Spiritual Faith and Genetic Testing Decisions among High-Risk Breast Cancer Probands[1]

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Abstract

Despite widespread access to genetic testing for the *BRCA1* and *BRCA2* breast cancer susceptibility genes, little is known about rates or predictors of test use among individuals from newly ascertained high-risk families who have self-referred for genetic counseling/testing. The objective of this study was to examine rates of test use within this population. In addition, we sought to determine whether spiritual faith and psychological factors influenced testing decisions. Participants were 290 women with familial breast cancer. All were offered genetic counseling and testing for alterations in the *BRCA1* and *BRCA2* genes. Baseline levels of spiritual faith, cancer-specific distress, perceived risk, and demographic factors were examined to identify independent predictors of whether participants received *versus* declined testing. The final logistic model revealed statistically significant main effects for spiritual faith [odds ratio (OR), 0.2; 95% confidence intervals (CIs), 0.1 and 0.5] and perceived ovarian cancer risk (OR, 2.4; 95% CIs, 1.3 and 4.7) and a statistically significant spiritual faith by perceived risk interaction effect. Among women who perceived themselves to be at low risk of developing breast cancer again, those with higher levels of spiritual faith were significantly less likely to be tested, compared with those with lower levels of faith (OR, 0.2; 95% CIs, 0.1 and 0.5). However, among women with high levels of perceived risk, rates of test use were high, regardless of levels of spiritual faith (OR, 1.2; 95% CIs, 0.4 and 3.0). These results highlight the role that spirituality may play in the decision-making process about genetic testing.

Introduction

The *BRCA1* and *BRCA2* genes are believed to account for most HBC[3] cases (1). Among women affected with breast cancer, inherited mutations in *BRCA1* or *BRCA2* are associated with a significantly increased risk of developing new primary cancers (2–4). Preliminary reports suggest that 40–80% of HBC family members elect to learn their genetic status for *BRCA1/2* (5, 6), with somewhat higher rates among persons with cancer as compared with those who are unaffected (5). However, these reports were based on a few large HBC families, most of whom were members of hereditary cancer registries and participants in prior genetics research. These participants may not be representative of newly ascertained individuals who self-refer for genetic counseling (5). In the present study, we evaluated *BRCA1/2* test use among women who had self-referred to a free genetic counseling/testing research program. The study focused on women who were affected with breast cancer, because standard clinical practice is to first screen for mutations among a likely carrier in the family before proceeding to unaffected relatives.

A novel goal of this study was to explore the role of spirituality in testing decisions. Although spirituality has been linked to the avoidance of health risk behaviors (7) and decreased mortality for a variety of diseases (8), little is known about its effects on medical decision making or on genetic testing, in particular. However, research and theory on coping with illness suggests that spirituality may actually deter participation in genetic testing for cancer risk. For example, research has shown that highly spiritual individuals are more optimistic (7), have greater acceptance of their cancer diagnoses (9), and are more likely to attribute health threats to external forces than to factors such as heredity (10). Thus, a woman with breast cancer who is highly spiritual may question the need for genetic testing because she accepts her condition and believes that whether she becomes ill or not is out of her hands. This is consistent with a previous study showing an inverse relationship between spirituality and interest in prenatal testing (11). Therefore, we hypothesized that highly spiritual individuals would be less likely than less spiritual individuals to receive *BRCA1/2* testing.

The present study also focused on cancer-specific distress and perceived risk, two psychological variables that have been implicated in *BRCA1/2* testing decisions. Perceived risk and cancer-specific distress have predicted intentions to obtain *BRCA1/2* testing (12). For example, among women from HBC families, we found that cancer-specific distress predicted *BRCA1/2* test use (13). Similarly, in a recent study, both perceived risk and cancer worries were associated with genetic testing for colorectal cancer susceptibility (14). Therefore, in

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[3] The abbreviations used are: HBC, hereditary breast cancer; CARE, Cancer Assessment and Risk Evaluation; OR, odds ratio; CI, confidence interval.

the present study, we predicted that perceived risk and cancer-specific distress would increase the likelihood of *BRCA1/2* testing, whereas spirituality would reduce test use.

Materials and Methods

Participants. Participants were 290 adult breast cancer patients (probands) who had self-referred to the CARE program at the Lombardi Cancer Center. To be eligible, participants were required to have a family history of breast/ovarian cancer that resulted in a minimum 20% prior probability of having a *BRCA1/2* mutation (15). If a risk-conferring mutation was identified in the proband, then enrollment in the CARE program was extended to other family members. However, the present report is limited to the first 290 probands to enter CARE.

