Résumé

Réactions des femmes aux données mammographiques sur la densité du tissu mammaire

Joan L. Bottorff, Pamela A. Ratner, Joy L. Johnson, T. Gregory Hislop, Jane A. Buxton, Cornelia Zeisser, Weihong Chen et Birgit Reime

Les auteurs de cette étude se sont attachés à déterminer les aspects négatifs et positifs de la divulgation des résultats de mammographie sur la densité du tissu mammaire (DTM) aux participantes d'un programme de dépistage du cancer du sein. Ils ont mené une expérience aléatoire auprès d'un échantillon de 618 femmes âgées de 50 ans et plus, montrant une DTM supérieure à 5 %. L'expérience consistait à préciser, dans la lettre sur les résultats de mammographie destinée aux intéressées, la DTM obtenue et à joindre un dépliant sur le sujet. Comparativement aux groupes témoins, un plus grand nombre de sujets du groupe expérimental ont expliqué correctement la notion de densité du tissu mammaire et admis qu'il s'agissait d'un facteur de risque de cancer du sein. Lorsqu'on a consulté les participantes quatre semaines plus tard, celles du groupe expérimental ont été plus nombreuses que celles des groupes témoins à indiquer qu'elles allaient « très probablement » demander de subir un examen annuel de dépistage; toutefois, au bout de six mois, on n'a constaté aucune différence notable entre les deux groupes. Aucune différence significative n'a été relevée non plus en ce qui concerne les autres critères comportementaux ou psychologiques, malgré le fait que le risque perçu de cancer du sein était « largement inférieur » chez les groupes. Les auteurs proposent ici un moyen d'information personnalisé sur le risque de cancer du sein, qui a l'avantage d'être réalisable et non alarmiste.

Mots clés : densité du tissu mammaire, dépistage du cancer du sein, mammographie

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Women's Responses to Information on Mammographic Breast Density

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The objective of this study was to determine the negative and positive outcomes of providing mammographic breast density (MBD) information to participants of a screening program. A randomized experiment was conducted with a sample of 618 women 50 years or older with MBD greater than 50% of breast volume. The intervention consisted of reporting the presence of MBD in the screening mammography results letter that was sent along with an information pamphlet. Compared to the controls, more women in the intervention group described the term breast density correctly and recognized it as a risk factor for breast cancer. Although at the 4-week follow-up the intervention group indicated that they were "very likely" to have an annual clinical breast examination more frequently than controls, no differences were detected at 6 months. There were no significant differences on other behavioural or psychological measures, although at the 4-week follow-up the control group perceived their risk for breast cancer, relative to other women their age, as "a lot lower" than did women in the intervention group. The results demonstrate a feasible and non-threatening way to provide women with important personalized information about breast cancer risk.

Keywords: Breast density, breast cancer screening, risk communication, mammography

Introduction

Mammographic breast density (MBD), determined radiologically by assessing relative amounts of fat, connective tissue, and epithelial tissue, has emerged as an important risk factor for breast cancer: women with widespread MBD have a four- to six-fold increase in risk compared with women with no MBD (Boyd et al., 2005; Harvey & Bovbjerg, 2004). Although MBD diminishes with age, the elevated risk has been shown to persist for 5 to 10 years after initial classification (Boyd et al., 1995; Byrne et al., 1995). Having a relative with breast cancer is significantly associated with smaller MBD reductions at menopause (Knight et al., 1999) and menopausal hormone therapy is associated with increases in MBD (Boyd et al., 1995; Greendale et al., 1999; Persson, Thurfjell, & Holmberg, 1997). Possible explanations for the association between high levels of MBD and increased breast cancer risk include the development of premalignant lesions, elevated growth factors, and increased estrogen

production within the breast related to aromatase (Harvey & Bovbjerg). Evidence is accumulating that MBD can be reduced among women without breast cancer through a variety of strategies, including dietary interventions (e.g., low-fat, high-carbohydrate diets), stopping menopausal therapy, and tamoxifen treatment (Boyd et al., 1997; Boyd et al., 2001; Boyd et al., 2003; Cuzick, Warwick, Pinney, Warren, & Duffy, 2004; Knight et al.). Researchers have also begun to demonstrate a trend of decreasing risk for breast cancer with diminishing levels of MBD (van Gils, Otten, Verbeek, Hendriks, & Holland, 1998). Further, a more lucent pattern may increase the possibility of early detection through mammography. Although methods for enhancing estimations of MBD have been reported (Brisson, Diorio, & Masse, 2003; Pawluczyk et al., 2003), it is particularly important that women with high levels of MBD obtain regular screening to increase the likelihood of early detection (Whitehead et al., 1985).

