ONLINE EXCLUSIVE

Mental Illness and *BRCA1/2* Genetic Testing Intention Among Multiethnic Women Undergoing Screening Mammography

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OBJECTIVES: To examine associations between patient-reported mental illness diagnosis and symptoms and *BRCA1/2* genetic testing intention among women undergoing screening mammography.

SAMPLE & SETTING: 100 multiethnic women of lower socioeconomic status who were undergoing mammography screening and met family history criteria for *BRCA1/2* genetic testing.

METHODS & VARIABLES: Descriptive and bivariate nonparametric statistics and multivariate logistic regression were used to examine associations between mental illness and genetic testing intention. Variables were anxiety, depression, patient-reported mental illness diagnosis and symptoms, and testing intention.

RESULTS: Prevalence rates of mental illness symptoms were 36% for clinically significant depression and 36% for anxiety. Although 76% of participants intended to undergo genetic testing, only 5% had completed testing. History of mental illness and elevated levels of anxiety and depressive symptoms were positively correlated with testing intention in the bivariate analysis. In multivariate analysis, only younger age and less education were associated with testing intention.

IMPLICATIONS FOR NURSING: Future studies should address psychosocial needs and other competing barriers at the patient, provider, and healthcare system levels to increase access to *BRCA1/2* genetic testing among multiethnic women.

KEYWORDS mental illness; *BRCA1/2*; genetic testing; multiethnic women; mammography

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Genetic counseling and testing for *BRCA1/2* gene mutations and other cancer susceptibility genes related to hereditary breast and ovarian cancer (HBOC) (*ATM*, *BARD1*, *BRIP1*, *CDH1*, *CHEK2*, *EPCAM*, *MLH1*, *MSH2*, *MSH6*, *NBN*, *NF1*, *PALB2*, *PMS2*, *PTEN*, *RAD51C*, *RAD51D*, *STK11*, and *TP53*) are the standard of care for women who meet personal or family history criteria (National Comprehensive Cancer Network [NCCN], 2019). The application of multigene panel testing for hereditary forms of cancer has rapidly changed the clinical approach to genetic testing for at-risk patients and their families (NCCN, 2019). Women who have a deleterious *BRCA1/2* gene mutation have a 69%–72% absolute risk of developing breast cancer by age 80 years, compared to a 12% lifetime risk in the general population (National Cancer Institute, 2018). Therefore, the U.S. Preventive Services Task Force ([USPSTF], 2019) recommends that primary care providers assess women with a personal or family history who have an ancestry associated with *BRCA1/2* gene mutations with an appropriate brief familial risk assessment tool.

Risk management options include intensive breast cancer screening (Saslow et al., 2007), risk-reducing surgeries (Isaksson et al., 2019), and chemoprevention (Cibula, Zikan, Dusek, & Majek, 2011), which have been shown to improve early detection and reduce cancer incidence and mortality. As reported by Hughes (2017), most at-risk women have yet to be tested. Childers, Childers, Maggard-Gibbons, and Macinko (2017) found that, among 3.8 million survivors of breast and ovarian cancer in the United States, only 14% had been tested. Despite the clinical availability of *BRCA1/2* genetic testing for more than 20 years and its associated benefit, there is significant underuse of genetic testing. Less than 20% of eligible women screened in primary care are referred for

genetic counseling; of those, only 8% undergo genetic testing (Kurian et al., 2017). Other studies have found that this is particularly true for those of lower socioeconomic status and racial/ethnic minority groups, such as Black and Hispanic women (Jones, McCarthy, Kim, & Armstrong, 2017; Tang et al., 2017; Underhill, Jones, & Habin, 2016). Although Hispanic women are at lower risk for breast cancer than non-Hispanic White women, they have the second highest prevalence of *BRCA1/2* gene mutations after Ashkenazi Jews (Weitzel et al., 2013). In addition, from 2006 to 2015, there was an increase in the breast cancer incidence rate (0.4%) annually among Hispanics, while this rate remained stable in non-Hispanic Whites (American Cancer Society [ACS], 2018). Breast cancer remains the leading cause of death among Hispanic women, with an estimated 3,200 deaths in 2018 (ACS, 2018).

