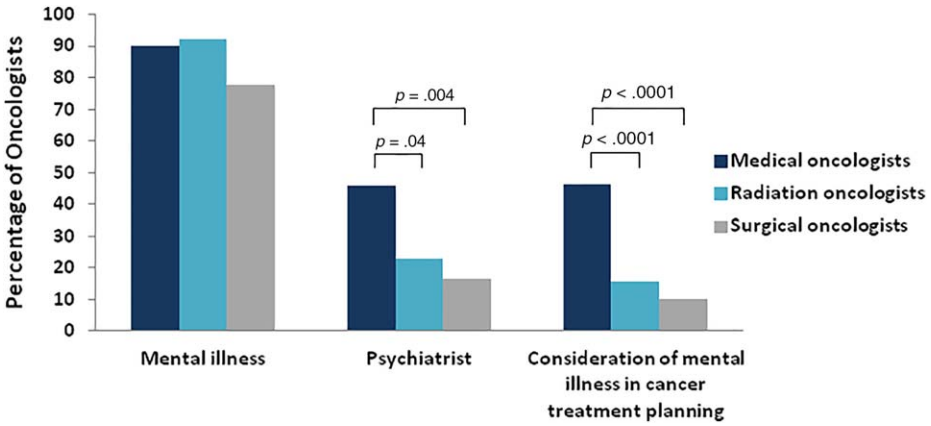

Figure 1. Oncologist documentation of mental health factors in initial consultation note. Forty-six percent (23/50) of medical oncologists documented a psychiatrist compared with 22.9% (8/35) of radiation oncologists (Fisher's exact test, $p = .04$) and 16.7% (7/42) surgical oncologists ($p = .004$). Forty-six percent (38/82) of medical oncologists documented consideration of schizophrenia in cancer treatment planning compared with 15.6% (10/64) of radiation oncologists and 10.1% (7/69) of surgical oncologists ($p < .0001$).

Table 2. Cancer treatment received

Treatment	Stage I–III ($n = 83$), *n* (%)	Stage IV ($n = 11$), *n* (%)
Underwent surgery	80 (96.4%)	3 (27.3%)
Lumpectomy as definitive surgical procedure	35 (42.2%)	
Mastectomy	45 (54.2%)	
Received radiation		4 (36.4%)
Received radiation/met criteria for radiation[a]	32/40 (80%)	
Completed radiation/started radiation	28/32 (87.5%)	
Received chemotherapy		3 (27.3%)
Received chemotherapy/met criteria for chemotherapy[a]	20/26 (76.9%)	
Completed chemotherapy/started chemotherapy	16/20 (80%)	
Received endocrine therapy		7 (63.6%)
Received endocrine therapy/ER/PR+ patients	65/74 (87.8%)	
Endocrine therapy within 1 year of diagnosis	56/74 (75.6%)	
Completed 5 years of endocrine therapy/5 years documented oncology care	24/46 (52%)	
Trastuzumab therapy (HER2/neu+ only)[b]	4/5 (80%)	1/2 (50%)
Palliative care referral		3 (27.3%)
Hospice referral		7 (63.6%)

[a]See supplemental online Appendix for criteria used to assess stage-concordant radiation and chemotherapy.
[b]Trastuzumab therapy became standard of care after 2006 and therefore assessed after 2006.
Abbreviations: ER, estrogen receptor; PR+, progesterone receptor-positive.

($n = 24$, 25.5%). Sixteen patients (17%) experienced more than one type of care disruption. Examples of delays and changes from stage-appropriate treatment, (e.g., surgery, radiation, chemotherapy, and endocrine therapy recommended and/or accepted at cancer diagnosis) are provided in Table 3. For example, one surgical oncologist noted in his initial consultation, "The patient was not a good candidate for 6 weeks of radiation, chemotherapy, or even hormonal therapy because of her mental status. It was therefore decided that a simple mastectomy would be advisable."

Clinical Relevance of Disruptions in Cancer Care

Delays were associated with cancer stage at diagnosis; delays occurred in 55% of patients with metastatic disease compared with 18.1% of patients with stage I–III disease (odds ratio [OR] = 5.44, 95% confidence interval [CI] = 1.46, 20.20, $p = .006$). In patients with stage I–III disease diagnosed between 1993 and 2011 ($n = 64$), those who experienced deviations from stage-appropriate care were more likely to recur sooner compared with patients who did not have deviations, over and above the effects of cancer stage (OR = 4.17, 95% CI = 1.03, 16.81, $p = .045$).