Despite the importance of MBD, most women do not know if they have dense breasts. Some screening programs in Canada have begun to routinely assess MBD in all mammograms, often as a means of identifying eligibility for specific clinical trials. Because of concerns about causing undue anxiety, however, only one Canadian program routinely shares this information with clients or clients' physicians (Ontario Breast Screening Program, 2003). Several factors point to the need to review the current practice. Women seeking information about their personal risk for breast cancer report that this information would motivate them to engage in activities to reduce their risk (Bottorff et al., 2000). Women recently have begun to learn about MBD on the Internet and through the media and are beginning to request information about the nature of their breast tissue. Because MBD represents a potentially modifiable risk factor for breast cancer, we need to develop effective ways of notifying women who have high levels of MBD and, in a manner that is not overly distressing, providing them with accurate information about ways that MBD may be modified and about the need for regular screening.

The impact of MBD information remains unknown, although anecdotal evidence suggests that sharing it does not lead to inordinately high levels of worry (Boyd et al., 1997). The purpose of this research was to determine the negative and positive behavioural and psychological outcomes of providing personalized information about MBD in the context of a population-based mammography program. Two central hypotheses were tested: 1. *Women who receive MBD information will demonstrate higher rates of healthful behaviours related to managing breast cancer risk (e.g., participation in screening, including breast self-examination, clinical breast examination, and intention to undergo re-screening and make dietary changes) than women in the comparison group who do not receive this information.*

2. *Women who receive MBD information will not have significantly different psychological responses (preoccupation with breast cancer, breast cancer worry, and psychological distress) from women in the comparison group who do not receive this information.*

In addition, we addressed three research questions: 1. *What is the relationship between receipt of MBD information and knowledge of MBD as a risk factor (i.e., does exposure to the informational intervention increase women's knowledge)?* 2. *What is the relationship between receipt of information about MBD and women's perceptions of their risk for breast cancer?* 3. *What is the relationship between receipt of MBD information and subsequent advice-seeking behaviour?*

Methods

Design and Setting

A randomized pre-test, post-test experiment was conducted with the Screening Mammography Program of British Columbia (SMPBC) following approval by the university research ethics board. At the time of this study, the SMPBC was encouraging women 50 to 79 years of age to have a mammogram every 2 years. Free screening is offered to women throughout the province through 21 fixed centres, 12 ancillary centres, and 4 mobile programs. The women and their physicians are informed of the mammography results by mail. Reminder letters are routinely mailed to women who are due for re-screening. In 2002 the SMPBC conducted over 230,000 examinations, 86% of which were for returning participants. Five fixed regional screening centres, including one mobile screening program serving a rural population, were selected for the study based on the following criteria: (a) the number of examinations completed at the centre in the previous year was among the highest in the SMPBC program, and (b) all of the screening radiologists working at the centre were determined to assess MBD reliably.

Participants

The target population included all women who made appointments for re-screening at one of the selected screening centres between February 2002 and August 2003 and who met the following criteria: (a) on a previous visit indicated a willingness to participate in research, (b) were 50 years of age or older, (c) were never diagnosed with breast cancer, (d) did not report the presence of breast lumps or discharge, (e) were able to comprehend English, (f) had MBD > 50% and an otherwise normal mammogram at the previous visit, (g) were not participating in other breast cancer prevention studies, and (h) were willing to participate.