Procedures. Probands who contacted the CARE program were screened by telephone to determine eligibility. Eligible probands completed a structured telephone interview that assessed sociodemographics, cancer family history, spirituality, perceived risk, and psychological distress. Following this interview, participants were invited to a pretest education session with a genetic counselor. Information provided to probands during this 1.5–2-h session included qualitative risk assessments based on their personal and family history, details about the process of testing for *BRCA1/2* mutations and interpretation of test results, cancer risks associated with *BRCA1/2* mutations, options for cancer prevention and surveillance (based on published guidelines; Ref. 16), details about the benefits and risks/limitations of testing, and details about the possible psychosocial impact of testing.

Following the educational session, participants were offered the opportunity to provide a blood sample for *BRCA1/2* mutation testing after providing written consent. When a participant's test result became available, the participant was invited to a disclosure/counseling session. Participants could decline to continue at any point in the process (*i.e.*, before education, after education, or before the receipt of test results). Thus, uptake was defined as the actual receipt of *BRCA1/2* test results.

Measures

Predictor Variables. All predictor variables were assessed at baseline (*i.e.*, before the education session and the offer of *BRCA1/2* testing).

Sociodemographics. We assessed age, race, religion, education, and marital status.

Family History of Cancer. We assessed the number of first-degree relatives (*i.e.*, parents, siblings, children) who were affected with breast and/or ovarian cancer. We dichotomized family history as one to two affected relatives *versus* three or more affected relatives.

Spirituality. Spirituality was assessed with the following item adopted by the NIH Cancer Genetics Studies Consortium: "How strong would you say your religious or spiritual faith is?" Participants responded using a four-point Likert scale ranging from not very strong to very strong. To create groups of as close to equal in size as possible, we dichotomized this item into very strong ($n = 123$) *versus* not very strong/a little strong/moderately strong ($n = 167$).

Cancer-specific Distress. We used The Intrusion Subscale of the Impact of Events Scale (17) to measure the frequency and severity of intrusive thoughts, worries, and feelings about being at increased risk for breast and ovarian cancer. Responses were on a Likert scale ranging from not at all to often. The seven-item Intrusion subscale had good internal consistency (Cronbach's α, 0.84) and has been used in previous studies to measure cancer-specific distress (13, 18).

Breast Cancer Perceived Risk. We measured perceived risk for breast cancer with the following Likert-style item (19): "In your opinion, compared to other women your age, what are your chances of developing breast cancer again?" (1 = much lower to 5 = much higher). Because responses to this item were not normally distributed, we dichotomized the item as close to the median as possible [much higher ($n = 151$) *versus* somewhat higher/the same/lower ($n = 139$)].

Ovarian Cancer Perceived Risk. We measured perceived risk for ovarian cancer with the following Likert-style item: "In your opinion, compared to other women your age, what are your chances of developing ovarian cancer?" (1 = much lower to 5 = much higher). We dichotomized this item as close to the median as possible [much higher/somewhat higher ($n = 148$) *versus* the same/lower ($n = 142$).

Dependent Variable. We classified test uptake based on whether or not participants underwent testing and received their result *versus* declined testing or test results (*i.e.*, declined to attend the pretest education session, declined to provide a DNA sample, or declined to learn their test result).

Table 1 Demographic, psychosocial, and cancer history characteristics of the study sample

Variable	Levels	Number
Age	<45	91 (31%)
	≥45	199 (69%)
Marital status	Married	212 (73%)
	Unmarried	78 (27%)
Race	Caucasian	276 (95%)
	African American	14 (5%)
Education	<College graduate	74 (26%)
	≥College graduate	216 (74%)
Religion	Catholic	72 (25%)
	Jewish	97 (33%)
	Protestant	91 (31%)
	Other	30 (10%)
Spiritual faith	Not strong/a little strong/ moderately strong	167 (58%)
	Very strong	123 (42%)
Relatives affected with breast and/or ovarian cancer	1–2	239 (82%)
	3+	51 (18%)
Perceived risk for breast cancer	Low	139 (48%)
	High	151 (52%)
Perceived risk for ovarian cancer	Low	142 (49%)
	High	148 (51%)

Results

Sample Characteristics. Sample characteristics are shown in Table 1. The majority of participants were Caucasian, 45 yr of age and older, married, and had a college education. Forty-two percent of participants reported that their spiritual faith was very strong, 52% reported that their risk for developing breast cancer was much higher than an average woman of the same age, and 51% reported that their risk for ovarian cancer was somewhat or much higher than an average woman of the same age.

Table 2 Bivariate associations of sociodemographic variables with *BRCA1/BRCA2* test use

Variable	Levels	% receiving test results	χ^2
Age	<45	82	
	≥45	82	0.01
Marital status	Married	82	
	Unmarried	82	0.00
Race	Caucasian	83	1.13
	African American	71	
Education	<College graduate	77	
	≥College graduate	84	1.72
Religion	Catholic	79	
	Jewish	87	
	Protestant	81	
	Other	77	2.39
Spiritual faith	Not strong/moderately strong	87	
	Very strong	76	6.01[a]
Affected relatives	1–2	82	
	3+	82	0.00
Perceived risk—breast cancer	Low	78	
	High	86	3.47[b]
Perceived risk—ovarian cancer	Low	75	
	High	89	8.53[c]

[a] $P < 0.05$.
[b] $P = 0.06$.
[c] $P < 0.01$.

