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ORIGINAL RESEARCH

A Psychological Perspective on Factors Predicting Prophylactic Salpingo-Oophorectomy in a Sample of Italian Women from the General Population. Results from a Hypothetical Study in the Context of BRCA Mutations

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Abstract The aim of this study was to assess attitudes toward ovarian cancer risk management options for BRCA mutation carriers in healthy Italian women, and to identify predictors of the preference for risk reducing salpingo-oophorectomy (RRSO) over surveillance. One hundred eighty-one women aged 30–45 completed a questionnaire about preferences, knowledge, risk perception, and socio-demographic information. Participants were randomly presented with a pamphlet about BRCA1 or BRCA2 mutation-specific testing, consequences of testing and preventive options for carriers, and they were stratified by having children or not and by age group. Surveillance was the preferred option (64.6%), followed by RRSO (24.3%). Although RRSO is the only effective strategy available to BRCA carriers, most healthy women faced for the first time with this option may not consider it as their preferred choice. Predictors associated with a higher likelihood to prefer surgery over surveillance were: knowing that life expectancy is longer with surgery, perceived comprehension of the consequences of testing, previous knowledge about BRCA testing, anticipated worry about developing cancer, and feelings of risk. Childbearing intentions and the effect of childbearing intentions on choice were associated with a lower preference for surgery. Further research is needed to confirm the role of the factors identified in this study in order to promote informed decision-making about RRSO.

Keywords BRCA mutation · Decision making · Genetic counseling · Prophylactic surgical procedures · Risk-reducing salpingo-oophorectomy (RRSO)

Introduction

Germline mutations in the *BRCA1* and *BRCA2* genes (collectively named "*BRCA*") predispose female carriers to an increased risk of breast and ovarian cancer. Women carrying a BRCA1 or BRCA2 mutation face a breast cancer risk of approximately 60% and an ovarian cancer risk that is approximately 60% for BRCA1 mutation carriers and 20% for BRCA2 mutation carriers (Mavaddat et al. 2013). Non-carriers face an average lifetime risk of about 12% for breast cancer (Cancer Research UK 2010) and 1.4% for ovarian cancer (Jelovac and Armstrong 2011).

Personalized strategies for the prevention of BRCA-associated breast cancers have been proposed, including intense surveillance, risk-reducing surgery, and chemoprevention (NICE 2013; NCCN 2015). At present, bilateral risk-reducing salpingo-oophorectomy (RRSO) is recommended worldwide as the prevention option for ovarian cancer in women carrying a BRCA mutation, given the absence of efficient methods for early detection, the poor prognosis associated with advanced ovarian cancer, and the significant reduction in mortality conferred by this procedure (Finch et al. 2014). Typically, RRSO is recommended around 40 years of age and upon completion of childbearing intentions (NICE 2013; NCCN 2015). In a large recent study, the use of RRSO among BRCA mutation carriers ranged from 34% to 45% by age 40, and from 71% to 86%

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by age 50, with BRCA1 mutation carries showing the higher uptake (Chai et al. 2014).

The decision to undergo RRSO and its optimal timing are challenging because of the impact on reproduction and the important physical and psychological implications of surgical menopause (osteoporosis and cardiovascular disease, cognitive changes, sexual concerns, psychological distress; Finch et al. 2012). Moreover, many BRCA-positive women might be familiar with breast cancer and breast cancer treatment; but they might not be familiar with RRSO, as they are less likely to have a family history of ovarian cancer, thus possibly having limited information about this rare cancer, and being therefore comparable to women of the general population.

In order to improve the effectiveness of genetic counseling in facilitating informed decision-making, it is crucial to identify which factors may affect this decision. Previous research focusing on socio-demographic characteristics found that RRSO is associated with older age (Tong et al. 2015) and with having a personal history of breast cancer (Kim et al. 2013). Studies concentrating on specific psychosocial variables related to RRSO suggested that the decision to undergo RRSO is significantly influenced by psychosocial factors such as feelings of guilt and fear about transmitting the mutation to offspring, feelings of vulnerability, a low degree of perceived social support (within the family and the social network) (Hesse-Biber and An 2016), the perceived benefits of surgery, and high levels of ovarian cancer risk perception (Fang et al. 2003). The psychological perspective is thus important to gain insight in how people make decisions and, in turn, how to improve decision-making. A decision can be considered informed when it is "based on relevant knowledge, consistent with the decision-maker's values and behaviourally implemented" (Marteau et al. 2001, p. 99).