Few studies have focused on mental illness and genetic testing, which demonstrates a need to address this gap. Major depressive disorder (MDD) is the most commonly diagnosed form of depression, affecting 16.2 million adults annually; the prevalence is higher among women (National Institute of Mental Health [NIMH], 2019). Anxiety disorders are the most common mental illnesses, affecting 40 million adults aged 18 years or older (Anxiety and Depression Association of America, 2017). In addition, data suggest that MDD is highest among adults from racial or ethnic minorities (NIMH, 2019). Individuals with mental illness are also at greater risk for poor health and inadequate healthcare access (National Council for Behavioral Health, 2018). Depression and anxiety symptoms also can influence patients' health behaviors and lead to treatment nonadherence (Nipp et al., 2017). Lack of support for women with mental illness may deter them from accessing preventive healthcare services (World Health Organization, 2017), such as breast cancer screening and genetic counseling and testing. In addition, it is unclear how a mental illness diagnosis and symptoms affect intention to complete *BRCA1/2* genetic testing.

In the authors' previous work, they conducted a retrospective cross-sectional study to evaluate the impact of mental illness among 308 multiethnic women with newly diagnosed breast cancer who were eligible for genetic testing and seen in an academic urban medical center (Ackerman, Shapiro, Coe, Trivedi, & Crew, 2017). The authors found that 57% of women who met NCCN guidelines for *BRCA1/2* testing underwent genetic counseling. In addition, mental illness did not affect the completion of genetic counseling. The current study builds on this research by exploring the impact of mental illness on intention to have genetic testing among predominantly Hispanic women. This study is guided by the theory of planned behavior (TPB) (Ajzen, 2011; Roncancio et al., 2015), one of the most widely used socio-cognitive theories, which encompasses behavioral intention (i.e., the stronger the intention to perform the behavior, the more likely the behavior will be performed). Because the purpose of the study is to determine factors that increase behavioral intention, no other constructs of TPB were explored. Genetic testing intention is a necessary first step to genetic testing use. Therefore, the aim of this study is to examine associations between validated measures of mental illness symptoms, patient-reported mental health history, and *BRCA1/2* genetic testing intention in multiethnic women at high risk for breast cancer.

Methods

Sample

From November 2014 to June 2016, the authors approached women during their screening mammography visit at the Avon Foundation Breast Imaging Center at Columbia University Irving Medical Center (CUIMC) in New York. This center provides screening mammography to about 15,000 women per year in the Washington Heights, New York, catchment area, which serves a diverse patient population with a predominantly Medicaid/Medicare payer mix. Participants consented to participate in a survey study, called Know Your Risk: Assessment at Screening (KYRAS) for breast cancer, at the time of screening mammography (McGuinness et al., 2018). The KYRAS survey included the Six-Point Scale (SPS), a family history screener that determines eligibility for *BRCA1/2* genetic testing based on USPSTF guidelines (Joseph et al., 2012; Stewart et al., 2016). Scores greater than 6 on the SPS warrant referral for genetic testing (Stewart et al., 2016). Among those who agreed to be contacted again for future studies, these women were later contacted via telephone for participation in the mental health substudy if they met the following inclusion criteria: aged 18 years or older; met family history criteria for *BRCA1/2* genetic testing, based on the SPS family history screener; spoke English or Spanish; and provided verbal or written informed consent. Participants completed an interviewer-administered survey via telephone in English or Spanish; this survey assessed patient-reported mental health history, current depression and anxiety symptoms, and genetic testing intention. This study was approved by the CUIMC Institutional Review Board.

