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Maternal perceptions of *BRCA* genetic counseling communication processes about disclosing cancer risk information to children and adult relatives

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Abstract

Objectives: Using a novel measure, examine maternal perceptions of the process by which issues pertaining to family communication of *BRCA* test results are addressed during cancer genetic counseling.

Methods: After receiving *BRCA* results, mothers ($N = 211$) of minor-age children reported on their counseling experiences with providers using a communication process measure as well as other psychosocial variables.

Results: The novel Genetic Counseling Communication Process measure demonstrated good internal consistency of its 2 factors: patient-led communication (Cronbach's $\alpha = 0.73$) and provider-led communication (Cronbach's $\alpha = 0.82$). Participants most often reported that discussions about family communication of *BRCA* test results to children and adult relatives were led only by their providers (38.2%–39.2%), as opposed to being led by the patient, both parties, or neither party. Providers were most likely to lead these discussions when mothers had stronger family histories of cancer and expressed more confidence about making a decision to talk to their children about *BRCA*. However, mothers typically led such discussions if they were raising older children and held more positive attitudes about pediatric *BRCA* testing.

Conclusions: When the assessment of *BRCA* genetic counseling outcomes includes family communication to potentially at-risk relatives, we learned that most but not all sessions addressed this topic. Cancer family history, child age, and maternal attitudes are important co-factors in these patient-provider communication exchanges. Providers delivering *BRCA* genetic counseling should

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CONFLICT OF INTEREST

None declared.

be attentive to mothers' information and support needs regarding communicating cancer genetic test results to at-risk relatives, including children.

Keywords

breast cancer; children; family communication; genetic counseling; genetic testing; mothers; oncology

1 | BACKGROUND

Genetic counseling and testing for hereditary breast/ovarian cancer (HBOC) susceptibility has been a standard part of clinical care for high-risk women for decades.^{1–5} Pathogenic variants (PV) in HBOC susceptibility genes *BRCA1* and *BRCA2* (*BRCA*) can confer very high lifetime risks for breast and ovarian cancer in women and an increased risk for prostate cancer in men.^{3,6} Biological children of a parent with a *BRCA* PV have a 50% chance of inheriting the alteration, and adult relatives are at risk of being carriers. However, cancer risks and recommendations for medical management generally do not apply until adulthood.^{3,7} Thus, genetic testing in minor children is discouraged.^{8,9}

Our prior research demonstrates that among mothers undergoing *BRCA* testing, the majority will disclose results indicating either the presence or absence of a PV to their children, including minors.^{10–12} Indeed, much of the motivation for mothers seeking testing relates to their beliefs that the information is relevant and beneficial for their children, including the prospect of pediatric *BRCA* testing.^{12–16} However, mothers commonly report unmet education and support needs when making decisions about sharing information about inherited HBOC risk results with children and other relatives.^{17–19} These unmet needs raise important questions about the extent to which these issues are being addressed as part of the process of *BRCA* genetic counseling and testing.

Post-test genetic counseling sessions (ie, when patients obtain their *BRCA* results from their provider and discuss the associated implications) represent a critical time in mothers' assimilation of their own, their children's, and their families' HBOC risk information. However, little is known about the process and content of education and counseling regarding family communication of *BRCA* results occurring between providers and patients. With the present study, we aimed to interrogate this "black box" aspect of genetic counseling by eliciting maternal reports about in-session experiences and providers' behaviors. Specifically, we used a novel self-report measure to evaluate maternal perceptions of if and how the topics of family communication about *BRCA* results and implications for both adult relatives and children were raised in their genetic counseling sessions. We then sought to determine if sociodemographic, clinical, and/or psychosocial characteristics were associated with these provider-led or patient-led discussions about *BRCA*, HBOC, and family communication. An improved understanding of these factors should prompt genetic counseling providers to be more responsive to the unique concerns of mothers learning about their inherited cancer risks.

2 | METHODS

2.1 | Study design and participants

Data were drawn from the 1-month follow-up survey of a trial of *BRCA* genetic counseling outcomes. Participants ($N = 211$) were female patients who self-reported as being mothers to at least 1 child age 8 to 17 years. This group represented 75% of the 283 patients approached for inclusion in the trial and 97% of those who consented to the research ($n = 217$).