In the present study, we included knowledge variables related to several aspects and subject variables related to personal values around wanting to have children. Having an adequate risk perception is also an important factor in informed decision-making (e.g., Braddock et al. 1999). For this reason we also included risk variables, adapted from prior studies (Cameron and Reeve 2006; Cameron et al. 2009; Weinstein et al. 2007). Indeed, although in the context of BRCA mutation risk perception has been extensively investigated (e.g., Smerecnik et al. 2009), its role in RRSO decision-making is still unclear. In a systematic review on the topic, only 6 of 21 studies assessing factors associated with RRSO uptake and intentions considered perceived risk, and their results are contradictory (Howard et al. 2009).

The aim of this hypothetical study was to assess attitudes toward ovarian cancer risk management options for BRCA carriers in healthy Italian women from the general population and to identify predictors of their preference for prophylactic surgery over intensified surveillance.

Methods

Participants

Women aged between 30 and 45 years were recruited between April and June 2015 through announcements and flyers in gathering places not related to health (e.g., offices, cafés, gyms). Cancer survivors and cancer patients were excluded.

Procedure

Eligible women were provided with an informative leaflet about the study. Those agreeing to participate signed the informed consent form and received the study instructions. First, participants were asked to imagine having a family history for breast and ovarian cancer and that one of their parents has a genetic mutation that increases the risk of these illnesses, which they could have inherited. Then, participants were provided with a pamphlet about predictive BRCA genetic testing (i.e. testing for the mutation detected in the family) and were asked to complete an ad hoc questionnaire. Participants were randomly presented with material about BRCA1 or BRCA2 predictive testing and stratified by *Having children or not* and *Age group* (30–34, 35–39, 40–45 years). Upon completion of the study, participants were debriefed. The study was approved by the Psychology Research Ethic Committee of the local University.

Materials

The pamphlets consisted of six pages entitled "The predictive genetic test for BRCA1" (or BRCA2, depending on the experimental condition) and were presented as the informative material from a genetic counseling service. The two pamphlets differed only in the numerical information about the lifetime ovarian cancer risk associated with BRCA1- (60%) or BRCA2- (20%) mutations and the residual ovarian cancer-risk after RRSO (12% and 4%, respectively).[1] A series of questions and answers guided the reader through the topic, addressing: the description of the BRCA mutation, risk estimates, consequences of testing, and risk management and risk reduction strategies available in case of a positive test result. Intensified surveillance was described as including a transvaginal ultrasound and a blood test for tumoral markers to undergo every 4–6 months starting at 30 years. It was specified that this option is not considered effective as an early

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[1] These figures were based on estimates recently reported (Mavaddat et al. 2013) rounded to the closest tens. This choice was based on previous work suggesting that: absolute risk reduction information should be provided (e.g., Akl et al. 2011), integers are better remembered and more believable than numbers with decimals (Witteman et al. 2011), and patients better comprehend information with less details, that reduce the cognitive burden of comparing information (Peters et al. 2007).

stage detection strategy, but is an option for those who do not want to or cannot undergo RRSO. RRSO was described as a surgery recommended at about 40 years, but considering childbearing intentions. It was specified that this option induces surgical menopause and all the related symptomatology. It was also made clear that this option has been shown to increase life expectancy relative to surveillance, and the risk reduction data were provided using approximate figures. The content of the pamphlet was based on current local guidelines for BRCA testing, and on decision science guidelines. The last page of the pamphlet contained a flowchart summarizing the information provided.

The main dependent variable for this study was the preference regarding available preventive strategies for ovarian cancer (see Fig. 1). Secondary variables (see Table 2) included: knowledge about these options (Surveillance description; Early detection; Life expectancy comparison; Perceived comprehension; Previous knowledge of BRCA test; Previous knowledge about Angelina Jolie case), risk perception (Base objective risk; Mutated objective risk; Perceived likelihood; Anticipated worry; Feelings of risk), and subject variables (Age, Having children, Having childbearing intentions, Effect of childbearing intentions on choice). All of these measures were developed by the research team for this study with the exception of the risk perception variables. On the basis of previous research, we distinguished a measure of cognitive appraisal of risk (perceived likelihood) and two different affect-based measures, one measure directly linked to the likelihood appraisal (feelings of risk), and one more general (anticipated worry) (Cameron and Reeve 2006; Cameron et al. 2009; Weinstein et al. 2007).