Measures

The authors collected demographic characteristics, such as age, highest education level, and race/ethnicity, and breast cancer risk factors, including parity, age at first live birth, menopausal status, number of first- and second-degree relatives with breast cancer, and any blood relative who ever tested positive for a *BRCA1/2* gene mutation, based on the SPS family history screener (Stewart et al., 2016). Perceived breast cancer risk was measured with one item that asked, "Compared to other women the same age, do you think your chance of getting breast cancer is: higher, same, or lower?" (Lipkus et al., 2000). The survey also included validated measures of anxiety and depression and patient-reported mental health history. The Center for Epidemiologic Studies Depression Scale (CES-D) is a widely used and validated self-report scale designed to measure symptoms associated with depression experienced in the past week using 20 items (Radloff, 1977). Psychometric equivalence of the CES-D has been previously studied within the heterogeneous population of Hispanic women (Hahn, Kim, & Chiriboga, 2011; McCabe, Vermeesch, Hall, Peragallo, & Mitrani, 2011). The Generalized Anxiety Disorder–7 (GAD-7) is a widely used and validated seven-item screen for generalized anxiety disorder (Terrill, Hartoonian, Beier, Salem, & Alschuler, 2015); Mills et al. (2014) reported that the GAD-7 in Hispanic men and women was reliable and structurally valid with strong internal consistency and reliability ($\alpha = 0.93$). Patient-reported mental illness history was assessed with the following items that were previously used in a national survey on drug use and health (Substance Abuse and Mental Health Services Administration, 2018):

- Have you ever had a serious mental illness or emotional problem? (yes or no)
- Have you ever seen a psychiatrist, psychologist, social worker, or other health professional for a psychological or emotional problem? (yes or no)
- Have you ever stayed overnight or longer in a hospital or treatment facility because of any mental or emotional problem? (yes or no)
- Has a doctor ever given you any medicine for a psychological or emotional problem? (yes or no)

The primary outcome was *BRCA1/2* genetic testing intention (Kessler et al., 2005) and was based on TPB. Using a single-item measure, the authors asked participants, "At the present time, which of the following statements describes your thoughts about having genetic testing for susceptibility to breast cancer?" Responses ranged from 1–6 and included the following:

- "I have not thought about it." (1)
- "I definitely will not get tested." (2)
- "I probably will not get tested." (3)
- "I probably will get tested." (4)
- "I definitely will get tested." (5)
- "I was already tested." (6)

The authors dichotomized genetic testing intention into two groups: those who intended to have genetic testing ("probably/definitely will get tested/already tested," yes) and those who did not intend to have testing ("definitely/probably will not get tested/have not thought about it," no). In addition, five participants reported that they already had genetic testing, which was not validated by medical record review; subsequently, the authors conducted a sensitivity analysis that excluded these five participants. Participants who reported that they were already tested were included in the genetic testing intention (yes) group because the authors were unable to perform a medical record review to determine concordance between self-report and completion of genetic testing.

Data Analysis

Descriptive statistics included relative frequencies for categorical/short scale ordinal variables, and means and standard deviations for normally distributed variables. Differences in categorical or ordinal variables between women who reported genetic testing intention and those who did not were assessed using chi-square, Fisher's exact, or Mantel–Haenszel chi-square tests. Wilcoxon rank-sum tests assessed differences between intention and mental illness scales. Bivariate analysis of genetic testing intention included patient characteristics, such as age, education, race, ethnicity, breast cancer risk factors, validated mental illness symptom measures, and patient-reported mental health characteristics. For variables from bivariate analyses that yielded p values less than 0.2 or that were clinically important predictors of breast cancer risk, the authors devised an initial multiple logistic regression model with GAD-7 and CES-D continuous scores and patient-reported mental illness variables, adjusting for covariates, with intention for genetic testing as the dichotomous dependent variable. The authors then devised a second model with GAD-7 and CES-D continuous scores and patient-reported mental illness variables and adjusted for age and education level. A monitored stepwise procedure for which

the variable in the subset yielding the greatest p value exceeding 0.05 was eliminated first. This approach was iterated until the final model included only variables with p values less than 0.05 with the retained mental health variables. Analyses were conducted using SAS, version 9.4.

