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## Uptake of *BRCA1/2* Genetic Testing in a Randomized Trial of Telephone Counseling

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### Abstract

**Purpose**—As genetic counseling and testing become more fully-integrated into clinical care, alternative delivery models are increasingly prominent. This study examines predictors of genetic testing for hereditary breast/ovarian cancer among high-risk women in a randomized trial of in-person vs. telephone-based genetic counseling.

**Methods**—Methods include multivariable logistic regression and interaction analyses.

**Results**—Of the 669 participants, 600 completed counseling and 523 received test results. As previously reported, participants randomized to telephone counseling were significantly less likely to be tested. In intention to treat analyses, completion of counseling and testing was associated

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with: race/ethnicity (OR = 1.96, 95% CI: 1.20-3.20), , perceived stress (OR = 0.89, 95% CI: 0.81-0.98, knowledge (OR=1.12, 95% CI: 1.02-1.23), and randomization group (OR = 1.48, 95% CI: 1.01-2.16).. Further, race/ethnicity moderated the association between randomization group and testing, where minority women receiving telephone counseling were least likely to complete testing.

**Conclusion**—Evidence for logistical and communication-based explanations for this interaction are presented. The overall increased access made possible with telephone genetic counseling should be considered in light of the possibility that this may also lead to lower rates of testing among high-risk minority women. Additional care should be taken to assess and address potential barriers when services are delivered by phone.

### Keywords

Cancer; genetic counseling; genetic testing; psychosocial predictors; telephone counseling

## INTRODUCTION

Genetic testing of the *BRCA1* and *BRCA2* (*BRCA1/2*) genes has become standard of care for women at risk for hereditary breast and ovarian cancer (HBOC). While comprehensive genetic counseling is recommended (<sup>1, 2</sup>) this service is not always accessible given the small size and unequal distribution of the genetic counseling workforce (<sup>3</sup>). Thus, in practice, this need may be addressed by having non-geneticist physicians, such as the patient's OB/GYN, primary care doctor, surgeon, or oncologist order *BRCA1/2* testing. The ordering of *BRCA1/2* testing by non-genetics professionals may or may not be accompanied by adequate genetic counseling and result interpretation (<sup>4, 5</sup>). However, an increasingly common alternative approach to service delivery is for genetics professionals to deliver preand/or post-test genetic counseling by telephone (<sup>6-8</sup>). Despite the increasing use of telephone counseling, little is known about how telephone delivery of genetic services impacts the receipt of counseling or uptake of testing.

We recently completed a randomized noninferiority trial that demonstrated that delivering genetic counseling via telephone (TC) led to outcomes that were noninferior to standard in-person genetic counseling (UC or usual care) for HBOC. Specifically, TC was noninferior to UC on knowledge, satisfaction, decisional conflict, quality of life and distress (<sup>9</sup>). In addition, TC yielded a cost savings of \$114 per patient counseled compared to UC (<sup>9</sup>). Although concerns exist regarding potential limitations of or adverse outcomes related to telemedicine generally (<sup>10, 11</sup>) and telephone genetic counseling specifically (<sup>12, 13</sup>), these data support the use of TC as a safe and cost-effective approach to increase access to genetic services for HBOC (<sup>9</sup>).

Notably, however, in this trial we found that women who were randomized to TC were less likely to complete *BRCA1/2* testing than women randomized to UC (<sup>9</sup>). The lower rate of genetic testing for TC participants was replicated in another recent trial comparing telephone and in-person genetic counseling (<sup>14</sup>). There are several plausible explanations for this difference. Since participants who received TC did not have the option of providing DNA for testing immediately after counseling, the built-in delay with TC may have been a barrier

to testing. Alternatively, the delay may have allowed increased time for deliberation among TC participants leading some women to decide not to proceed with testing. Although these structural differences are plausible, it is also possible that unmeasured genetic counseling process differences (e.g., differences in rapport or needs assessment between TC and UC) contributed to this difference.

If telephone delivery of genetic counseling is to be part of the solution to the shortage and uneven distribution of genetics professionals, a better understanding of how TC impacts uptake of genetic testing is needed. The increasing use of panel-based genetic testing for cancer susceptibility only underscores the need for understanding the factors contributing to counseling and test uptake with alternative delivery models, as greater demand is being placed on the professionals delivering this service. Specifically, identifying factors that contribute to the lower uptake of genetic testing following TC could facilitate improved tailoring and delivery of TC. For example, TC may not be uniformly appropriate for all patients, based on their medical, socio-demographic or psychological characteristics.