All materials were in Italian. The present paper focuses on ovarian cancer; additional variables that were measured are reported elsewhere (submitted).

Data Analysis

Descriptive statistics (frequencies, means, and standard deviations) summarize sample characteristics and outcome variables. The association between categorical variables was assessed using Chi-square tests.

Due to the low frequency of preferences expressed for oral contraceptives and "other" options, analyses on choice were limited to participants who indicated surveillance or surgery as preferred options. Choices were analyzed using binary logistic regression models, with a model selection perspective based on the Bayes Factor (BF) (Wagenmakers 2007). This approach is considered to be a valid alternative to model selection procedures based on p-values. When comparing two models, the BF represents the ratio between the plausibility of the data under the two models. Conventionally, BF can be classified as weak (1–3), positive (3–20), strong (20–150), or very strong (>150) evidence for one model over the other

(Raftery 1995). First, all variables were included in the model, with *Choice* as dependent variable: the type of mutation (BRCA1 or 2), knowledge variables, risk variables, and subject variables, as well as the two-way interactions between the type of mutation and each of the other variables. Then, the model was reduced - removing first one interaction term at a time, then one variable at a time – and the plausibility of each reduced model was compared with that of the previous model using the BF, until the plausibility of the model was no longer increased by removing variables (BF < 3).

Data were analyzed using SPSS (version 20, SPSS, Chicago, IL, USA).

Results

One hundred eighty-one women completed the study. Their socio-demographic characteristics are reported in Table 1. Childbearing intentions were higher in younger women (age 30–34: 81.5%; age 35–39: 62.7%) than in older ones (age 40–45: 28.1%; χ^2 (2) = 36.40, Φ = .45, p < .001), and were higher in women who had already at least one child (74.4%) than those who did not (42.9%; χ^2 (1) = 18.61, Φ = .32, p < .001).

Surveillance was judged very positively (M = 4.95 on a scale from 1 to 6) and was the preferred option (64.6%), followed by surgery (24.3%), whereas oral contraceptives and "other" options were chosen only by a minority of participants (Fig. 1).

Variable analyzed as predictors of choice are reported in Table 2. After 25 iterations, the model selection procedure excluded the following variables: the type of mutation, some knowledge variables (Surveillance description; Early detection; Previous knowledge Jolie), some risk variables (Base objective risk; Mutated objective risk; Perceived likelihood), and some subject variables (Age, Having children), as well as all the two-way interactions between the type of mutation and each of the other variables. The final model included seven predictors. Five were associated with a higher likelihood to prefer surgery over surveillance: knowing that life expectancy is longer with surgery compared to surveillance, perceived comprehension of all the consequences of testing, previous knowledge about BRCA testing, anticipated worry about developing cancer, and feelings of risk. Two factors were associated with a lower likelihood to choose surgery: having childbearing intentions and the effect of childbearing intentions on choice. The model correctly classified 79.5% of choices, had a Nagelkerke's R^2 of .452 and a BIC of 162.039.

Discussion

This study assessed attitudes toward ovarian cancer risk management options in a sample of Italian healthy women ranging