TABLE 1. Comparison of High-Risk Women Meeting Eligibility Criteria for *BRCA1/2* Genetic Testing Who Participated in the Mental Health Substudy Versus Those Who Did Not

	Participated in Substudy (N = 100)		Did Not Participate in Substudy (N = 267)		
Characteristic	**$\bar{X}$**	**SD**	**$\bar{X}$**	**SD**	**p**
Age (years)	60.65	11.79	58.13	11.05	0.06
Six-Point Scale score	8.76	4.69	9.15	4.27	0.45
Characteristic	**n**	**%**	**n**	**%**	**p**
Education					0.03
High school or less	59	59	124	46	
More than high school	41	41	143	54	
Race/ethnicity					0.44
Hispanic	73	73	174	65	
Non-Hispanic White	15	15	59	22	
Non-Hispanic Black	8	8	25	9	
Asian/other	4	4	9	4	
Age at first live birth (years)					0.23
No live births or missing	14	14	45	17	
Younger than 20	28	28	63	24	
20–24	28	28	76	28	
25–29	21	21	39	15	
30 or older	9	9	44	16	
Breast cancer risk perception[a]					0.01
Much higher	34	34	38	20	
About the same	42	42	112	58	
Much lower	23	23	42	22	
First-degree relatives with breast cancer[b]					0.63
1 or more	51	52	116	55	
0 or do not know	47	48	95	45	
Blood relatives ever tested positive for a breast cancer gene mutation					0.11
Yes	12	12	49	18	
No	63	63	142	53	
Do not know	25	25	76	28	

[a] 1 response was missing from the 100 participants who participated in the substudy, and 75 responses were missing from the 267 who did not participate in the substudy.
[b] 2 responses were missing from the 100 who participated in the substudy, and 56 responses were missing from the 267 who did not participate in the substudy.
Note. Because of rounding, percentages may not total 100.
Note. Data are missing because some participants chose not to respond.
Note. Scores greater than 6 on the Six-Point Scale warrant referral for genetic testing.

TABLE 2. Characteristics of the Women Who Were Eligible for *BRCA1/2* Genetic Testing by Their Genetic Testing Intention (N = 100)

	Genetic Testing Intention				
	Yes (N = 76)		No (N = 24)		
Characteristic	**$\bar{X}$**	**SD**	**$\bar{X}$**	**SD**	**p**
Age (years)	58.74	10.88	66.71	12.72	0.007
CES-D score	15.39	12.47	8.13	7.79	0.009
GAD-7 score	5.63	6.23	1.46	2.25	0.004
Six-Point Scale score	9.13	4.92	7.58	3.68	0.266
Characteristic		**n**		**n**	**p**
Education					0.014
High school or less		50		9	
More than high school		26		15	
Race/ethnicity					0.031
Hispanic		60		13	
Non-Hispanic White		7		8	
Non-Hispanic Black		6		2	
Asian/other		3		1	
Age at first live birth (years)					0.312
No live births		8		6	
Younger than 20		24		4	
20–24		22		6	
25–29		16		5	
30 or older		6		3	
Menopausal status					0.291
Pre- or perimenopausal		17		2	
Postmenopausal		59		22	
First-degree relatives who had breast cancer[a]					0.101
1 or more		42		9	
0		32		15	
Blood relatives tested positive for breast cancer gene mutation					0.061
Yes		11		1	
No		43		20	
Do not know		22		3	
Breast cancer risk perception[b]					0.599
Much higher		26		8	
About the same		30		12	
Much lower		19		4	
CES-D score[c]					0.009
High (clinically significant)		32		3	
Low (not clinically significant)		40		21	
GAD-7 score					0.004
No anxiety		43		21	
Mild anxiety		14		3	

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TABLE 2. Characteristics of the Women Who Were Eligible for *BRCA1/2* Genetic Testing by Their Genetic Testing Intention (N = 100) *(Continued)*

	Genetic Testing Intention		
	Yes (N = 76)	No (N = 24)	
Characteristic	**n**	**n**	**p**
GAD-7 score *(continued)*			0.004
Moderate anxiety	10	0	
Severe anxiety	9	0	