In this report we examined socio-demographic, medical, and psychosocial predictors of genetic testing uptake and we evaluated whether there were patient-related moderators that contributed to lower genetic testing uptake following TC. Specifically, we tested the following moderator variables based on prior literature<sup>(15, 16)</sup>: knowledge, numeracy, race/ethnicity, education, perceived and objective mutation risk and distress. We examined these putative moderators within both our intention-to-treat (ITT) and per-protocol (PP) samples. The ITT population reflects the comparison between UC and TC with respect to both attending genetic counseling **and** obtaining *BRCA1/2* results, whereas the PP analyses reflect a comparison of test uptake following receipt of in-person vs. telephone genetic counseling.

## MATERIALS AND METHODS

### Participants

Participants were women who were enrolled in a randomized noninferiority trial comparing standard genetic counseling to telephone-based genetic counseling<sup>(9, 17)</sup>. From 2005-2012, we enrolled women who were self- or physician-referred to the genetic counseling programs at the Lombardi Comprehensive Cancer Center (Washington, DC), Icahn School of Medicine at Mount Sinai (New York, NY), University of Vermont Cancer Center (Burlington, VT), and the Dana Farber Cancer Institute (Boston, MA). Eligible participants were women age 21-85 who sought *BRCA1/2* genetic counseling, had not received prior counseling or testing, did not have newly diagnosed or metastatic breast or ovarian cancer, lived within the catchment area of one of our study sites and agreed to be randomized to telephone vs. in-person genetic counseling. As displayed in Figure 1, of 1,057 potentially eligible women, 669 (63.3%) completed a baseline interview and agreed to be randomized to telephone counseling (N=335) vs. in-person counseling (N=334). This report focuses on baseline (i.e., pre-randomization) predictors of the completion of genetic testing within this trial.

## Procedures

Eligible patients completed a pre-counseling telephone interview with a research assistant to collect demographic, cancer history and psychosocial information. Following the interview, we explained the study, obtained verbal consent and randomized consenting participants via computer-generated random numbers to either usual care (in-person genetic counseling; UC) or telephone genetic counseling (TC). The UC and TC interventions are explained in detail in other reports (9, 17). UC participants completed both their initial session and result disclosure session in-person. TC participants completed both sessions by telephone. The study was approved by the Institutional Review Boards of the participating sites.

## Measures

**Socio-demographics**—We assessed age, education, marital status, race/ethnicity, employment and Jewish ancestry. For analysis we treated age as a continuous variable but created binary variables for education (college graduate vs. less than college graduate), marital status (married/partnered vs. unmarried/unpartnered), race/ethnicity (non-Hispanic white vs. racial/ethnic minority), employment (full time vs. less than full time), Jewish ancestry (Jewish vs. non-Jewish).

**Medical History**—We assessed personal and family cancer history in order to calculate an a priori risk score using BRCAPRO (18). We used BRCAPRO score as a single composite of objective risk rather than using individual measures of personal cancer history and breast and ovarian cancer family history (all of which are components of and highly correlated with BRCAPRO score).

**Intentions for risk reducing surgery**—We created a binary variable to reflect baseline intentions for risk reducing mastectomy (RRM) or risk reducing oophorectomy (RRO). Participants who reported that they were not considering RRM or RRO served as the reference group (n=353). This group included: participants who had already had both surgeries (n=24); participants who had one of the surgeries but were not considering the other (n=125); and participants who had neither surgery and were not considering either in the future (n=204). These participants were contrasted with participants who reported that they were considering RRM, RRO or both (n=316).

**Perceived risk of a BRCA mutation**—We measured perceived risk with the following 5-point Likert style item: “In your opinion, how likely is it that you have an altered breast-ovarian cancer gene?” We dichotomized this variable for analysis as “very likely and above” vs. “somewhat likely and below” based on response distribution.

**Perceived risk of breast cancer and perceived risk of ovarian cancer**—We measured perceived risk for breast and ovarian cancer with separate 5-point Likert response items. For both we dichotomized the responses at “very likely and above” vs. “somewhat likely and below” based on response distribution.

**Knowledge**—We measured *BRCA1/2* knowledge with the 27-item Breast Cancer Genetic Counseling Knowledge scale (<sup>19</sup>). Total score was the number of correct responses. Cronbach's alpha for this sample was 0.78.

**Numeracy**—We measured numeracy with Lipkus' 3-item scale (<sup>20</sup>). The number of items answered correctly was summed to create a total numeracy score (range 0–3). Cronbach's alpha was 0.74.