Fig. 1 Preferences among different preventive options for ovarian cancer
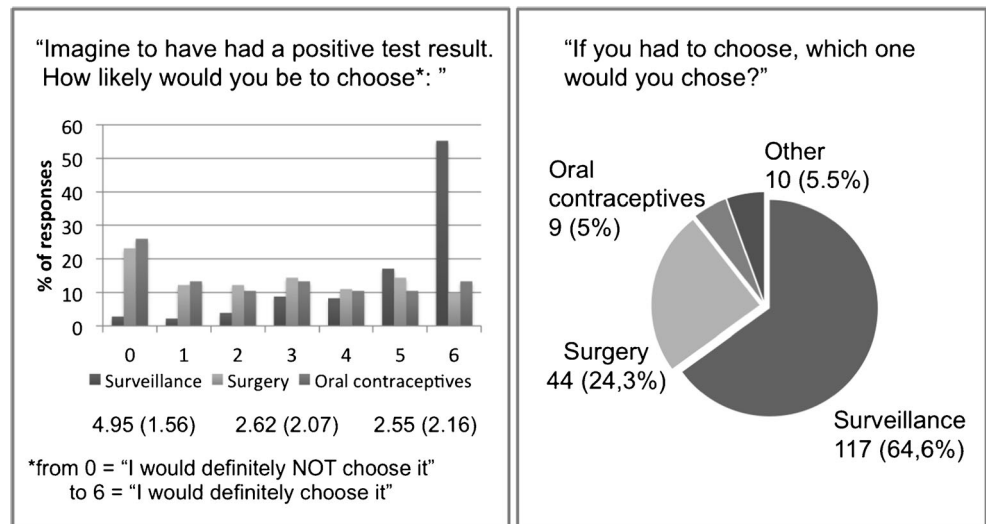
in age from 30 to 45 years, who did not undergo personal BRCA genetic counseling and testing, and who were asked to think of being a member of a BRCA mutation-positive family and to make decisions about BRCA-associated risks.

When asked to choose only one option, the majority of participants (64.6%) stated that they would prefer intensified surveillance, and only 24.3% of the sample would choose to undergo RRSO. This finding is in line with available literature regarding the actual choice of RRSO in our country: in a sample of Italian BRCA mutation carriers, Borreani et al. (2014) reported that 15% (4/27) of the cancer unaffected women underwent RRSO in the 15 months following genetic test disclosure. Unfortunately, data on large cohorts of Italian

BRCA mutation carriers are not yet available, limiting the comparison of the results of this study with actual RRSO uptake in our country. The comparison with other data from the literature should take into account that our sample is of a relatively young age (30–45) while in other studies samples have a wider age range and usually include older women (e.g., up to 85 years; Garcia et al. 2014).

According to the non-directive approach of genetic counseling, the uptake of risk reducing surgery should be a woman's informed choice, based on the provision of complete and unbiased information and on its comprehension. In our study, the information in the material presented to participants clearly stated that, at present, bilateral RRSO is the only recommended option for a woman who wants to effectively reduce her risk of developing ovarian cancer. Also, the limits of intensified surveillance using transvaginal ultrasound and CA125 serum marker were discussed, including the poor prognosis of ovarian cancer if diagnosed at an advanced stage. Our results showed that the majority of women (69.6%) correctly judged as true the statement "Surgical removal of ovaries and tubes is more effective than intensified gynecological surveillance, indeed life expectancy is longer." However, the statement "Intensified gynecological surveillance allows to find ovarian cancer in an early stage" was erroneously judged as true by about half of the participants (44.2%), even though in the pamphlet it was clearly stated that surveillance is not effective for early detection of ovarian cancer.

The observed preference for surveillance over surgery may be due to a general positive attitude towards cancer screening procedures. Indeed, after decades of promotion and recommendations from various health organizations, most people tend to have a positive attitude about cancer screening tests, regardless of the scientific evidence (e.g., Gigerenzer et al. 2009; Hoffmann and Del Mar 2015; Hudson et al. 2012). For example, interviews with over 10 thousand persons from

Table 1 Socio-demographic characteristics of participants included in the study (N = 181)

	n (%)
Age in years	
30–34	65 (35.9%)
35–39	59 (32.6%)
40–45	57 (31.5%)
Children	
Have children	90 (49.7%)
No children	91 (50.3%)
Education	
High school	78 (43.3%)
Master	56 (31.1%)
Bachelor	28 (15.6%)
Other	18 (10.0%)
Occupation	
Office workers	83 (45.9%)
Employees	41 (22.7%)
Professionals	25 (13.8%)
Other	32 (17.7%)