[a] 2 missing responses in the yes group
[b] 1 missing response in the yes group
[c] 4 missing responses in the yes group
CES-D—Center for Epidemiologic Studies Depression Scale; GAD-7—Generalized Anxiety Disorder–7
Note. Data are missing because some participants chose not to respond.
Note. Total scores on the CES-D range from 0–60. A score of 16 or higher was used as the cut-off point for clinically significant depressive symptoms. Total scores on the GAD-7 range from 0–21. Scores of 5–9 indicate mild anxiety, 10–14 moderate anxiety, and 15–21 severe anxiety. Scores greater than 6 on the Six-Point Scale warrant referral for genetic testing.

Findings

Participant Characteristics

Among 18,502 women who had screening mammography at CUIMC from November 2014 to June 2016, 3,558 (19%) were approached for participation in the KYRAS survey study and 3,055 (86% of total approached) enrolled (McGuinness et al., 2019). Demographic characteristics of the enrolled women were similar to the entire screened population, based on electronic health record data (Jiang et al., 2019). Of these women, the authors found that 369 (12%) were eligible for *BRCA1/2* genetic testing according to the SPS family history screener. Of these, 269 either declined, were unable to be reached by telephone, or were missing data. Among women eligible for *BRCA1/2* genetic testing, 100 women were contacted a median of 171 days (range = 50–288) after enrollment in the KYRAS parent study and agreed to participate in the mental health substudy. A comparison of baseline characteristics of KYRAS participants eligible for genetic testing who enrolled in the substudy compared to those who did not is shown in Table 1. Results revealed that education level and breast cancer risk perception differed between participants who enrolled in the mental illness substudy and those who did not. Women who participated in the mental illness substudy had higher breast cancer risk perception compared to those who did not (34% versus 20%).

Baseline characteristics for the 100 evaluable women are shown in Table 2. Participants had a mean age of 60.65 years (SD = 11.78). The majority were Hispanic (73%), and 59% had no more than a high school education. More than 85% were parous, and more than 80% were postmenopausal. About half of the participants had one or more first-degree relatives who had breast cancer (51%), and few women had a personal history of breast cancer (n = 6) or ovarian cancer (n = 6). Twelve percent of women reported that they did have a blood relative who had tested positive for a *BRCA1/2* gene mutation.

Bivariate Analyses

Among all evaluable participants, the majority reported that they intended to complete genetic testing (76%). More specifically, 5% were already tested, 37% reported that they would definitely get genetic testing, 34% reported they would probably get tested, 9% reported they would probably not get tested, 8% reported they will definitely not get tested, and 7% said they had not thought about it. In an unadjusted analysis, the authors found that women who reported genetic testing intention (yes) were younger ($\bar{X}$ age of 58.74 years versus 66.71 years, p = 0.007), more likely to have a high school education or less (66% versus 38%, p = 0.014), and more likely to be Hispanic (79% versus 55%, p = 0.031). In addition, on the validated screening measures, women who intended to complete genetic testing had higher mean depression scores on the CES-D (15.39 versus 8.13, p = 0.009) and higher anxiety scores on the GAD-7 (5.63 versus 1.46, p = 0.004) compared to those who did not. From the patient-reported mental illness variables (see Table 3), 32% of the participants reported that they had a serious mental illness or emotional problem; 53% had ever seen a psychiatrist, psychologist, social worker,

or other health professional for a psychological or emotional problem; 12% had ever stayed overnight or longer in a hospital or treatment facility because of any mental or emotional problem; and 41% had ever been prescribed medicine for a psychological or emotional problem. In bivariate analyses, the authors found that women who intended to complete genetic testing were more likely to report having a serious mental illness or emotional problem (40% versus 8%, p = 0.004); ever seeing a psychiatrist, psychologist, social worker, or healthcare professional for a psychological or emotional problem (62% versus 25%, p = 0.001); and ever being prescribed medicine for a psychological or emotional problem (47% versus 21%, p = 0.021) compared to those who did not.