**Decisional Conflict**—We measured decisional conflict regarding *BRCA1/2* testing with the 10-item version of the Decisional-Conflict Scale (DCS) (<sup>21</sup>). Items are scored on a weighted 3-point scale (Yes (0)/Unsure (2)/No (4)) with higher scores indicating greater decisional conflict. We calculated a total score by multiplying the average item score by 25. Cronbach's alpha was 0.82.

**Distress**—We measured cancer-specific distress with the total score on the 15-item Impact of Event Scale (IES) (<sup>20</sup>). Cronbach's alpha was 0.88. We measured global perceived stress with the 4-item version of the Perceived Stress Scale (PSS) (<sup>22</sup>). PSS items are rated on a 5-point Likert scale and summed for a total score. Cronbach's alpha was 0.69.

**Quality of Life**—We measured quality of life with the SF-12 (<sup>23</sup>). The SF-12 has two subscales, the Mental Component Summary (MCS) and the Physical Component Summary (PCS). Higher scores reflect better quality of life. Due to complex scoring procedures we relied on published SF-12 internal consistency data (Cronbach's alpha = 0.86 and 0.87 (<sup>25</sup>)).

## Statistical Analyses

We conducted analyses separately for the intention to treat (ITT) and per protocol (PP) populations. We used t-tests and Chi-square tests to identify bivariate associations with completion of genetic testing in the entire sample (ITT population) and limited to those who completed a genetic counseling session (PP population). To identify independent main effect predictors, we used multiple logistic regression with backward elimination in which we started with all variables with  $p < 0.10$  for bivariate associations with the outcome of interest. To identify variables that modified the association between randomization group and counseling/testing completion we conducted exploratory analyses of the following potential moderator variables: knowledge, numeracy, race/ethnicity, education level, perceived and objective mutation risk and distress (IES and PSS). For each of these putative moderators we conducted separate multiple logistic regressions in which we added the main effect term for the moderator (if not already in the final model) and the group by moderator interaction term to the final main effects model. All analyses were conducted using SAS, version 9.3.

## RESULTS

### Sample Characteristics

The participants were predominantly non-Hispanic white (82.7%), affected with cancer (65.3% with breast or ovarian cancer), college-educated or greater (79.7%), and married (62.3%). Participants had a mean age of 47.7 years ( $SD = 13.4$ ) and had a mean BRCAPRO

risk score of 25.0% (SD = 22.9). The TC and UC groups did not differ significantly on any socio-demographic variables ( $p > .05$ ).

As previously reported, of the 669 participants in the trial, 600 (89.7%) completed an initial genetic counseling session and the TC and UC groups did not differ on genetic counseling participation (UC = 90.4%, TC = 89.0%;  $p=0.53$ )<sup>(9)</sup>. Also as previously reported, 523 participants received genetic testing results representing 78.2% of all participants and 87.2% of participants who completed an initial genetic counseling session. The TC and UC groups differed significantly on genetic testing uptake within the ITT sample (UC=81.4% vs. TC=74.9%;  $X^2$  (N=699) = 4.16,  $df=1$ ,  $p=0.04$ ) and the PP sample (UC=90.1% vs. TC=84.2% ( $X^2$  N=600 = 4.57,  $df=1$ ,  $p=0.03$ ).

### Genetic Counseling and Testing Completion: Intention to Treat Population

As shown in Table 1, significant bivariate predictors of completing genetic testing in the full sample were: being randomized to UC ( $X^2 = 4.16$ ,  $df=1$ ,  $p = 0.042$ ), higher knowledge ( $t=2.80$ ,  $df=667$ ,  $p=0.005$ ), lower perceived stress ( $t = 2.29$ ,  $df=200.68$  (satterthwaite),  $p=0.023$ ), non-Hispanic white race/ethnicity ( $X^2=6.48$ ,  $df=1$ ,  $p=0.011$ ) and higher education ( $X^2=5.76$ ,  $df=1$ ,  $p=0.016$ ). Jewish ancestry ( $X^2 = 3.39$ ,  $df=1$ ,  $p = 0.066$ ) and being married/partnered ( $X^2 = 3.03$ ,  $df=1$ ,  $p=0.082$ ) were marginally associated with completing genetic counseling and testing.