Table 2 Measured variables and their inclusion in the predictive model

		Descriptive statistic[a]	Predictive model[b]
Socio-demographic			
Age	Number of years	36.7 (4.67)	-
Having children	"Do you have any children?" (yes)	90 (49.7%)	-
Children			
Childbearing intentions	"Do you intend to have any (more) children?" (yes)	106 (58.6%)	0.237 [0.065, 0.871]
Effect of childbearing intentions on choice[c]	"To what extent did your desire to have children affect your choice?"	3.47 (2.17)	0.528 [0.378, 0.737]
Knowledge			
Previous knowledge BRCA test[c]	Knowledge about BRCA genetic testing before reading the information material	1.92 (1.93)	1.589 [1.239, 2.038]
Previous knowledge Jolie case[c]	Familiarity with Angelina Jolie's case recently reported in the news	2.59 (1.76)	-
Perceived comprehension[c]	Perceived comprehension of all the consequences of genetic testing, based on the information material	4.85 (1.18)	1.949 [1.206, 3.148]
Surveillance description[d]	"Intensified gynecological surveillance consists of a transvaginal echography and a tumoral markers exam every 4/6 months, from 30 years of age" (true)	147 (81.2%)	-
Early detection[d]	"Intensified gynecological surveillance allows to find ovarian cancer in an early stage" (false)	80 (44.2%)	-
Life expectancy comparison[d]	"Surgical removal of ovaries and tubes is more effective than intensified gynecological surveillance, indeed life expectancy is longer" (true)	126 (69.6%)	6.501 [1.904, 22.194]
Risk, risk knowledge and risk perception			
Type of mutation	Information provided in pamphlet:		-
	BRCA1 ovarian risk about 60%	90 (49.7%)	
	BRCA2 ovarian risk about 20%	91 (50.3%)	
Base objective risk knowledge[e]	"For a woman without the mutation the lifetime risk of ovarian cancer is about…"	144 (79.6%)	-
Mutated objective risk knowledge[e]	"For a woman with the mutation the lifetime risk of ovarian cancer is about…"	103 (56.9%)	-
Perceived risk:			
Perceived likelihood[c,f]	"How likely do you think would be that, at some point in your life, you would get cancer?"	4.02 (1.48)	-
Anticipated worry[c,f]	"To what extent would you be worried about getting cancer?"	5.00 (1.42)	1.592 [1.027, 2.466]
Feelings of risk[f,g]	"If I had this genetic mutation, I would feel that I'm going to get cancer."	3.74 (1.70)	1.071 [0.763, 1.503]

a) Mean (standard deviation) or frequency (%); b) OR [95% CI], the model included also a constant ($OR = 0.0005$); c) from 0 = "not at all" to 6 = "extremely"; d) true/false questions (correct answers); e) select the correct value: 1%, 10%, 20%, 40%, 60%, 80%, 90% (correct answers); f) adapted from previous studies referring to BRCA-positive women (Cameron and Reeve 2006; Cameron et al. 2009; Weinstein et al. 2007); g) from 0 = "strongly disagree" to 6 = "strongly agree"

nine European countries, including Italy, revealed that benefits of mammography are vastly overestimated, regardless of the scientific evidence (Gigerenzer et al. 2009). It is worth noting that the erroneous belief that intensified gynecological surveillance allows early detection was not retained in our model as predictive of a greater preference for surveillance.

Predictors of the preference for RRSO over intensified surveillance were evaluated using a model selection approach (Wagenmakers 2007), starting with a model including all potential predictors, and reducing it until the plausibility was no longer increased by removing variables (Raftery 1995). The final model included seven variables: 1) awareness that surgery, compared to surveillance increases life expectancy; 2) perceived comprehension of all testing consequences; 3) previous knowledge about BRCA testing; 4) anticipated worry about developing cancer; 5) feelings of risk; 6) having childbearing intentions; and 7) effect of childbearing intentions on choice.

Awareness that life expectancy is longer with surgery than with surveillance was the strongest predictor, being associated with a 6.5 times increase in the odds of choosing surgery over surveillance. This finding suggests that during genetic counseling it is important to verify the counselees' comprehension of the comparative effectiveness of the two options, ensuring that they have clearly understood the different effects on life expectancy.