***BRCA1/2* Uptake.** Of the 290 probands, 82% ($n = 238$) were tested and received results and 18% ($n = 52$) declined testing/results. Of those who declined testing/results, 73% ($n = 38$) declined preliminary education; 15% ($n = 8$) participated in the education session, but declined to provide DNA; and 12% ($n = 6$) provided DNA, but declined subsequently to learn their test result. None of the predictor variables were associated with the stage at which the decision to decline testing/results was made (*i.e.*, before education *versus* after education).

Predictors of Test Use. As shown in Table 2, spiritual faith [χ^2 (1, $n = 290$) = 6.01, $P = 0.01$] and perceived risk for ovarian cancer [χ^2 (1, $n = 290$) = 8.53, $P < 0.01$] were significantly associated with uptake. The association between breast cancer perceived risk and uptake approached significance [χ^2 (1, $n = 290$) = 3.47, $P = 0.06$] and was included in the multivariate modeling.

To identify independent predictors of receipt of *BRCA1/2* test results, we conducted a backwards stepwise logistic regression. All variables with significant bivariate associations with receipt of test results were included in the initial model (spiritual faith, breast cancer perceived risk, and ovarian cancer perceived risk). The spirituality by breast cancer perceived risk and spirituality by ovarian cancer perceived risk interactions were included in the model for exploratory purposes. On Step 1, the spirituality by ovarian cancer perceived risk interaction term was removed from the model [χ^2 change (1, $n = 290$) = 0.14, $P > 0.20$]. None of the remaining variables could be removed from the model. Thus, the final model (see Table 3) included spirituality, ovarian cancer perceived risk, breast cancer perceived risk, and the breast cancer perceived risk by spirituality interaction.

The final ORs revealed that highly spiritual women were 80% less likely to receive test results compared with less spiritual women. Compared with women with low levels of perceived risk for ovarian cancer, those with high perceived risk were about twice as likely to receive *BRCA1/2* test results.

Table 3 Logistic model predicting *BRCA1/2* test uptake

Variables in final model	OR	95% CI	*P*
Spirituality			
Low (referent)	1.0		
High	0.2	0.1, 0.5	0.001
Perceived risk for ovarian cancer			
Low (referent)	1.0		
High	2.4	1.3, 4.7	0.009
Perceived risk for breast cancer			
Low (referent)	1.0		
High	0.6	0.2, 1.6	0.31
Spirituality × breast cancer perceived risk			0.01
Low perceived risk			
Low spirituality (referent)	1.0		
High spirituality	0.2	0.1, 0.5	0.01
High perceived risk			
Low spirituality (referent)	1.0		
High spirituality	1.2	0.4, 3.0	0.76
Variables not in final model[a]			
Spirituality × ovarian cancer perceived risk			0.72

[a] Final model: χ^2 (df = 4, $n = 290$) = 23.5, $P = 0.0001$.

The statistically significant ($P < 0.01$) spirituality by breast cancer perceived risk interaction (see Fig. 1) revealed that among women with high perceived risk for breast cancer, spirituality was unrelated to receipt of test results (OR, 1.2; 95% CIs, 0.4 and 3.0); however, among women with low perceived risk, those with high spirituality were 80% less likely to receive test results (OR, 0.2; 95% CIs, 0.1 and 0.5).

Discussion

Although *BRCA1/2* test use has been evaluated among research registry participants (5), this study is the first to examine test use among newly ascertained high-risk breast cancer probands. Overall, our 82% uptake rate was higher than the rates reported in previous studies (5, 6). This is not surprising because all participants had self-referred to a genetic counseling clinical research program and presumably were more highly motivated to have testing. This higher rate of testing probably reflects what can be expected among initial probands in clinical genetic testing programs. Not surprisingly, the majority of participants who declined testing/results declined to attend the initial education session. These individuals may have decided against testing before the baseline interview or based on the minimal information about the testing process provided at the conclusion of the baseline interview. In contrast, individuals who declined to provide a blood sample after the initial education session may have been dissuaded by the information received during the preliminary education session. Individuals who provided DNA but declined to learn the results of their gene test may have been having some difficulty deciding whether or not to receive test results.

Women who perceived their risk for ovarian cancer to be high, were most likely to be tested. This is not surprising because none of these women had previously been diagnosed with ovarian cancer. For this group, the results of a *BRCA1/2* test could have important implications for decision-making regarding ovarian cancer prevention and surveillance. Thus, women who believe that they are at high risk for ovarian cancer may be particularly motivated to learn their *BRCA1/2* status.