Predictors of Disruptions in Cancer Care

Older patients with schizophrenia (age >65) experienced more disruptions (OR = 3.05, 95% CI = 1.24, 7.51, $p = .015$). Higher medical comorbidity (CCI) was associated with fewer care disruptions (OR = 0.364, 95% CI = 0.15, 0.88, $p = .023$). Cancer stage, private versus public insurance, smoking status, obesity, housing status (living alone or with family vs. living in supportive housing) and documentation of a PCP at cancer diagnosis

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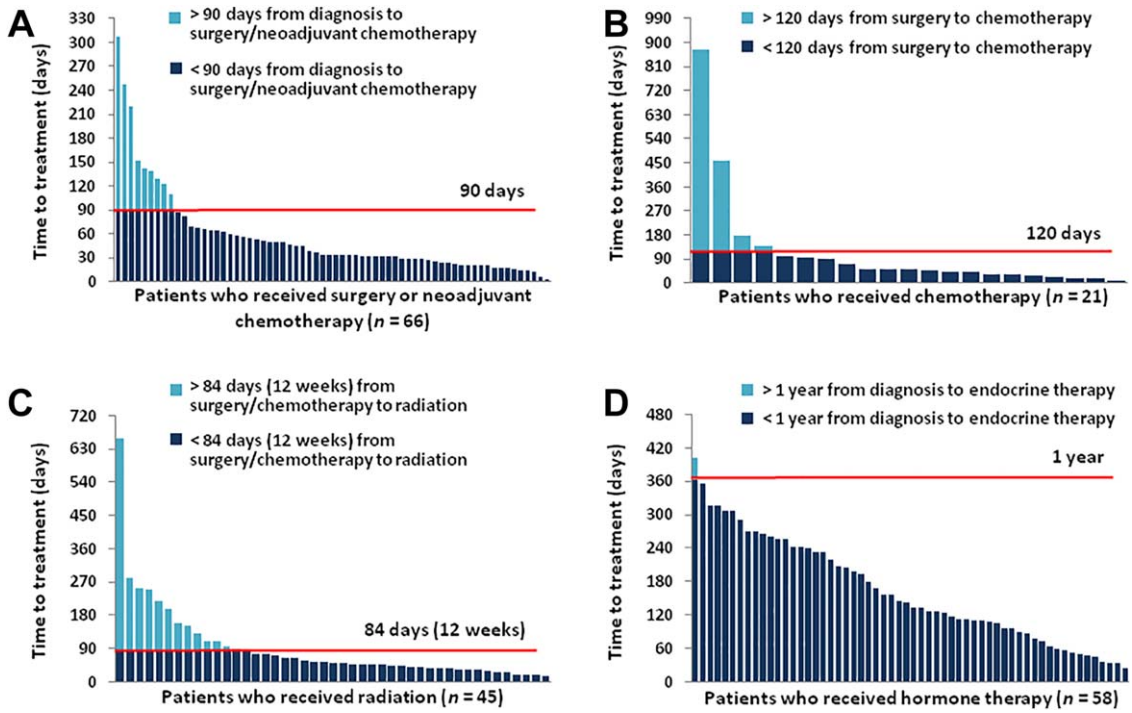

Figure 2. Proportion of patients meeting national guidelines for time to breast cancer treatment. **(A)**: 13.6% of the patients who underwent surgery or neoadjuvant chemotherapy received treatment >90 days after diagnosis. **(B)**: 19% of the patients who received chemotherapy started treatment >120 days after surgery. **(C)**: 31.1% of the patients who received radiation started treatment >84 days (12 weeks) after surgery. **(D)**: In contrast, 98.3% of patients who received endocrine therapy started treatment within 1 year of diagnosis.

Table 3. Disruptions in cancer care ($n = 94$)

Disruptions	Definition	*n* (%)	Illustrative vignettes from electronic health record
Overall disruptions[a]		47 (50%)	
Delays	No mammogram in last 2 years (women age ≥40); delay to diagnosis	22 (23.4%)	Delay to diagnosis: Patient reported not seeing a doctor in 17 years. Refused mammogram and breast exam multiple times. When evaluated by psychiatry, she did not have capacity to refuse recommended medical care. She had capacity to appoint health care proxy who supported palliative goals for the patient.
	Delay to surgery		Delay to surgery: After meeting with her surgeon, the patient became overwhelmed with fear about a mastectomy and could not understand how reconstruction could work. She postponed her surgery multiple times. She was then hospitalized psychiatrically, her paranoia decreased, her thinking became more organized, and she agreed to have a mastectomy, which was well tolerated.
Deviations from stage-appropriate treatment	Oncologist recommends modification of treatment	20 (21.3%)	Recommendation: "The patient was brought back to be fluoroscopically simulated. However, the patient became upset and began shouting at the therapist. Based on the patient's schizophrenia and inability to be cooperative, it was decided the patient would not be a candidate to receive daily radiation therapy for her tumor."
	Patient, family, or guardian refusal of care; patient unable to consent, no substitute decision-maker		Refusal: "Her sister refused any treatment that could upset the patient's routines or require weekly trips to the hospital."
Interruptions in cancer treatment	Postoperative complication; did not complete chemotherapy; did not complete radiation; did not complete endocrine therapy (or >3 month gap in treatment)	24 (25.5%)	Interruption: "Due to the very prolonged and difficult postoperative recovery related to mastectomy site infection, which was likely due to the patient's heavy cigarette smoking and diabetes, taxol could not be resumed."