In health decision making research, information comprehension is typically assessed using ad hoc knowledge

questions, that is, developed for the specific study (cf. Schenker et al. 2010). In this study, in addition to ad hoc objective knowledge questions, we assessed participants' subjective feeling of comprehension, as research in other areas suggests objective versus subjective measures may gauge similar but distinct constructs (e.g., Dolan et al. 2016). We found that a one point increase in the extent to which participants felt they had understood all the consequences of testing almost doubled the odds of choosing surgery. Thus, the subjective feeling of comprehension was an independent predictor of choice, whereas only one of the items assessing objective knowledge was retained in the model. These findings suggest that, during counseling sessions, it is critical to ensure deep comprehension of the information and to check that counselees have a feeling of having understood all the consequences of their decision.

A 1.5 times increase in the odds of surgery over surveillance was found for each additional point of "*Previous knowledge about BRCA testing.*" We suggest that this might be due to the fact that people who have little or no previous knowledge about BRCA, when hearing about preventive surgery for the first time, perceive it as a drastic solution and may not be fully considering it. Indeed, previous research showed that when choosing between surgery and surveillance, the latter is more frequently preferred in the case of a genetic predisposition for cancer (Gavaruzzi et al. 2011). According to some theories on decision-making, decisions are reached after mental restructuring or re-evaluation of information (Brownstein 2003; Pieterse et al. 2013). For example, Differentiation and Consolidation Theory (Svenson 1992) posits that the evaluation of available options changes overtime, gradually favoring one option for which the supporting reasons tend to become more positive, whereas reasons against the other options tend to become more negative. Accordingly, the decision to undergo RRSO is a process that develops over time and requires that the information is reconsidered over subsequent moments. Therefore, within a multidisciplinary care pathway (genetic counselor, gynecologist, psychologist), it is important to give to counselee the opportunity to consider relevant information and to adapt and to deal with feelings related to such a difficult decision.

Among the three measures used to assess risk perception, "*Perceived likelihood*" was excluded from the model, while each additional point of "*Anticipated worry about developing cancer*" increased about 1.6 times the odds of choosing surgery versus surveillance, and "*Feelings of risk*" increased it by about 1.1 times. While perceived likelihood is a cognitive-based judgment, anticipated worry and feelings of risk are affect-based judgments. Feelings of risk are more closely related to likelihood appraisals, whereas anticipated worry also reflects other factors, such as disease severity and personal experience with the disease (Cameron et al. 2009). Our results are in line with previous research, suggesting that anticipated affect is likely to influence genetic testing decisions (e.g., Blumenthal-Barby et al. 2015; Connolly and Reb 2005). More generally, emotional responses to risk have been repeatedly found to weigh more heavily than cognitive evaluations in shaping peoples' preferences and behaviors, a phenomenon referred to as "affect bias" (Loewenstein et al. 2001).

Women's intentions to have children in the future decreased the odds of choosing surgery to about 0.2 times. Additionally, the odds of choosing surgery were halved for each additional point of the extent to which women's desire to have children affected their choice. These findings confirm the importance of considering motherhood plans, which may also change following a positive test result (Mancini et al. 2015). However, considering that both variables were retained in the model, they also indicate that not all participants who want (more) children are equally affected in their choice by this desire. Presumably, some participants would have chosen surveillance regardless of their childbearing intentions.

The type of mutation (BRCA1 or BRCA2) was not retained in the final model, indicating that participants' choice was not affected by the risk figures associated with the mutation, namely an approximate lifetime risk of ovarian cancer of 60% versus 20%, respectively. This is in line with psychological theories on judgment and decision making as well as recent findings on BRCA mutation carriers (Flippo-Morton et al. 2016). According to the Prospect Theory (Kahneman and Tversky 1979), the probability weighting function (a function linking probability values and the weight people attribute to them) is s-shaped, steeper close to the extremes and rather flat in the middle, thus accounting for people's insensitivity to differences for medium/medium-high probabilities (Prelec 1998). The finding is also in line with Fuzzy Trace Theory (Reyna and Brainerd 1995), according to which there are two types of mental representations referred to as "verbatim" and "gist traces." While people can remember correctly risk figures (verbatim trace), they prefer to reason using the bottom-line meaning (gist trace) of the message (e.g. "the risk is high"; Reyna 2008). There is also robust evidence that quantities are difficult to evaluate in isolation, and the reference points used to draw comparisons of risk affect judgments (e.g., Fagerlin et al. 2007; Hsee et al. 2005). As our participants judged the risk of having ovarian cancer with BRCA1 (60%) in comparison to the general population (1%), or else BRCA2 (20%) in comparison to the general population (1%), presumably both 20% and 60% appeared rather high compared to this reference point. Additionally, our data suggest that what is important in predicting the preference for surgery over surveillance is subjective risk rather than objective risk itself. Indeed, risk perception variables were retained in the model,