Sample-size calculations were conducted for each hypothesis in light of the expected findings using Cohen's power tables (Cohen, 1988) and

Kelsey, Thompson, and Evans's (1986) formulae. The conditions set for the study were: (a) 90% statistical power, and (b) $\alpha_{(2\text{-tailed})} = .05$. The expectation for H_2 was a null effect in that we expected to find no adverse psychological effects. Consequently, we wanted to ensure that failure to note differences between the groups did not result because of insufficient power. There was a danger that too much power would result in statistically significant findings in H_2 because of trivial departures; consequently we sought to find a balance such that a minimal meaningful difference could be detected if it existed. We also took feasibility into consideration in light of attendance rates at the screening centres and an expected dropout or loss-to-follow-up rate of 10%. A priori calculations indicated that, with 535 participants, we would have an adequate number of cases to conduct multivariate analyses.

Intervention

The women in the intervention group received information about their MBD with the mailed results of their mammogram, along with a pamphlet describing MBD (including photographs showing mammograms of dense and not-dense breasts) and other risk factors for breast cancer, factors that influence MBD (i.e., age, hormone therapy, dietary fat), and risk-reduction strategies (i.e., regular breast screening, healthful low-fat diet, healthful lifestyle).[1] The results letter included a statement indicating that the woman had MBD, briefly described what is known about MBD, and provided reassurance that having MBD does not mean that a woman has or will have cancer. Because alternative screening modalities such as ultrasound are not routinely available for women with MBD in the study setting, they were not mentioned in the information pamphlet. The mammogram results letter, signed by the director of the screening program, was sent to both the woman and her family physician.

The intervention letter and pamphlet were developed in conjunction with the staff of the SMPBC and other experts, with input by women with MBD, and incorporated concepts from the Health Belief Model as well as constructs such as psychological distress and self-efficacy. The messages about MBD and breast cancer risk factors included in the intervention were designed to influence perceived susceptibility to breast cancer in addition to reassuring women that they did not have breast cancer. Since receipt of abnormal mammogram results is often associated with increased anxiety (Rimer & Bluman, 1997), information about risk-reduction strategies was framed positively, addressing the benefits of regular breast screening and the positive outcomes associated with a healthful diet and lifestyle (Finney & Iannotti, 2002). In addition, direct

[1] A copy of the intervention pamphlet and results letter can be obtained from the lead author.

linkages were made between these recommendations and women's risk for breast cancer, in order to enhance perceived control and self-efficacy.

The women in the control group and their physicians received the usual results letter sent by the screening centre (i.e., without reference to MBD). These women provided baseline and follow-up data in a manner identical to that of the intervention group.

Procedures

Women who phoned to make an appointment for re-screening and who met the initial eligibility criteria were recruited by telephone before attending the screening centre for their scheduled mammogram. Informed consent was sought from eligible women (signed consent was obtained subsequently, when the woman attended her screening appointment, or, if necessary, the consent form was mailed to the woman with a stamped, self-addressed envelope), and baseline (pre-test) data were collected via a telephone-administered questionnaire to measure anxiety, depression, breast cancer worry, subjective and objective estimates of breast cancer risk, family history of breast cancer, distance to mammography screening centre, and demographics. Women who were found, upon re-screening, to have suspicious or abnormal findings or who did not have MBD > 50% were excluded from further involvement in the study. The other women were randomly assigned to the intervention or the control group. The SMPBC computer that tracked appointments was used to determine group assignment by randomly generating a number with the generator initialized by using the computer's real time clock as the seed. The number generated was passed through a rule such that if the number fell below 500,000 the woman was assigned to the control group and if the number was 500,000 or above the woman was assigned to the intervention group.

Group-appropriate mammogram results letters were then generated and posted to the women and their physicians by the screening program staff. The usual time between screening and reporting of results was 1 week. At 4 weeks and 6 months following screening, the women in both groups were telephoned and interviewed by research assistants who were blind to group assignment.

Before commencement of the study, all family physicians in the study communities were sent a letter describing the study, along with a telephone number for the project director, a copy of the MBD pamphlet, and additional information on MBD, including a copy of a journal article (Hislop, Coldman, Warren Burhenne, Smart, & Olivotto, 1997; Tristant, Chiche, & Lvy, 2002), the purpose being to ensure that, if approached, physicians would be prepared to discuss MBD with the study participants.