2.2 | Study procedures

Complete details are provided elsewhere.²⁰ Briefly, participants at 2 NCI-designated comprehensive cancer centers were approached for trial enrollment at the time of their *BRCA* pretest education and comprehensive genetic counseling session and after providing a DNA sample for *BRCA* testing. Data for the present analysis were collected during a telephone interview conducted 30 days following the post-test genetic counseling and result disclosure session (as per standard of care,^{2,21} topics potentially covered in this session include test result interpretation, medical management and follow-up, psychosocial care, and family communication. Because *BRCA* counseling and testing were delivered as part of regular medical care, the trial did not provide specific directives to counselors about how or whether these topics should be addressed). Genetic counselors ($n = 18$ across sites; no differences in study outcomes observed across sites) were certified or supervised by a certified genetic counselor. Counseling sessions lasted approximately 30 minutes and were delivered both in person and by telephone. All participants gave informed consent, and the Institutional Review Boards at participating sites approved all procedures.

2.3 | Independent variables

2.3.1 | Sociodemographic variables—Participants reported their age, race, education, employment status, income, marital status, age(s) of child(ren), and number of children.

2.3.2 | Clinical variables—Data regarding participants' proband status (ie, the first family member to seek *BRCA* genetic counseling/testing), personal history of breast or ovarian cancer, and family history of breast or ovarian cancer (among first- and second-degree relatives) were collected and verified by genetic counseling providers and medical record review. Participants' *BRCA* test results were also documented as a descriptive variable.

2.3.3 | Knowledge—Knowledge about *BRCA* testing and risks/benefits of communication with children was assessed using a trial-specific 16-item true/false scale (Cronbach's $\alpha = 0.91$).

2.3.4 | Distress—Psychological distress was assessed with the anxiety and depression subscales of the 12-item Brief Symptom Inventory.²² Scores range from 12 to 48 with higher scores indicating greater distress ($\alpha = 0.89$).

2.3.5 | Parent-child communication—The 20-item Parent-Adolescent Communication scale was administered to capture the quality of the parent-child

communication relationship.²³ Scores range from 20 to 100; higher scores indicate more open, less problematic parent-child communication ($\alpha = 0.85$).

2.3.6 | Pediatric genetic testing attitudes—The 11-item Pediatric *BRCA* Testing Attitudes Scale was used to assess participants' attitudes toward testing minor children for HBOC genes.¹³ The Pediatric *BRCA* Testing Attitudes Scale is a valid self-report measure of parents' own beliefs about risks and benefits of *BRCA* testing in childhood, decision-making, and communication of genetic testing results to children. Scores range from 11 to 55; higher scores indicate more positive attitudes ($\alpha = 0.91$).

2.3.7 | Decision self-efficacy—A modified version of the 11-item Decision Self-Efficacy Scale²⁴ was used to measure participants' self-confidence in their ability to make an informed choice about discussing their *BRCA* results with their children. Scores range from 0 to 44, with higher scores indicating greater confidence in one's decision-making capacity ($\alpha = 0.87$).

2.4 | Dependent variable

2.4.1. | Genetic counseling communication process—A new, task-specific measure was developed to examine participants' perceptions of the extent to which issues regarding family communication about their *BRCA* results were both raised and discussed during the post-test genetic counseling session, and by whom (provider, patient). The measure's item pool was developed based on the consensus of genetic counseling (B.N.P., T.A.D.) and psychological counseling (K.P.T.) investigators and pertaining to published recommendations regarding essential elements of psychosocial genetic counseling, the routine identification of at-risk relatives, and discussion of family communication about genetic risk information among adult relatives.^{25,26} We also included items about communication with minor children and information/support needs based on early research about parent-child communication of *BRCA* results.^{12,18} After pilot testing, the Genetic Counseling Communication Process (GCCP) measure included items about whether *BRCA* result communication to adult relatives (4 items) and minor-age children (6 items) were discussed during the genetic counseling session (yes/no response options; see Appendix). In addition, 2 items assessed participants' estimates of the amount of session time spent discussing family communication to adult relatives and minor children (response options ranging from 0 minutes to greater than 15 minutes).

2.5. | Statistical analyses

Descriptive statistics were computed to characterize the study sample. Next, chi-squared tests were used to examine bivariate associations between conceptually corresponding pairs of GCCP items (eg, items describing whether the provider or patient raised an issue during the session). Then, the reliability and validity of the GCCP measure were examined through a combination of exploratory factor analysis and confirmatory factor analysis using Mplus 7.4. Finally, bivariate analyses (ie, *t*-tests, Pearson's *r* correlations) and multivariable linear regressions were used to examine associations between participant sociodemographic, clinical, and psychosocial factors and aspects of the genetic counseling session measured by the GCCP. All statistical tests were 2-tailed with $\alpha = 0.05$.