while neither the type of mutation nor objective risk knowledge measures were retained. Of note, our findings do not imply that risk communication is not essential to decision making, nor that risk magnitude should be communicated simply with fuzzy words rather than numbers. We strongly believe that accurate risk perception and knowledge are essential elements of informed decision-making (Braddock et al. 1999).

In some cases famous people's choice shapes others' preferences. After the ex-First Lady Nancy Regan chose to undergo a mastectomy, in 1987, despite the recommendation to undergo a lumpectomy, many women followed her example, and the use of breast-conserving surgery considerably decreased (Nattinger et al. 1998). In May 2013, the famous actress, Angelina Jolie, made public her preventive double mastectomy, which she underwent because she learned she carried a BRCA1 mutation. More recently (March 2015), she also underwent RRSO. The "Angelina effect" increased referrals for BRCA genetic testing, inquiries about preventive mastectomy (Evans et al. 2014) and awareness of Jolie's double mastectomy, but only a minority of people was able to answer even simple knowledge questions about BRCA and breast cancer (Borzekowski et al. 2013). Similarly, our participants were aware of the Jolie case, but this did not significantly affect their preferences.

Study Limitations

This study has some limitations. As our sample is relatively small and composed of women living in Northern Italy, most of them employed and with a medium-high school degree, it cannot fully explore some socio-demographic and cultural factors (e.g. attitudes of women living in a rural area, with a low school degree, unemployed/never employed). Also, its hypothetical nature limits the possibility to interpret its results as the choices and attitudes of the women who actually undergo genetic counseling for the presence of a BRCA mutation in their family, although efforts were made to enhance the realism of the presenting scenario. Moreover, the hypothetical nature of the present study limited the possibility to consider family history of cancer, which is a factor known to affect the decision to undergo RRSO (e.g., Kim et al. 2013). However, many BRCA-positive families do not present with a history of ovarian cancer, and at risk BRCA- positive women from these families face for the first time the issue of RRSO during genetic counseling, being in that similar to our sample population. Additionally, our findings align with a recent study on attitudes toward risk-reducing surgery in women prior to genetic counseling and testing (Tong et al. 2015). Therefore, it seems reasonable to extend our results to the cases of women with a BRCA mutation.

Practice Implications

Although at present RRSO is the only effective strategy available to BRCA mutation-positive women, most healthy women facing this option for the first time may not consider it as their preferred choice. Several factors influence the choice to undergo RRSO, and the present findings suggest that some may be more influential than others. In summary, in terms of information provision: the comparative effectiveness of surgery and surveillance and their effect on life expectancy are important issue to be clearly discussed with counselees; also, information provision prior to counseling is useful, especially considering that many counselees might be unfamiliar with RRSO. On the counselees' side, their belief that they understood all the consequences of their decision seems particularly important. Additionally, while risk communication is an essential component of genetic counseling, affective-based risk perception appears to drive preference for RRSO more than cognitive-based risk perception. Finally, in addition to discussing childbearing intentions, the effect of childbearing intentions on choice should be considered.

Research Recommendations

Further research is needed to confirm the role of the factors identified in this study in order to promote informed decision-making about RRSO in the context of BRCA mutations. As mentioned earlier, studies with larger samples and including women at actual risk would provide further evidence of the validity of the present findings. Furthermore, qualitative investigations would help to elicit rich and nuanced descriptions of at-risk individuals' decision-making.

Compliance with Ethical Standards

Conflict of Interest Teresa Gavaruzzi, Alessandra Tasso, Marzena Franiuk, Liliana Varesco and Lorella Lotto declare that they have no conflict of interest.

Human Studies and Informed Consent All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2000. Informed consent was obtained from all participants for being included in the study.

Animal Studies No animal studies were carried out by the authors for this article.

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