To make certain that all data were of high quality, all research assistants were trained in data-collection procedures and telephone-interviewing techniques. At the SMPBC, radiologists routinely assess MBD and receive formal education in its visual assessment. As is standard practice in this screening program, assessments of MBD were limited to two categories: MBD occupying ≥ 50% of breast volume, and MBD occupying < 50% of breast volume. Before the study commenced, a reliability check of MBD assessments on a sample of mammograms was made for all screening radiologists by a senior reference radiologist. Only women seen by screening radiologists with reliable scores for MBD determination were included in the study.

Measures

Perceptions of personal risk were assessed by asking the women to rate their own lifetime risk of breast cancer (1 = *none at all,* 6 = *very high*) and to compare their risk of developing breast cancer to that of other women their age (1 = *a lot lower,* 5 = *a lot higher*). The upper two response categories for each item were collapsed into one category because of infrequent endorsement.

Preoccupation with breast cancer was assessed by measuring the psychological effects of receiving the mammogram results using the intrusion-subscale of the revised Impact of Event Scale (IES) (Horowitz, Wilner, & Alvarez, 1979). This subscale has demonstrated acceptable internal consistency (Cronbach's alpha = .78) and has been found to be a sensitive measure of the psychological impact of the notification of breast cancer risk (Kash, Holland, Halper, & Miller, 1992; Lerman et al., 1993; Lerman et al., 1995; Lerman, Kash, & Stefanek, 1994).

Breast cancer worry and fear were assessed using a series of Likert-type items developed by Lerman and colleagues (Lerman et al., 1993; Lerman, Trock, Rimer, Boyce, et al. 1991; Lerman, Trock, Rimer, Jepson, et al., 1991) that measure the frequency with which women worry about developing breast cancer, the impact of such worry on mood and daily functioning, and current levels of anxiety related to the results of future mammograms.

Psychological distress was assessed using the nine-item anxiety subscale of the Brief Profile of Mood States (POMS) (McNair, Lorr, & Droppleman, 1992). All 20 items of the Center of Epidemiological Studies Depression scale (CES-D) were used to measure signs of depression (Radloff, 1977).

Behavioural consequences were measured using items focused on participation in breast cancer screening and in dietary changes. First, the women were asked if they had had a clinical breast examination since their mammogram (4-week follow-up) or last interview (6-month

follow-up) and the likelihood of their having a clinical breast examination every year (at 4-week and 6-month follow-up). In a similar fashion, the women were asked about breast self-examination. These questions were taken from Canada's Health Promotion Survey (Stephens & Graham, 1993). Finally, at the 6-month follow-up the women were asked about their intention to return for mammography within the recommended time interval. At the time of the study, the SMPBC was recommending that all women over 50 years of age (regardless of MBD status) have a mammogram every 2 years. In relation to diet, at 4 weeks and 6 months the respondents were asked how healthy their diet was, if they had made changes to their diet, and what changes they had made.

Background factors measured at baseline included demographics and family history of breast cancer (using the Gail Model Risk Assessment Tool; Gail et al., 1989).

Women's knowledge of breast density was measured at the 4-week follow-up. First, the women were asked whether they had ever heard of the term breast density. If they said yes, they were asked to describe the term. Two questions were used to ask the participants to judge whether women with breast density have a greater chance of developing breast cancer than women without breast density (yes/no) and how important it is for women to know if they have breast density (1 = *not at all important,* 4 = *very important*). These two questions were also posed at the 6-month follow-up.

Advice-seeking behaviour was assessed at both follow-ups. First the women were asked if they had received information about their risk for breast cancer since their last telephone interview and whether they had discussed the information with anyone.

Psychometric Verification of Measures

The reliabilities of the IES, CES-D, and POMS anxiety subscale were found to be sufficiently high (ranging from 0.7 to 0.8), and factor analyses confirmed the established factor structures of these scales. In Lerman et al.'s (1996) work, the two breast cancer worry-impact items were found to be highly correlated ($r = 0.63$) and thus were used to create a breast cancer worry index. However, similar psychometric characteristics were not found in the present study. Therefore, the two worry-impact items were treated as individual measures.

Data Analysis

The data were screened for entry errors, missing data, and possible outliers. For all statistical analyses, critical values were set at $p < .05$ for two-tailed tests. The two study groups were compared in terms of their baseline demographic characteristics and personal background factors,

because the randomization split between the intervention and control groups was less than optimal (non-equivalent sizes).