To identify independent main effect predictors of completing genetic counseling and testing, we included all variables with  $p<0.10$  for bivariate associations with genetic counseling/testing completion in the initial step of a backward elimination procedure for the logistic regression model. The following variables remained in the final model indicating that they were independently associated with the completion of *BRCA1/2* genetic counseling and testing: non-Hispanic white race/ethnicity (OR = 1.96, 95% CI: 1.20-3.20), perceived stress (OR = 0.89, 95% CI: 0.81-0.98), knowledge (OR = 1.12, 95% CI: 1.02-1.23) and randomization group (OR = 1.48, 95% CI: 1.01-2.16) (Table 2). Participants randomized to UC, those with higher knowledge, lower perceived stress and non-Hispanic white participants were more likely to complete genetic counseling and *BRCA1/2* testing.

We tested the following patient variables as potential moderators of the association between randomization group and completion of genetic testing: race/ethnicity, knowledge, education, numeracy, distress and objective and perceived risk for carrying a *BRCA1/2* mutation. We tested each of the potential moderators separately by adding their main effect term (if not already in the model) and the randomization group by moderator interaction term to the final main effect model described above. Only the group by race/ethnicity interaction approached statistical significance ( $p=.054$ ). As displayed in Figure 2, within the UC group, 76.2% of minority participants completed counseling and *BRCA1/2* testing compared to 82.1% of non-Hispanic white participants (OR=0.88, 95% CI: 0.40-1.94). Within the TC group, 53.1% of minority participants completed counseling and *BRCA1/2* testing compared to 78.9% of non-Hispanic white participants (OR=0.33, 95% CI: 0.17-0.62).

## Genetic Testing Among Those Who Completed a Counseling Session: Per Protocol Population

As displayed in Table 1, significant bivariate predictors of *BRCA1/2* testing among those who completed a genetic counseling visit were: randomization to UC ( $X^2 = 4.57$ ,  $df=1$ ,  $p = 0.033$ ), higher knowledge ( $t = -2.56$ ,  $df=598$ ,  $p=0.011$ ), Jewish ancestry ( $X^2 = 3.01$ ,  $df=1$ ,  $p = 0.083$ ), being married/partnered ( $X^2 = 5.14$ ,  $df=1$ ,  $p=0.023$ ), intentions for risk reducing surgery ( $X^2 = 4.91$ ,  $df=1$ ,  $p = 0.027$ ) higher objective risk as measured by BRCAPRO score ( $t=-2.69$ ,  $df=598$ ,  $p=0.007$ ) and non-Hispanic white race/ethnicity ( $X^2 = 3.38$ ,  $df=1$ ,  $p=0.066$ ).

As above, we included all variables with  $p<0.10$  for bivariate associations with genetic testing in the initial step of a backward elimination procedure for the logistic regression model. The following were independently associated with utilization of *BRCA1/2* genetic testing: marital status (OR = 1.85, 95% CI: 1.12-3.08), BRCAPRO probability (OR = 1.22, 95% CI: 1.06-1.41), knowledge (OR = 1.13, 95% CI: 1.00-1.27), and randomization group (OR = 1.65, 95% CI: 1.00-2.72) (Table 2). The odds of undergoing *BRCA1/2* testing were higher for participants who were married, had higher objective risk, greater knowledge and were randomized to UC.

We evaluated the same potential moderator variables as above. Only the race/ethnicity by group interaction was statistically significant ( $p=.028$ ; data for null-interactions not presented). As displayed in Figure 3, among participants who completed an in-person genetic counseling session, race/ethnicity was not associated with undergoing *BRCA1/2* testing. Specifically, 94.2% of minority participants completed *BRCA1/2* testing compared to 89.4% of non-Hispanic white participants (OR = 2.75, 95% CI: 0.61-12.50). In contrast, race/ethnicity was significantly associated with testing among participants who completed a TC session with 68.4% of minority participants completing *BRCA1/2* testing compared to 87.0% of non-Hispanic white participants (OR=0.41, 95% CI: 0.18-0.92).

## DISCUSSION

The goal of this report was to better understand the lower rate of genetic testing completion among women who received telephone-based *BRCA1/2* counseling compared to women who received standard in-person counseling. We examined this question within our ITT and PP samples. It is particularly important to evaluate this question in both samples because the ITT population included all randomized participants regardless of whether they completed a genetic counseling session, and therefore reflects the comparison between UC and TC with respect to both attending genetic counseling **and** obtaining *BRCA1/2*. In contrast, the PP analyses were limited to participants who completed a genetic counseling session as assigned, and therefore reflects a comparison of test uptake following receipt of in-person vs. telephone genetic counseling.