Although the role of spirituality in health and well-being has have received extensive attention (20–22), the present

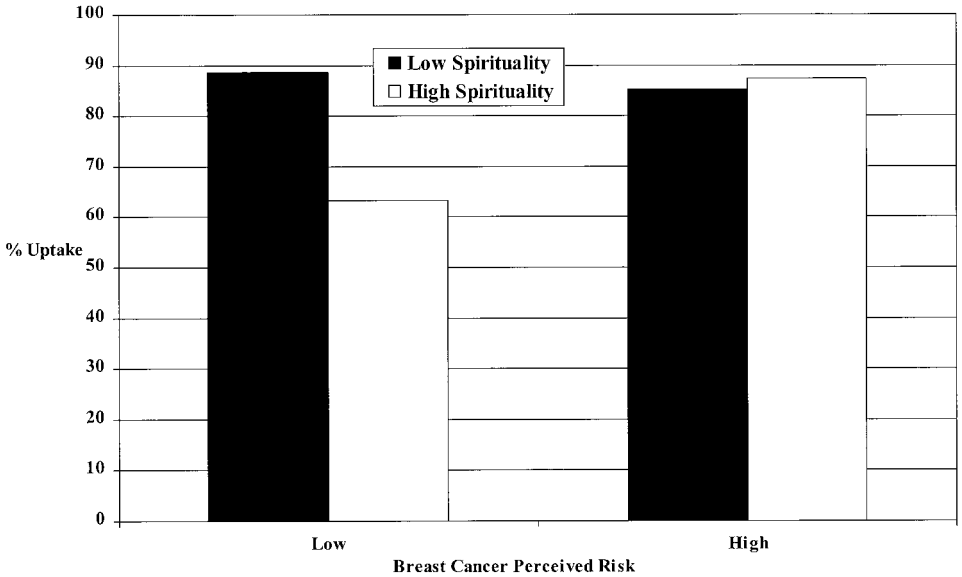

Fig. 1. The impact of perceived risk and spirituality on *BRCA1/2* test uptake.

study is the first to evaluate its influence on genetic testing for cancer susceptibility. The influence of spirituality on testing decisions may be attributable, in part, to the fact that this sample was comprised of individuals who had been previously affected with breast cancer. Previous research has found that spiritual and religious beliefs are used by cancer patients to find meaning in and to facilitate acceptance of their cancer experience (9). Whereas finding meaning may involve attempts to understand the cause of the disease, acceptance involves coming to terms with the fact that it has happened (23, 24). Breast cancer patients with higher levels of spiritual faith may be less likely to receive *BRCA1/2* testing because they are less motivated to understand the cause of their cancer and have greater acceptance.

This effect of spiritual faith on testing decisions was dependent on a woman's perceived risk of developing cancer again. Among women with low levels of perceived risk, those who were highly spiritual were five times less likely to receive test results compared with women with lower levels of spiritual faith. Importantly, spiritual faith did not predict uptake of testing among women who perceived their cancer risk to be high. The modifying influence of perceived cancer risk is consistent with previous research showing that low levels of perceived cancer risk are associated with decreased readiness and interest in genetic testing (25, 26). Thus, women with high spiritual faith and low perceived risk would be least likely to obtain *BRCA1/2* test results. However, as perceived cancer risk increases, motivation to reduce uncertainty may also increase, so that even highly spiritual women overcome their reluctance to obtain test results.

There are a few caveats about these findings. First, this sample was limited to women who self-referred for genetic counseling and agreed to complete a baseline telephone interview. Thus, the 83% uptake rate may be higher than rates of test use in population-based or clinic-based samples in which the denominator includes all eligible women. Second, all study participants were affected with breast cancer and members of high-risk families. Thus, we cannot assume that rates of test use or predictors of use would apply to low risk or unaffected individuals. Third, all testing and counseling was offered free of charge and, therefore, may overestimate levels of uptake in fee-for-service settings. Finally, our measure of spirituality was based on a single item. The use of more sophisticated measures of spirituality could yield a better understanding of the association between spirituality and *BRCA1/2* test use. Nonetheless, the primary finding regarding the role of spirituality in testing decisions is not likely to be influenced by factors such as the cost of testing; however, this may vary among members of different ethnic groups.

Despite these limitations, this study is the first to show that high levels of spiritual faith may deter genetic testing among some women with familial breast cancer. Future research should extend these findings by evaluating the role of spirituality in the testing decisions of unaffected individuals and members of different ethnic groups. Also, additional studies are needed to elucidate the cognitive and emotional correlates of spirituality that may deter genetic testing. Such research is important to better inform clinicians about how and when to incorporate discussions of spirituality into genetic counseling.

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