Before testing the hypotheses, we examined whether exposure to the intervention increased women's knowledge of MBD as a risk factor for breast cancer by comparing the two randomized groups on questions related to knowledge of breast density using Chi-square analyses. We then compared the two groups on measures of participation in screening using Chi-square analysis. Multiple logistic regression analyses were conducted to explore potential covariates and predictors of intended screening participation. The dependent variables were examined for group differences using Chi-square analysis for categorical data and Student's *t* test for continuous data. Descriptive statistics were used to determine particular patterns of women's advice-seeking behaviour upon receipt of MBD information.

Results

Sample

A total of 1,328 women met the initial study criteria. Of these, we were able to contact 1,188 by telephone for further assessment of eligibility and to determine their willingness to participate. Of these women, 97 did not meet the initial inclusion criteria: 45 were unable to comprehend English; 40 did not appear for their scheduled screening appointment or had already had a mammogram; 8 had participated in other breast cancer prevention studies; and the remainder reported breast discharge ($n = 1$), a suspected lump ($n = 2$), or cancer ($n = 1$). On re-screening, 185 women did not have MBD ≥ 50% or had an abnormal mammogram and were excluded. Of the 906 remaining women, 288 refused to participate in the study, the majority citing lack of interest (63.0%) or being too busy (16.2%) (participation rate = 68.2%). Non-participants were compared to participants using data available from the SMPBC. No significant differences were found for age, number of previous mammograms with abnormal findings, and number of screenings in the preceding 6 years. The mean length of time since their last mammogram at the SMPBC, however, was significantly different: 26 months for non-participants and 23 months for participants ($t_{(404.8)} = 2.03$, $p = .04$).

The final sample included 618 women, with 333 participants in the control group and 285 in the intervention group. The random assignment process did not result in a 50/50 split; no obvious bias was identified, however, in the greater likelihood of assignment to the control group. The two groups did not differ significantly on baseline measures (see Table 1). Of the 618 participants at baseline, 579 (93.7%) completed the 4-week survey and 586 (94.8%) the 6-month survey. Similarly, there was no differential loss to follow-up at 4 weeks (χ^2 (1, $N = 618$) = .45, $p = .50$) and 6 months (χ^2 (1, $N = 618$) = .01, $p = .93$).

Women's Knowledge of MBD as a Risk Factor for Breast Cancer

At the 4-week follow-up, 93.2% of the women in the intervention group and 72.1% in the control group said that they had heard the term breast density (χ^2 (1, N = 577) = 42.8, $p < .001$). Among those who had heard the term, 24.8% in the intervention group described it correctly, 48.6% had a vague answer, and 26.6% described it incorrectly. The corresponding figures for the control group were 7.5%, 63.8%, and 28.7%. Chi-square analysis revealed that more women in the intervention group than in the control group could describe the term breast density correctly (χ^2 (2, N = 402) = 22.3, $p < .001$). More women in the intervention group than in the control group recognized breast density as a risk factor for breast cancer (85.3% at 4 weeks and 89.2% at 6 months) (66.4% and 63.8%, respectively) (χ^2 (1, N = 336) = 16.5, $p < .001$ at 4 weeks and χ^2 (1, N = 374) = 34.9, $p < .001$ at 6 months).

Behavioural and Psychological Outcomes

The two study groups were compared in relation to breast screening behaviours (clinical breast examination, breast self-examination, and mammography). Although at the 4-week follow-up the intervention group (n = 61, 23.0%) more frequently than controls (n = 47, 15.1%) indicated that they were "very likely" to have an annual clinical breast examination (χ^2 (1, N = 576) = 8.86, p = .03), no differences were detected at 6 months. Logistic regression analyses using baseline measures did not identify any significant predictors of intended annual clinical breast examination. Group comparisons revealed no statistically significant differences at the 4-week and 6-month follow-up for engagement in breast self-examination and intention to return for screening mammography within the recommended time interval. There were no significant differences between the groups in participants' assessment of their diet, in the number who reported making changes to their diet, and in the type of changes made at both follow-ups. No statistically significant differences were found in any of the psychological outcomes: preoccupation with breast cancer (IES, Intrusion subscale), breast cancer worry/fear, and psychological distress (POMS and CES-D) at either follow-up (see Table 2).