Within the ITT population, independent predictors of genetic testing were: randomization group, race/ethnicity, perceived stress and knowledge. Within the PP population, independent predictors were: randomization group, knowledge, marital status and objective mutation risk. The fact that knowledge was a predictor in both populations suggests that

knowledge prior to counseling may be a facilitator of attending counseling and of choosing to be tested following counseling. Knowledge did not interact with group assignment in either analysis. Similarly neither education nor numeracy interacted with group assignment, indicating that the impact of prior knowledge, education and numeracy were comparable for in person and telephone counseling.

Predictors that differed in the ITT and PP populations included objective risk, perceived stress, and marital status. Objective risk was associated with getting tested only among participants who completed a genetic counseling session. This suggests that the decision about whether to proceed with testing is appropriately influenced by knowledge of objective risk that is conveyed through genetic counseling. In contrast, perceived stress was associated with a decreased likelihood of completing genetic testing in the ITT but not PP analyses. This may suggest that perceived stress serves as a barrier to participating in counseling but became less important after counseling. Perhaps women who were experiencing moderate stress avoided the potential added stressor of genetic counseling. This is consistent with previous data highlighting the roles of stress and avoidant coping as barrier to completing the HBOC genetic testing process (26). Lastly, being married/partnered was associated with getting tested only among participants who completed a genetic counseling session. This suggests that the life-cycle stability of long-term partnership may create a more conducive environment for pursuing *BRCA1/2* testing and the subsequent risk-management decision-making (27, 28).

Neither perceived stress nor objective risk interacted with group assignment suggesting that the effects of these variables were comparable in both TC and UC; interactions with marital status were not tested.

Given our previously reported difference in genetic testing uptake between the two groups (9), a key aim of this report was to explore moderators that could help to explain this unexpected difference. The only variable that moderated the association between group and genetic testing uptake was race/ethnicity. Compared to non-Hispanic white participants, minority participants were significantly less likely to undergo *BRCA1/2* testing when randomized to the telephone counseling and when limited to participants who completed an initial genetic counseling session but were no less likely than whites to be tested when randomized to in-person counseling or when limited to those who completed an in-person counseling session. The differential impact of race between UC and TC largely accounts for the overall uptake difference between these groups. Previous studies have reported lower rates of *BRCA1/2* testing for minority participants receiving standard in-person genetic counseling and testing (15, 29, 30) and have speculated on the contribution of access and awareness to decreased uptake. However, our sample focused on women who had self-referred for genetic counseling. Thus, our data suggest that the lower rate of counseling and testing in minority women cannot be fully explained by reduced access and awareness (15, 16).

There are several plausible explanations for the lower rate of testing among minority women in the TC arm. For all women receiving TC, the logistics of completing testing may have served as a barrier. Whereas, UC participants could provide DNA immediately following



their genetic counseling session, TC participants had to travel to a doctor's office, lab or the genetic counseling clinic to provide DNA. It is possible that these practical barriers may have been more important for minority participants. For example, evidence suggests that minorities are less likely to have a regular healthcare provider to go to for DNA provision (31). Second, a recent report (32) indicates that non-white participants experience high and clinically significant levels of distress and depression related to genetic counseling and testing. For participants experiencing this distress during genetic counseling, choosing not to pursue testing may be a coping strategy. This line of evidence suggests that particular attention be paid to assessing distress during the initial genetic counseling session.

Third, it is possible that unmeasured genetic counseling process differences may have differentially impacted minority participants. While explicit biases are rare, social patterns related to race/ethnicity from the dominant culture are evident in health care communication across almost all services and illnesses (33-38). Thus, minority patients often receive slightly poorer and less patient-centered communication from their providers. Further, there is some evidence that TC increases specific negative communication patterns, such as less rapport building, increased verbal dominance by the health care provider, and fewer problems disclosed by patients (11, 39). Thus, it is possible that the telephone delivery of genetic counseling compounded such existing differences in verbal and non-verbal communication to minority participants. To our knowledge, no process studies have directly investigated the effect of telephone vs. in-person counseling on communication with minority and racial majority patients.

The present findings suggest that clinicians should consider the possibility that delivering counseling via telephone may lead to lower rates of *BRCA1/2* genetic testing among minority women. However, this concern should be balanced with the possibility that offering telephone delivery may increase access in the first place (40). Thus, the question of whether overall rates of testing would be increased with the availability of telephone delivery remains to be answered. However, for those women who do complete telephone genetic counseling, additional care should be taken to assess and address potential barriers to completing genetic testing. With the availability of buccal sampling for DNA provision, it is possible that one of the major barriers to completing testing could be greatly minimized. Despite the undefined mechanism for the interaction between race/ethnicity and randomization group, these findings suggest that attention to communication quality and responding to signs of distress for all patients, but especially for minority patients receiving genetic counseling by telephone, may address potential aspects of the identified discrepancy in testing uptake.