Multivariate Analyses

In the multivariate logistic regression model (see Table 4), the authors present associations between validated mental illness measures, patient-reported mental health history, and genetic testing intention after controlling for age, education, race/ethnicity, and breast cancer risk factors. The authors found no statistically significant associations between validated mental illness measures of anxiety and depression, patient-reported mental illness, and genetic testing intention when adjusted for known confounders. Younger age was the only covariate that was significantly associated with genetic testing intention in the initial model. For the second model that included fewer covariates, younger age and less education remained statistically significant. Results for the sensitivity analysis were similar: Younger age and less education remained statistically significant.

Discussion

In the current study, the authors demonstrated that, among a predominantly Hispanic population undergoing screening mammography who met eligibility criteria for *BRCA1/2* genetic testing, intentions to complete *BRCA1/2* genetic testing for breast cancer risk were high. However, completion of genetic testing was low, with only 5% reporting previously having genetic testing performed. The authors also found a high prevalence of patient-reported mental illness among this multiethnic cohort. In addition, women who intended to complete genetic testing had higher mean depression scores on the CES-D and higher anxiety scores on the GAD-7. Despite this high prevalence of mental illness, a majority (76%) of the participants reported that they intended to complete *BRCA1/2* genetic testing.

TPB was useful in understanding genetic testing intention because the theory posits that one's intention is an indicator of readiness to perform the

TABLE 3. Associations Between Patient-Reported Mental Illness History and Genetic Testing Intention

	Genetic Testing Intention		
	Yes (N = 76)	No (N = 24)	
Variable	n	n	p
Ever had a serious mental illness or emotional problem			0.004
Yes	30	2	
No	46	22	
Ever seen a psychiatrist, psychologist, social worker, or other health professional for a psychological or emotional problem			0.001
Yes	47	6	
No	29	18	
Ever stayed overnight or longer in a hospital or treatment facility because of any mental or emotional problem			0.283
Yes	11	1	
No	65	23	
Ever been prescribed medicine for a psychological or emotional problem			0.021
Yes	36	5	
No	40	19	

behavior—in this case, *BRCA1/2* genetic testing. Of note, among women who intended to have *BRCA1/2* testing performed, 40% reported that they had a serious mental illness or emotional problem and 62% had ever seen a mental healthcare provider for a psychological problem, highlighting the role of psychological functioning in genetic testing. This high prevalence of mental health problems and low completion of *BRCA1/2* genetic testing is likely explained by lower socioeconomic status and high stress experienced by racial and ethnic minority women. The current findings are consistent with a previous study (González-Ramírez et al., 2017) that found that 16% of Mexican women undergoing genetic counseling for HBOC had depressive symptomology and 29% had anxious symptomology. Those results suggest that anxious and depressive symptomatology, worries, grief, and sleep problems affect the well-being of participants undergoing genetic counseling. Similar to the current findings, a study by Holden, Ramirez, and Gallion (2014) of 117 Latina breast cancer survivors showed that 32% had CES-D scores above the threshold, about three times those of the general population. Cancer screening rates were extremely low among

TABLE 4. Logistic Regression Models Assessing Associations With Genetic Testing Intention (N = 100)