Women's Perception of Risk for Breast Cancer upon Receipt of MBD Information

At the 4-week follow-up, group comparison revealed no significant differences in the women's perceptions of their lifetime risk of breast cancer. However, a significant difference was found with respect to the women's relative risk perceptions (i.e., compared to other women their age)

Table 1 ***Baseline Comparison of Control and Intervention Groups by Demographic/Personal Background Characteristics, Perception of Breast Cancer Risk, and Psychological Responses***

Variables	Control (n = 333)	Intervention (n = 285)	Statistics[a] t	χ^2
Age (mean years)	65.9	66.1	-.45	
Education level (%)				3.32
High school incomplete	6.4	5.6		
High school complete	23.9	27.4		
Postsecondary degree (university not included)	39.4	33.0		
Bachelor's or postgraduate degree	30.3	34.0		
Years of schooling (mean)	14.8	15.1	-1.26	
Born in Canada (no) (%)	34.8	32.3		.34[b]
Years lived in Canada (mean)	38.4	39.7	-.79	
Marital status (%)				.98
Married/common law	67.4	69.5		
Separated/divorced/widowed	25.9	22.8		
Single	6.6	7.7		
Household income (%)				3.42
< 10,000–29,000	18.2	16.7		
30,000–59,000	41.3	34.8		
60,000–89,000	22.2	29.3		
90,000+	18.3	19.2		
Residence (%)				.39[b]
Urban	72.7	75.3		
Rural	27.3	24.7		
Distance to mammography screening centre (mean miles)	7.8	6.7		.41
First-degree relatives with breast cancer (%)				.57[b]
None	81.7	84.3		
One or more	18.3	15.7		

Variables	Control (n = 333)	Intervention (n = 285)	Statistics[a] t	χ^2
Gail lifetime risk of breast cancer (mean %)	9.1	8.7	.88	
Own lifetime risk perception (%)				.71
None at all	8.1	8.7		
Very low	25.8	22.9		
Low	36.0	36.7		
Moderate	24.5	25.8		
High	5.6	5.8		
Relative risk perception (%)				6.46
A lot lower	14.9	8.1		
Somewhat lower	34.0	36.7		
About same	40.3	43.0		
Higher	10.8	12.2		
How often worry about getting breast cancer? (%)				3.01
Not at all	32.2	30.3		
Rarely	40.7	36.3		
Sometimes	24.1	29.6		
Often to almost all of the time	3.0	3.9		
Breast cancer worry affecting mood (%)				.16
Not at all	64.9	65.5		
A little	25.8	24.4		
Somewhat to a lot	9.3	10.2		
Breast cancer worries affecting functioning (%)				.14
Not at all	92.9	91.9		
A little	4.9	5.6		
Somewhat to a lot	2.2	2.5		
POMS anxiety subscale score (mean)	15.1	14.8	.78	
CES-D total score (mean)	7.2	6.5	1.17	

[a] None of the test statistics was statistically significant at $p < .05$.
[b] Yates's continuity correction applied.

Table 2 *Comparison of Control and Intervention Groups by Psychological Responses for Follow-up Data*

Variable	Control		Intervention		Statistics[a]			
	4 weeks (n = 314)	6 months (n = 316)	4 weeks (n = 265	6 months (n = 270)	4 weeks T	4 weeks χ^2	6 months T	6 months χ^2
Impact of Events Scale, Intrusion subscale (mean)	26.1	26.2	26.2	26.0	-0.28		0.64	
How often worry about getting breast cancer? (%)						1.65		0.24
Not at all	36.6	34.5	31.7	35.2				
Rarely	43.0	44.6	45.3	45.6				
Often	20.4	20.9	23.0	19.3				
Breast cancer worry affecting mood (%)						0.01		1.82
Not at all	69.3	69.6	69.6	73.7				
A little	24.1	23.2	23.8	17.7				
Somewhat to a lot	6.5	7.2	6.6	8.6				
Breast cancer worry affecting functioning (%)						0.21		0.95
Not at all	91.3	90.3	92.3	90.3				
A little	6.6	5.3	5.5	6.9				
Somewhat to a lot	2.0	4.3	2.2	2.9				
POMS anxiety subscale (mean)	15.6	15.9	15.2	15.9	1.00		-0.09	
CES-D total score (mean)	6.9	6.8	6.8	6.6	0.14		0.33	

[a] None of the test statistics was statistically significant at $p < .05$.