Our study had several limitations. First, because the study sample was comprised of participants in a randomized trial, these results may not be generalizable to the larger population of women seeking genetic counseling and testing. Specifically, the overall completion rate of both counseling and testing may be higher than in the general population. It is also possible that some of the participants who did not complete genetic counseling may have chosen to receive counseling and testing outside of the study protocol. Although at least two of the enrolled women who did not complete genetic counseling as part of this protocol went on to receive clinical genetic counseling through one of our programs, it is possible that some women pursued genetic counseling elsewhere. Additionally, although this

large multi-site study enrolled a sample that reflects the typical genetic counseling population, the fact remains that the sample was primarily non-Hispanic white and well-educated. Also, the heterogeneous minority race/ethnicity categorization did not allow sufficient power to investigate more specific associations between race/ethnicity and uptake. Lastly, although studying many psychosocial and biomedical associations, this study did not seek to characterize *patient-reported* reasons for test uptake or lack thereof; the collection of that type of information could have further contextualized our findings.

Despite these limitations, the present study provides information about the potential barriers and facilitators to genetic testing across two modes of clinical service delivery. These results indicate an interaction between race and randomization group, such that minority women assigned to telephone counseling are the least likely to complete genetic testing and it is this difference that makes up the majority of differential uptake between randomization groups. As other modes of delivery emerge for genetic counseling and testing, attention to factors that influence uptake and outcomes will be important.

## Acknowledgments

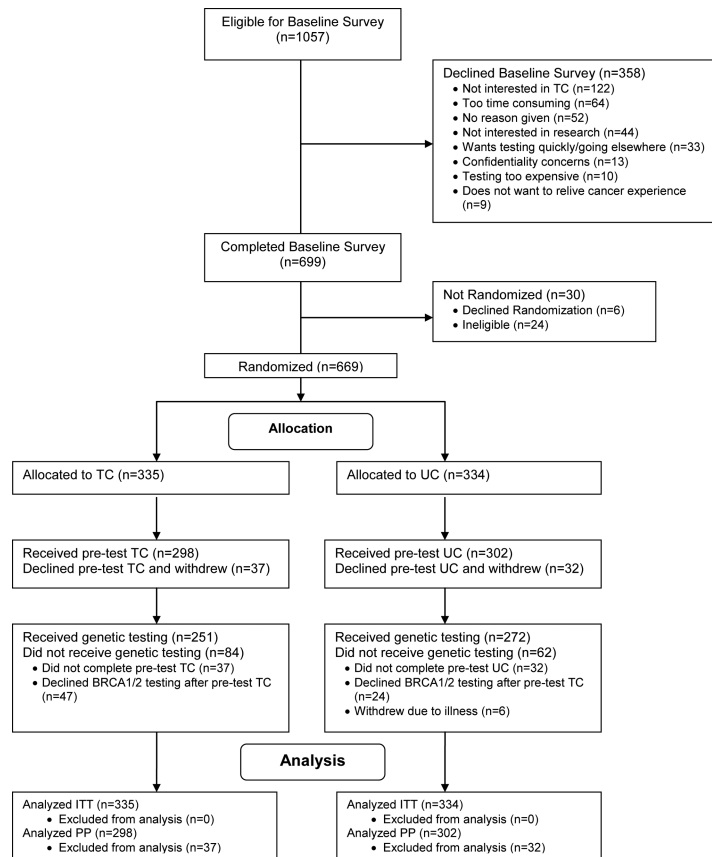
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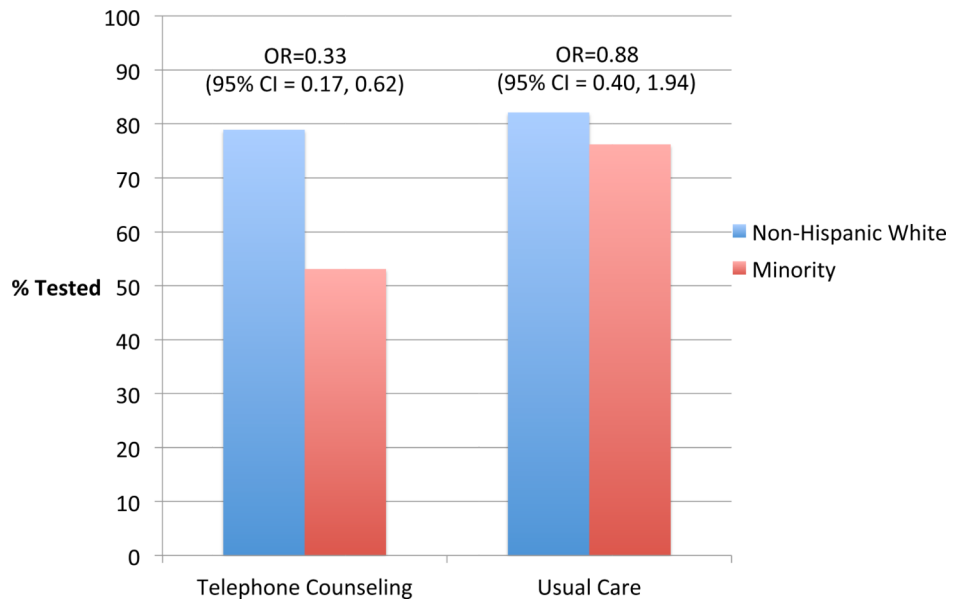
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**Figure 1.**  
Consort diagram detailing study flow