3 | RESULTS

3.1 | Participant characteristics

Participant characteristics ($N = 211$) are shown in Table 1. Mothers were mostly non-Hispanic white (73.0%), had a college education (78.2%), and were married or living as married (79.1%). The majority (86.3%) were the proband, and approximately half (54.0%) had been diagnosed with breast or ovarian cancer (ie, were cancer survivors). Through genetic counseling and testing, 9% of participants received a positive (ie, PV) *BRCA* result.

3.2 | GCCP item-level analysis

We compared the distribution of responses for conceptually corresponding pairs of GCCP items. For the issue of who raised the topic of communicating *BRCA* test results to adult relatives, 29.9% of patients reported both they and their provider raised this issue during post-test genetic counseling, 9.8% of patients reported that only they had raised this issue, 39.2% of patients reported that only their provider had done so, and 21.1% of patients reported that neither party had introduced this topic in the conversation ($\chi^2 = 2.41$ [1 df], $P = 0.12$).

In comparing the distribution of items regarding who raised the issue of communicating *BRCA* results to minor-age children, it was similarly observed that 26.1% of patients reported that both they and their provider raised this issue, 6.8% reported that only they raised this topic, 38.2% reported that only their provider did, and 29.0% reported that neither they nor their provider addressed this topic ($\chi^2 = 10.13$ [1 df], $P = 0.002$).

For the items regarding pediatric *BRCA* testing, we found that 12.1% of patients reported that both they and their provider raised this issue, 9.2% reported that only they raised this issue, 31.9% reported that only their providers did, and a total of 46.9% of patients reported that neither they nor their provider addressed this topic ($\chi^2 = 3.75$ [1 df], $P = 0.05$).

In comparing the distribution of items regarding seeking information, support, and education, 14.4% of patients reported that they asked for these resources for both their adult relatives and minor-age children, 2.9% asked for these resources for only their adult relatives, 9.6% asked for only their children, and 73.1% of patients reported that they did not ask for these resources for either their adult relatives or children ($\chi^2 = 83.82$ (1 df), $P < 0.0001$). Although infrequently requested, these resources were more likely to be requested for children than adult relatives. Furthermore, 46.4% of patients reported that information about whether or how to communicate with both adult relatives and minor-age children was discussed during the session, whereas 8.2% of patients reported that only communication with adult relatives was discussed, 9.7% reported that only communication with minor-aged children was discussed, and 35.8% reported that communication with neither was discussed ($\chi^2 = 84.46$ (1 df), $P < 0.0001$). These results suggest that information about whether or how to communicate was discussed more frequently for children than for adult relatives.

3.3 | Reliability and validity

To examine the reliability and validity of the GCCP measure, we first randomly split the sample in 2 approximately equal subsamples ($N_1 = 105$, $N_2 = 106$), and in the first subsample conducted exploratory factor analysis using weighted least squares estimation and oblique rotation to identify an underlying factor structure. Based on the number of items, we tested solutions ranging from 1 to 3 factors. The 2-factor solution improved model fit over a single factor ($\chi^2 = 46.88$ [9 df], $P < 0.001$) and yielded the most interpretable solution that maximized item to factor loadings, minimized cross-loadings, and was conceptually meaningful relative to a 3-factor solution. Next, we conducted confirmatory factor analysis in the second subsample to test this factor structure. The 2-factor solution fit the data moderately well ($\chi^2 = 51.03$ [34 df], $p = 0.03$, RMSEA = 0.07 [90% CI 0.02, 0.11], CFI = 0.98).

As an additional test of the GCCP measure's face validity, we combined items regarding the discussion of test result communication to adult relatives (4 items) and minor children (6 items). We compared means for these variables against 2 items assessing whether participants reported spending any time (recoded into yes/no responses) during the genetic counseling session discussing family communication of test results to adult relatives and minor-aged children, respectively. Mean scores across items pertaining to communication of results to adult relatives were significantly greater among participants reporting having spent time discussing this topic during counseling ($M = 2.30$, $SD = 0.95$) versus those who did not ($M = 0.40$, $SD = 0.62$, $P < 0.001$). Similarly, mean scores for items pertaining to communication of results to children were greater among participants who endorsed having spent time on this topic during counseling ($M = 3.19$, $SD = 1.52$) versus not ($M = 0.43$, $SD = 0.90$, $P < 0.001$).