	Model 1			Model 2		
Variable	**OR**	**95% CI**	**p**	**OR**	**95% CI**	**p**
Validated mental health measures						
CES-D score	0.967	[0.878, 1.066]	0.5000	0.981	[0.904, 1.065]	0.6482
GAD-7 score	1.220	[0.890, 1.674]	0.2165	1.182	[0.926, 1.509]	0.1784
Patient-reported mental health characteristics						
Ever had a serious mental illness or emotional problem	3.228	[0.254, 40.994]	0.3661	2.471	[0.293, 20.830]	0.4057
Ever seen a psychiatrist, psychologist, social worker, or other health professional for a psychological or emotional problem	2.031	[0.273, 15.139]	0.4892	3.102	[0.596, 16.136]	0.1785
Ever stayed overnight or longer in a hospital or treatment facility because of any mental or emotional problem	1.039	[0.037, 29.549]	0.9820	1.391	[0.091, 21.248]	0.8125
Ever been prescribed medicine for a psychological or emotional problem	0.379	[0.033, 4.309]	0.4339	0.399	[0.055, 2.886]	0.3629
Covariates						
Age (years)	0.924	[0.858, 0.994]	0.0333	0.935	[0.888, 0.985]	0.0117
Education (high school or less = 0, more than high school = 1)	0.190	[0.027, 1.364]	0.0987	0.260	[0.079, 0.854]	0.0264
Hispanic race/ethnicity[a]	1.850	[0.146, 23.445]	0.6349	–	–	–
Non-Hispanic Black race/ethnicity[a]	0.742	[0.020, 27.113]	0.8709	–	–	–
Asian/other non-Hispanic race/ethnicity[a]	0.838	[0.019, 37.840]	0.9275	–	–	–
Breast cancer risk factors						
Breast cancer risk perception	0.639	[0.225, 1.815]	0.4008	–	–	–
Number of first-degree relatives who had breast cancer	2.847	[0.690, 11.746]	0.1478	–	–	–
Blood relatives ever tested positive for a breast cancer gene mutation (no = 0, yes = 1)	2.017	[0.179, 22.690]	0.5699	–	–	–

[a] Reference: Non-Hispanic White race/ethnicity
CES-D—Center for Epidemiologic Studies Depression Scale; CI—confidence interval; GAD-7—Generalized Anxiety Disorder–7; OR—odds ratio
Note. Model 1 included CES-D total score, GAD-7 total score, patient-reported mental illness variables, and adjusted covariates (age, education, race/ethnicity, risk perception, number of relatives with breast cancer, and relatives who ever tested positive for a cancer gene mutation). Model 2 included CES-D total score, GAD-7 total score, patient-reported mental illness variables, and adjusted for covariates (age and education).

this cohort, with only 5 (4%) women who screened for ovarian and colorectal cancers. The authors concluded that depressive symptoms may be a barrier to cancer screening.

Although the current authors found bivariate associations between validated measures of anxiety and depression, patient-reported mental illness, and genetic testing intention, mental illness variables were not significantly associated with genetic testing intention in the multivariate adjusted analysis. Instead, only younger age and lower education level were associated with genetic testing intention. Consistent with previous studies, patients who undergo genetic testing tend to be younger (Ayme et al., 2014). This sample was predominantly Hispanic, and the majority had less than a high school education. The authors found that education level was inversely associated with intention to have genetic testing performed. This finding is consistent with another study (Jones et al., 2016) that found an inverse relationship between education level and *BRCA1/2* genetic testing; however, that study did not include women of Hispanic ethnicity. One possible explanation for this finding is that women of Hispanic ethnicity with lower education levels may have a trusting relationship with their healthcare providers and be more likely to follow through with their providers' recommendations to have genetic testing performed, when healthcare system–related barriers are removed. In this same KYRAS screening cohort, the authors found that Hispanic women underwent more frequent screening mammography compared to non-Hispanic Whites, despite having lower breast cancer risk (McGuinness et al., 2018). Previous research of intention to pursue genetic testing for HBOC risk has found that attitudes and beliefs about genetic testing are a significant predictor of intention (Braithwaite, Sutton, & Steggles, 2002; Kessler et al., 2005). Future research can include constructs from the TPB as a framework to understand barriers to the low completion of genetic testing that the authors observed in the current study of primarily Hispanic women at high risk for breast cancer; this population may have unique needs and require additional support to remove barriers to completion of genetic testing.

About 25% of patients who attend genetic counseling experience clinically significant levels of anxiety, and anxiety levels have been associated with decision making and adherence to screening methods and to risk-reduction measures (González-Ramírez et al., 2017). Psychoeducation, a form of psychosocial intervention, has been well documented in the literature to improve coping among individuals with mental illness (Bevan Jones et al., 2018). Future studies are needed to explore whether the use of psychoeducation during genetic counseling and testing sessions could reduce anxiety levels among women who intend to complete genetic testing. To increase *BRCA1/2* genetic testing, more efficient models of genetic counseling, such as telephone-based counseling, telemedicine counseling, and group counseling, could be used to facilitate greater access to genetic testing services.