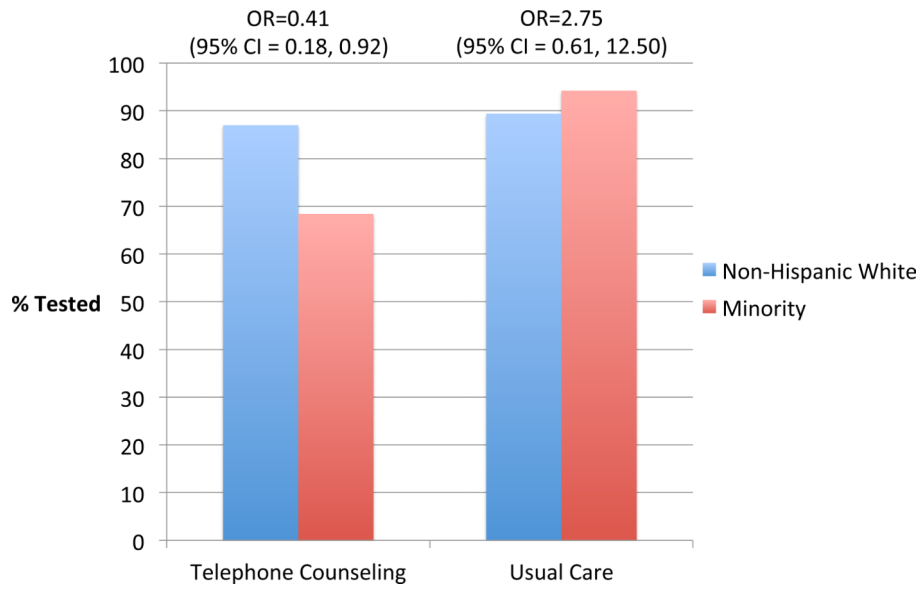
**Figure 2.**  
Race by group interaction in intention to treat sample

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**Figure 3.**  
Race by group interaction in per protocol sample

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**Table 1**

Predictors of genetic testing uptake in intent-to-treat and per protocol analyses