These findings support the 2 factors identified in the GCCP scale: findings for this solution in the complete sample are shown in Table 2. The first factor, labeled "Patient-led Communication," included 5 items regarding topics about family communication raised by the patient during the genetic counseling session (Cronbach's $\alpha = 0.73$). The second factor, labeled "Provider-led Communication," included 5 items regarding topics about family communication that were raised by the genetic counseling provider and/or not explicitly raised by the patient during the session (Cronbach's $\alpha = 0.82$). Summed scores of the items for each factor were used as the outcome variables for subsequent analyses.

3.4 | Bivariate analysis

Bivariate correlations among the GCCP outcome variables and patient sociodemographic, clinical, and psychosocial factors are shown in Table 3. Greater patient-led communication scores were significantly associated with the patient having an older child ($r = 0.20$, $P = 0.003$) and holding more positive attitudes toward pediatric *BRCA* testing ($r = 0.15$, $P = 0.03$). Patient-led discussions were not associated with either proband ($P = 0.13$) or survivorship statuses ($P = 0.35$). Greater provider-led communications were significantly associated with mothers having more extensive cancer family histories (number of affected second-degree relatives: $r = 0.18$, $P = 0.01$; number of affected first-degree and second-

degree relatives: $r = 0.19$, $P = 0.005$), and; greater levels of decision self-efficacy ($r = 0.17$, $P = 0.01$). Patient proband ($P = 0.99$) and survivorship status ($P = 0.17$) were again unrelated.

3.5 | Multivariable analyses

Variables significantly associated ($P < 0.05$) with GCCP outcomes in bivariate analyses were examined in separate multivariable linear regression models (Table 4). Analyses indicated that greater patient-led communications were significantly associated with older child age and with more positive attitudes about pediatric *BRCA* testing. Greater provider-led communications were significantly associated with familial cancer history and greater patient confidence in making a decision about talking with their children about HBOC and genetic test results.

4 | CONCLUSIONS

We aimed to assess mothers' perceptions of the process of *BRCA* post-test genetic counseling with respect to discussions about implications of and communication about test results to adult relatives and minor-age children. To help accomplish this goal, we developed a novel patient-report measure to characterize if and how patients and their genetic counseling providers discussed *BRCA* family communication topics.

One aspect of genetic counseling that has not been well characterized is whether patients and/or providers initiate discussion about familial implications of HBOC risk testing. The new GCCP measure, which assesses these dimensions of genetic counseling, appears to be reliable and valid. Among mothers tested for *BRCA* with minor-age children, the internal consistency of the 2 factors (patient-led communication, provider-led communication) was very good (Cronbach's $\alpha = 0.73$ -.0.82). We also observed promising results when the validity of the GCCP measure was evaluated against variables assessing time, and through its association with sociodemographic, clinical, and psychosocial factors. It is clear that mothers of older children and those holding more favorable attitudes about testing their children for *BRCA* are more likely to initiate discussions about family communication and HBOC risk during genetic counseling sessions. These mothers are ultimately more likely to disclose their *BRCA* results to older children¹² and may be curious about testing implications among emerging young adults. On the other hand, greater provider-led communication was associated with more extensive family histories and greater maternal self-efficacy for deciding about speaking with their children. Thus, our findings suggest that providers were attuned not only to the high-risk level in the family but also to mothers' perceived confidence about enacting a cancer risk communication strategy. During the course of comprehensive pre-test and post-test genetic counseling, providers may have noted that patients were more engaged and/or motivated to communicate with their relatives, and they may have been more likely to initiate these discussions, particularly with patients who had more affected relatives. Even among mothers with uninformative negative *BRCA* results, extensive family histories of cancer would be concerning for HBOC, which likely prompted more discussion about familial risk by the provider. Interestingly, neither proband status nor a personal cancer history was related to patient-led or provider-led discussions on

family communication. This finding suggests that overall risk status and age of at-risk children may be key determinants of these exchanges.

It is not clear from our findings whether mothers initiated discussions about testing minor-age children and gaining information, support, and/or educational resources about family communication because it was foremost in their minds during their counseling sessions (and may have been intended to be addressed at a later time by the provider) or because providers did not attend to these issues. It is also possible that mothers initiated these discussions preemptively out of high concern for the well-being of their children and adult relatives. Providers may have initiated conversations about family communication primarily when they felt that it was most relevant, or when they perceived that mothers were most able to assimilate the information. In either instance, it is important to assess the outcomes of counseling and examine its process and content to advance our understanding of care delivery and ensure that patients' needs are met.