[a]Many patients experienced more than one type of disruption. Patients could experience more than one type of delay, deviation, or interruption

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Table 4. Predictors of disruptions in breast cancer care in individuals with schizophrenia

	Unadjusted analyses		Adjusted analysis[a]	
Predictors of disruptions	**Odds ratio (95% CI)**	***p* value**	**Odds ratio (95% CI)**	***p* value**
No documented primary care provider[b]	1.71 (0.63, 4.71)	.290	1.82 (0.62, 5.35)	.276
No documented psychiatrist at diagnosis[b]	4.97 (1.90, 12.98)	.001	3.85 (1.38, 10.71)	.010
No documented antipsychotic medication[b]	4.56 (1.37, 15.15)	.013	3.94 (1.12, 13.81)	.033
Psychiatric hospitalization after cancer diagnosis	3.31 (1.39, 7.92)	.007	4.94 (1.78, 13.72)	.002

[a]Analysis adjusted for cancer stage, age >65, and no documented primary care provider.
[b]Documentation in the complete medical record.
Abbreviation: CI, confidence interval.

were not associated with disruptions. Conversely, lack of psychiatric treatment (no documentation of psychiatrist and no antipsychotic medication) was associated with disruptions in cancer care (Table 4). Additionally, psychiatric hospitalization after cancer diagnosis was associated with overall cancer care disruptions. These associations remained significant after adjusting for cancer stage, age >65, and documented PCP.

In exploring the three types of disruptions in cancer care, we found that patients with no documented psychiatrist at diagnosis experienced more delays (OR = 3.97, 95% CI = 1.30, 12.13, $p = .016$); patients with no antipsychotic medication at cancer diagnosis were more likely to have deviations from stage-appropriate treatment (OR = 4.33, 95% CI = 1.53, 15.49, $p = .007$); and patients who were psychiatrically hospitalized after cancer diagnosis had more interruptions in planned cancer treatment (OR = 10.07, 95% CI = 3.09, 33.55, $p < .0001$). All analyses were adjusted for stage.

Discussion

In this study, we comprehensively describe the trajectory of cancer care for a cohort of patients with schizophrenia and breast cancer. In an NCI-designated comprehensive cancer center, one half of patients experienced clinically meaningful care disruptions, including delays to diagnosis or treatment, deviations from stage-appropriate treatment, and interruptions in planned treatment. One in five patients with schizophrenia experienced deviations from guideline-concordant care due to oncologist recommendation and/or patient or caregiver refusal; these patients had an increased risk of breast cancer recurrence at 5 years independent of cancer stage. The clinical relevancy of these disruptions may partially account for the increased breast cancer mortality experienced by patients with schizophrenia.

Recent analyses using national databases have underscored the importance of avoiding delays to breast cancer treatment [26, 27]. Each additional 60 days to surgery was associated with worse breast cancer-specific survival (BCSS). Only 1.5% of patients in these national cohorts had >90 days from diagnosis to surgery versus 22.7% of our sample [26]. Furthermore, >90 days from chemotherapy to surgery was associated with worse BCSS; 9.8% had >90 days to chemotherapy compared with one third of our sample [27]. The significant delays experienced by a subset of patients with schizophrenia may increase their risk of dying from breast cancer.

Additionally, patients with schizophrenia and early-stage breast cancer were nearly twice as likely to have a mastectomy as their initial surgical procedure than patients with early-stage breast cancer treated at academic cancer centers in the Northeast: 38% of patients in our sample compared with 20% at similar cancer centers [28–30]. Furthermore, patients in our sample had low rates of receiving adjuvant chemotherapy and radiation; 25% of patients with schizophrenia who met clear criteria for adjuvant radiation failed to receive radiation compared with 5% in national samples [31]. Mastectomy likely makes sense for a subset of patients who are at high risk for not completing radiation [18]. However, many patients with schizophrenia may benefit from less complicated surgical procedures, which are associated with decreased morbidity, particularly given the increased risk of postoperative complications, increased length of stay, and in-hospital mortality in this population [32]. Specifically, patients with schizophrenia have two to three times greater risk of postoperative infection, pulmonary embolus/deep venous thrombosis, respiratory failure, and delirium compared with patients without mental illness [33, 34]. Contributing factors likely include high rates of smoking, obesity, and medical comorbidity, factors that also predict poor outcomes from breast reconstruction [35]. Furthermore, patients with schizophrenia may have increased risk of emergent surgery and experience challenges communicating their symptoms with clinicians [33].