KNOWLEDGE TRANSLATION

- Healthcare providers, particularly nurses, should be aware of the high prevalence of patient-reported mental illness diagnosis and anxiety and depression symptoms among predominantly Hispanic women who meet family history criteria for *BRCA1/2* genetic testing.
- Women who were younger and less educated were more likely to intend to complete *BRCA1/2* genetic testing; however, interventions are needed to support women during the process from intention to actual completion of *BRCA1/2* genetic testing.
- Screening women's mental health and providing psychosocial support for mental illness diagnosis, such as anxiety and depression, may increase the rate of those who complete *BRCA1/2* genetic testing.

Limitations

Several limitations of this study warrant discussion. The study was conducted at a single institution with a relatively small sample of primarily Hispanic women undergoing mammography screening, and the findings may not be generalizable to other populations geographically or to those who do not seek mammography. Multigene panel testing is the standard of care; however, the study was limited to *BRCA1/2* genetic testing intention. Mental illness history was based on self-report from patients, and the authors were unable to confirm clinical diagnosis of mental illness via medical record review. However, the authors included validated measures of anxiety and depression. The study assessed prior completion of *BRCA1/2* genetic testing in the survey. However, only five participants reported having completed genetic testing, and the authors were unable to confirm genetic testing via medical record review; therefore, these women were included in the genetic testing intention (yes) group. In addition, the theoretical framework focused on intention, and a further limitation is that intention may not lead to completion; other constructs of this theory can be explored in

future studies. Of note, although intentions to have genetic testing were high, other possible barriers affecting uptake of genetic testing include lack of systematic family history screening with a screening tool, such as the SPS, at the mammography site to identify appropriate candidates and refer them to have genetic counseling or testing and limited access to cancer genetic services.

Implications for Nursing

The current study indicates that the majority of Hispanic women with self-reported mental illness who are at high risk of developing breast cancer have high intentions of completing *BRCA1/2* genetic testing. The findings indicate that healthcare providers, particularly nurses, should be aware of the high prevalence of mental illness among Hispanic women who meet family history criteria for *BRCA1/2* genetic testing. Although genetic testing intention was high, very few Hispanic women completed *BRCA1/2* testing. Because of the underuse of *BRCA1/2* genetic testing among women at high risk who are eligible for testing, healthcare providers, particularly nurses, should be aware of barriers impeding completion of genetic testing, particularly for racial and ethnic minorities who experience cancer health disparities. Nurses should be aware that Hispanic women with a personal history of mental illness and high anxiety or depression levels may require additional psychosocial support to facilitate completion of genetic testing. Healthcare providers, particularly nurses, who are on the frontline of health care, are well positioned to identify women who are eligible for genetic testing through family history screening, to assess mental health status, and to provide psychosocial support. Prior to genetic testing, mental health history should be considered because individuals with a psychiatric history may be at greater risk for anxiety post–genetic testing (Hirschberg, Chan-Smutko, & Pirl, 2015). Useful screening tools, such as the psychosocial aspects of hereditary cancer questionnaire and the psychological health interview, assess psychosocial functioning of individuals who intend to undergo genetic counseling and testing (González-Ramírez et al., 2017). These tools may facilitate greater completion of genetic testing, particularly among multiethnic women, who are more likely to experience cancer health disparities.

Conclusion

High-risk multiethnic women who had a high prevalence of anxiety or depression had high intentions of completing *BRCA1/2* genetic testing, but actual reported completion of genetic testing was low. Although mental illness was not significantly associated with *BRCA1/2* genetic testing intention after adjusting for covariates, healthcare providers' attempt to increase completion of *BRCA1/2* genetic testing among high-risk multiethnic women should include assessment of mental health status and other competing barriers at the patient, provider, and healthcare system level. Addressing psychosocial needs, such as anxiety and depression, in women at high risk for breast cancer may increase the rate of those who intend to have *BRCA1/2* genetic testing.

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