4.1 | Limitations

The patient sample was not highly diverse (ie, few racial/ethnic minority participants, high socioeconomic status overall). Notably, most participants were from high-risk HBOC kindreds, and very few (9%) received PV *BRCA* results, thereby attenuating our ability to detect meaningful differences in outcome by maternal test result. Thus, it will be critical for future, larger studies to determine whether these findings generalize to other testing contexts and clinical populations. The GCCP measure was obtained 1 month after genetic counseling. Content of the genetic counseling sessions was not standardized, and variability may have existed across counseling sessions consistent with real-world variability that can occur in practice. Although family communication is more likely to be discussed in-depth during post-test counseling sessions, it is possible that some issues were raised prior to counseling or subsequently. Furthermore, because these data were cross-sectional, we cannot determine whether associations between psychosocial factors (eg, decision self-efficacy) and communication outcomes were bidirectional or operate in the opposite direction. Finally, it is possible that participants' recollections of their genetic counseling sessions were suboptimal; direct observation methods along with longitudinal study designs could help verify patient reports and provide more nuanced information about the process and content of these interactions.

4.2 | Clinical implications

Future research could assess concordance between patient-provider perceptions of discussions about family disclosure of test results and *BRCA* implications for relatives. Discrepancies in concordance as well as topics that tend to be raised more by patients than providers would suggest that cancer genetic counseling sessions adopt a more consistent approach to discussing such issues with patients. Future research should also examine how patient-led or provider-led discussions about family disclosure ultimately influence patients' familial dissemination of their *BRCA* genetic testing experiences and results.

Currently, many probands who undergo HBOC genetic testing are offered the option of multi-gene panel testing rather than *BRCA* testing alone.^{27–29} Implications of panel test

results for family members can be far more complex owing to uncertainty in cancer risks of PV in other genes, the potential for learning about elevated risks for cancers that are inconsistent with one's personal and/or family history, and the likelihood that more variants of uncertain significance will be identified.^{30–32} Finally, alternative service delivery models are increasingly being used to meet demands for HBOC genetic counseling (eg, telephone, video, or group counseling).³³ Assessing patient-provider communication in these settings compared with traditional in-person counseling may elucidate whether patterns of communication are different and whether that may impact patient satisfaction and outcomes. Those data could inform the development of genetic counseling protocols. Overall, it will be important that patients and providers understand and attend to the familial implications of increasingly complex results, and for researchers to assess how to optimize patient education and satisfaction with the discussion of these concerns during genetic counseling.

In conclusion, it is important to assess whether and how discussions about family communication and genetic testing implications, both for adult and child relatives, occur during the process of genetic counseling. To this point, we have added a new measure for this purpose for use by the clinical and research communities. Clarifying the process of such discussions may identify inconsistencies in how and when patients and providers raise issues related to the familial implications of HBOC genetic testing. Increased awareness of these dimensions may help providers become more attentive to the information and support needs of their patients, particularly those with young at-risk children.

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APPENDIX A

Genetic Counseling Communication Process Measure.

Please answer Yes or No to each of the following items regarding family communication of your *BRCA* genetic test result that might have applied to your genetic counseling session.

		Yes	No
1.	The issue of test result communication to adult relatives was raised by me	1	0
2.	The issue of test result communication to minor-age children (<18) was raised by me	1	0

		<u>Yes</u>	<u>No</u>
3.	The issue of test result communication to adult relatives was raised by my genetic counseling provider	1	0
4.	The issue of test result communication to minor-age children was raised by my genetic counseling provider	1	0
5.	The issue of genetic testing minor-age children was raised by me	1	0
6.	The issue of genetic testing minor-age children was raised by my genetic counseling provider	1	0
7.	I asked for information/support or educational resources about family communication to adult relatives	1	0
8.	I asked for information/support or educational resources about family communication to minor-age children	1	0
9.	Information about whether/how to communicate with adult relatives was discussed	1	0
10.	Information about whether/how to communicate with minor-age children was discussed	1	0

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TABLE 1Participant characteristics (*N* = 211)