Compared with patients who have breast-conserving therapy, patients with early-stage cancer who have mastectomies have longer delays to adjuvant chemotherapy and radiation and lower rates of BCSS [36, 37]. In contrast, rates of discontinuation of endocrine therapy were similar to national cohorts; 50% of patients nationally, and 48% in our sample, with schizophrenia with estrogen receptor/progesterone receptor-positive breast cancer had discontinued endocrine therapy at 5 years [38, 39].

Although delays and inequities in cancer care are common in patients with schizophrenia, oncologists have limited information to inform their decisions regarding cancer treatment. Therefore, we identified potentially modifiable risk factors for disruptions in cancer care in this vulnerable population. Rather than cancer stage, public insurance, or lack of primary care physician, lack of mental health treatment predicted disruptions in breast cancer care for patients with schizophrenia. At cancer diagnosis, patients without a documented psychiatrist and antipsychotic medication were four to five times more likely to have disruptions. Patients who were psychiatrically hospitalized after cancer diagnosis also had significantly more disruptions. Treatment of schizophrenia at cancer diagnosis may be critical to facilitate the delivery of cancer care.

Although there is increasing recognition of the need to incorporate psychosocial care into cancer treatment [40, 41], cancer care and mental health care remain fragmented, particularly for patients with severe mental illness. Mental illness may not be recognized at the time of cancer diagnosis and

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oncologists may not assess whether mental illness is treated. Despite a previously documented diagnosis of schizophrenia, in our sample, oncologists rarely documented if patients had psychiatrists. Surgical and radiation oncologists, who may be the only oncologists involved for patients with early-stage breast cancer, had particularly low rates of documentation of mental health factors. Collaborative care models that integrate mental health and cancer care are effective for patients with cancer who develop depression [42] and may be adapted to meet the specialty care needs of patients with schizophrenia and cancer [17]. Addressing psychiatric comorbidity at diagnosis may have the potential to prevent disruptions in cancer care by controlling psychiatric symptoms and supporting oncologists in adapting the cancer treatment plan [43]. For example, if psychiatric symptoms are sufficiently treated and psychiatric consultation is available, the oncology team may feel more comfortable recommending breast-conserving therapy followed by adjuvant chemotherapy or radiation. Decreasing deviations from stage-appropriate treatment at diagnosis may be one key strategy to improve cancer outcomes in this underserved population.

Although this is the largest medical record review of patients with schizophrenia and breast cancer, the findings are limited given that the population is from a single academic center and the lack of a control group of patients without mental illness. Our primary purpose was to identify potential predictors within the group of patients with schizophrenia and breast cancer to elucidate potential factors that may increase the risk of cancer care disruptions. Future studies will be strengthened by including a control group of patients without mental illness treated at the same cancer center. Although restricting our cohort to a single academic center limits generalizability, focusing on patients who are receiving treatment within an NCI-designated cancer center likely underestimates the magnitude of the disparity given the resources necessary to receive outpatient oncology care and the relatively greater availability of psychosocial services at academic medical centers compared with community sites. It will be important for future research to include community cancer centers and utilize a prospective study design. Finally, although documentation of mental illness in the medical record is incomplete, this is the extent of the information available to the practicing oncologist and therefore has face validity. Moreover, we focused on the time of cancer diagnosis, when documentation of cancer and comorbid medical conditions should be most comprehensive.

Conclusion

Individuals with schizophrenia have worse cancer outcomes, yet little is known about the factors driving those disparities. In patients with schizophrenia and breast cancer, we identified frequent disruptions that could adversely affect cancer outcomes, including survival. Moreover, we identified potentially modifiable risk factors (e.g., access to psychiatric treatment at cancer diagnosis) that should be evaluated in prospective studies. In particular, optimizing psychiatric treatment when breast cancer is diagnosed may increase the likelihood that patients with schizophrenia receive timely, stage-appropriate treatment. Furthermore, findings suggest that the receipt of stage-appropriate treatment protects against risk of recurrence for these patients. Comanagement of schizophrenia and breast cancer starting at cancer diagnosis may be one key strategy that can decrease inequities in treatment and therefore improve cancer survival in this underserved population. Research investigating how to integrate mental health and cancer care is urgently needed to improve cancer outcomes for people with schizophrenia.

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Disclosures

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