Variable	Genetic Testing (GT) Uptake Intent to Treat (N=669)		Genetic Testing (GT) Uptake Per protocol (N=600)	
	Accepted GT (N=523)	Declined GT (N=146)	Accepted GT (N=523)	Declined GT (N=77)
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
<i>Continuous Predictors</i>				
Age	47.7 (13.7)	47.7 (12.3)	47.7 (13.7)	47.7 (12.0)
BRCAPRO Probability (%)	25.7 (23.3)	22.4 (21.2)	25.7 (23.3)	18.1 (21.9)**
Pre-test Knowledge	17.4 (4.5)	16.2 (4.6)**	17.4 (4.5)	16.0 (3.9)*
Pre-test Numeracy	1.6 (0.9)	1.5 (0.8)	1.6 (0.9)	1.6 (0.9)
Pre-test Impact of Events	21.6 (15.4)	23.2 (15.3)	21.6 (15.4)	20.5 (14.0)
Pre-test Perceived Stress	4.3 (2.4)	4.9 (2.9)*	4.3 (2.4)	4.6 (3.0)
Pre-test Decisional Conflict	23.7 (9.6)	22.2 (10.8)	23.7 (9.6)	22.2 (11.3)
PCS 12	50.9 (8.9)	49.9 (9.1)	50.9 (8.9)	49.2 (10.2)
MCS 12	48.9 (10.5)	48.1 (10.2)	48.9 (10.5)	49.8 (9.5)
<i>Categorical Predictors</i>				
<b>Randomization Arm</b>				
Usual Care	272 (81.4)	62 (18.6)*	272 (90.1)	30 (9.9)*
Telephone	251 (74.9)	84 (25.1)	251 (84.2)	47 (15.8)
<b>Education</b>				
< College Graduate	96 (70.6)	40 (29.4)*	96 (85.7)	16 (14.3)
College Graduate <sup>+</sup>	427 (80.1)	106 (19.9)	427 (87.5)	61 (12.5)
<b>Marital Status</b>				
Not Married	188 (74.6)	64 (25.4) <sup>+</sup>	188 (83.2)	38 (16.8)*
Married	335 (80.3)	82 (19.7)	335 (89.6)	39 (10.4)
<b>Race<sup>#</sup></b>				
Non-white	58 (63.7)	33 (36.3)*	58 (80.6)	14 (19.4) <sup>+</sup>



Variable	N (%) Completed	N (%) Declined	N (%) Completed	N (%) Declined
<b>Employment</b>				
White	458 (80.3)	111 (19.7)	458 (88.3)	61 (11.7)
Not Employed	226 (78.8)	61 (21.2)	226 (87.3)	33 (12.7)
Currently Employed	297 (77.8)	85 (22.2)	297 (87.1)	44 (12.9)
<b>Jewish Ancestry</b>				
Non-Jewish	364 (76.3)	113 (23.7) <sup>+</sup>	364 (85.7)	61 (14.3) <sup>+</sup>
Jewish	159 (82.8)	33 (17.2)	159 (90.9)	16 (9.1)
<b>Perceived risk of BRCA mutation</b>				
< Very High	380 (77.1)	113 (22.9)	380 (86.0)	62 (14.0)
Very High	143 (81.3)	33 (18.7)	143 (90.5)	15 (9.5)
<b>Perceived Breast Cancer Risk</b>				
< Very High	434 (78.1)	122 (21.9)	434 (86.6)	67 (13.4)
Very High	89 (78.8)	24 (11.2)	89 (89.9)	10 (10.1)
<b>Perceived Ovarian Cancer Risk</b>				
< Very High	496 (78.1)	139 (21.9)	496 (87.0)	74 (13.0)
Very High	27 (79.4)	5 (20.6)	27 (90.0)	3 (10)
<b>RRM/RRO Intentions</b>				
Not considering RRM or RRO	269 (76.2)	84 (23.8)	269 (84.3)	50 (15.7) <sup>*</sup>
Considering RRM or RRO	254 (80.4)	62 (19.6)	254 (90.4)	27 (9.6)

**Legend**<sup>+</sup> p<0.10<sup>\*</sup> p<0.05<sup>\*\*</sup> p<0.01<sup>#</sup> For race analyses N = 660 for per protocol and 551 for intention-to-treat due to missing data

**Table 2**  
 Logistic Regression Models Predicting Genetic Testing Uptake (Main Effect Models)

GT Uptake – Intent to Treat (ITT) (N=660)		GT Uptake – Per Protocol (PP) (N=591)	
Variables	OR (95% CI)	P value	OR (95% CI) P value
Randomization			
TC (ref)	--		--
UC	1.48 (1.01,2.16)	0.045	1.65 (1.00,2.72) 0.050
Knowledge	1.12 (1.02,1.23) <sup>‡</sup>	0.018	Marital Status
			Not Married (ref)
			Married
Race/ethnicity			1.85 (1.12,3.08) 0.017
Minority (ref)			
Non-Hispanic White	1.96 (1.20,3.20)	0.007	BRCAPRO Probability
			1.22 (1.06,1.41) <sup>‡</sup> 0.007
PSS - Perceived stress	0.89 (0.81,0.98) <sup>‡</sup>	0.017	Knowledge
			1.13 (1.00,1.27) <sup>‡</sup> 0.050

\* Variables removed via backwards elimination: PP: RRM/RRR Status (p=.12), Jewish Ethnicity (p=.19), Race/ethnicity (p=.62); ITT: Jewish Ethnicity (p=.35), Marital Status (p=.38), Education (p=.24)  
<sup>‡</sup>OR and 95% CI reflect a 0.5 SD change.