	<i>M (SD) or n (%)</i>
<u>Sociodemographics</u>	
Maternal age, years	45.3 (5.3)
Race	
Non-Hispanic white	154 (73.0%)
Non-white	57 (27.0%)
Education	
< college education	46 (21.8%)
college education	165 (78.2%)
Employment status	
Employed full-time	116 (55.0%)
Not employed full-time	95 (45.0%)
Annual household income	
\$75 000	39 (18.5%)
> \$75 000	172 (81.5%)
Marital status	
Married/living as married	167 (79.1%)
Unmarried	44 (20.9%)
Child age, years	12.4 (3.0)
Number of children	
Children < age 13	0.8 (0.8)
Children age 13	0.8 (0.7)
<u>Clinical characteristics</u>	
Proband status	
Yes	182 (86.3%)
No	29 (13.7%)
Personal history of breast/ovarian cancer	
Yes	114 (54.0%)
No	97 (46.0%)
Family history of breast/ovarian cancer	
Number of affected first degree relatives	0.6 (0.7)
Number of affected second degree relatives	0.9 (1.0)
Number of affected first and second degree relatives	1.5 (1.2)
<i>BRCA1/2</i> result	
Positive	19 (9.0%)
Negative (true negative and uninformative negative)	192 (91.0%)

TABLE 2
Factor loadings of items and factor structure matrix for the genetic counseling communication process measure

Item	Factor 1	Factor 2
<u>Factor 1: Patient-led communication</u>		
1. The issue of test result communication to adult relatives was raised by me.	0.71	0.02
2. The issue of test result communication to minor-age children (<18) was raised by me.	0.84	-0.08
5. The issue of genetic testing minor-age children (<18) was raised by me.	0.86	-0.14
7. I asked for information/support or educational resources about family communication to adult relatives.	0.83	0.05
8. I asked for information/support or educational resources about family communication to minor-age children (<18).	0.86	0.05
<u>Factor 2: Provider-led communication</u>		
3. The issue of test result communication to adult relatives was raised by my genetic counseling provider.	-0.20	0.93
4. The issue of test result communication to minor-age children (<18) was raised by my genetic counseling provider.	0.07	0.84
6. The issue of genetic testing minor-age children (<18) was raised by my genetic counseling provider.	0.15	0.68
9. Information about whether/how to communicate with adult relatives was discussed.	-0.01	0.88
10. Information about whether/how to communicate with minor-age children (<18) was discussed.	0.23	0.78

TABLE 3

Bivariate correlations

	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Patient-led communication	-												
2. Provider-led communication	.40***	-											
3. Child age	.20**	.07	-										
4. Number of children < 13	-.12	.02	-.67***	-									
5. Number of children 13	.11	-.01	.70***	-.61***	-								
6. Family history (first degree)	-.00	.08	-.01	-.05	.13	-							
7. Family history (second degree)	.06	.18*	.09	-.12	.05	-.01	-						
8. Family history (first and second degree)	.04	.19**	.07	-.13	.12	.55***	.83***	-					
9. Knowledge	-.10	.05	-.07	.01	-.05	.02	.01	.02	-				
10. Distress	.07	-.10	.04	-.01	-.01	-.03	-.10	-.10	.12	-			
11. Parent-child communication	.03	.07	.02	-.03	.03	-.01	.04	.03	-.07	-.26***	-		
12. Pediatric testing attitudes	.15*	.02	.09	-.08	-.04	-.07	-.09	-.11	-.16	.04	.09	-	
13. Decision self-efficacy	-.00	.17*	.04	-.05	.07	.09	.15*	.17*	.03	-.07	.26***	-.05	-
M(SD)	1.36 (1.51)	2.86 (1.85)	12.42 (2.98)	0.85 (0.77)	0.76 (0.70)	0.56 (0.66)	0.94 (1.00)	1.50 (1.19)	6.97 (1.02)	16.43 (5.04)	78.92 (10.93)	34.39 (11.74)	42.41 (2.94)

* $P < 0.05$.

** $P < 0.001$.

*** $P < 0.01$.

TABLE 4

Final multivariable linear regression models of associations between sociodemographic, clinical, and psychosocial factors with patient and provider communication

	Patient-Led Communication	Provider-Led Communication
Variable	<i>b</i> (SE)	<i>b</i> (SE)
Child age	0.10 (0.03) **	-
Family history (first and second degree) ^a	-	0.26 (0.11) *
Pediatric testing attitudes	0.02 (0.01) *	-
Decision self-efficacy	-	0.09 (0.04) *
Percent variance (model R^2) in communication outcome accounted for by model variables	5.99%	5.71%

* $P < 0.05$.

** $P < 0.01$.

^aBoth “family history (second degree)” and “family history (first and second degree)” were significantly associated with provider-led communication in bivariate analyses; however, the latter provides a more comprehensive assessment of family history and was therefore included in the multivariable analysis.