(χ^2 (N = 579) = 8.00, p = .046). More women in the control group (n = 46, 15.5%) than in the intervention group (n = 27, 10.5%) perceived their risk as "a lot lower."

At the 6-month follow-up, no significant differences were found between the study groups with respect to perception of lifetime or relative risk of breast cancer (see Table 3).

Women's Advice-Seeking Behaviour upon Receipt of MBD Information

At the 4-week follow-up, the women were asked if they had received information about their risk for breast cancer. In the intervention group, 106 women (40%) recalled receiving risk information in either the SMPBC results letter or the SMPBC pamphlet. Of these women, 45 reported they had discussed their risk for breast cancer with one or more individuals, including their husband/partner (48%), physician (21%), friends (17%), and family members (13%). Only one woman reported contacting the screening program staff to discuss her results.

Table 3 ***Women's Perceptions of Risk for Breast Cancer upon Receipt of MBD Information***

	Control		Intervention		Statistics	
Variable	**4 weeks (n = 314)**	**6 months (n = 316)**	**4 weeks (n = 265)**	**6 months (n = 270)**	**4 weeks χ^2**	**6 months χ^2**
Own lifetime risk perception (%)					9.27	5.39
None at all	7.7	9.4	6.7	7.9		
Very low	34.0	32.8	23.2	25.6		
Low	32.0	31.5	36.2	34.2		
Moderate	22.7	23.7	28.3	28.2		
High	3.7	2.6	5.5	4.1		
Risk perception relative to other women (%)					8.00*	5.26
A lot lower	15.5	16.7	10.5	10.6		
Somewhat lower	35.0	32.1	29.3	33.0		
About the same	38.7	42.6	50.0	45.1		
Higher	10.8	8.5	10.2	11.4		

* $p < .05$.

Discussion

To our knowledge, this is the first study to evaluate the outcomes of a risk-notification intervention designed specifically to provide personalized information about MBD and risk-reduction strategies in the context of a population-based mammography screening program. In this study, women's knowledge of breast density as a risk factor for breast cancer was enhanced by the information provided with their mammography results letter.

Those concerned about the effect, on women's psychological well-being, of sharing MBD information in mammogram results letters should be reassured by our finding that the receipt of personalized MBD information is not associated with increased breast cancer worry, anxiety, or depressive symptoms. Although many women become anxious after being told they have an abnormal mammogram (Brett, Austoker, & Ong, 1998; Gilbert et al., 1998; Gram, Lund, & Slenker, 1990; Gram & Slenker, 1992; Lerman, Trock, Rimer, Boyce, et al., 1991; Lowe, Balanda, Del Mar, & Hawes, 1999), it appears that the women in this study did not interpret their MBD status as an abnormality. The statement we included in the mammogram results letter reassuring women with MBD that their mammogram was normal appears to have been effective.

The difficulties experienced by lay people in understanding risk-related information (e.g., probabilities or percentage estimates) are well documented. Because the MBD information was provided in the context of a mammography screening service, we wanted to be sure that it did not increase women's misunderstanding of their risk. Although at follow-up no significant difference between the two study groups was found with respect to perception of lifetime risk for breast cancer, at the 4-week follow-up fewer women in the intervention group than in the control group rated their risk for breast cancer as "a lot lower" than that for other women their age. These findings suggest that receipt of information about MBD may have increased the accuracy of risk perception by reducing the women's propensity to be optimistically biased about their personal risk for breast cancer.

Although we had hoped that providing MBD information would encourage women to engage in recommended screening practices, the only demonstrated change was a greater likelihood, at the 4-week follow-up, to report intention to undergo annual clinical breast examination. Importantly, receipt of MBD information did not appear to deter women from engaging in breast cancer screening. It is possible that the lack of change in screening intention was related to the level of commitment to breast cancer screening in this sample. All of the participants had at least one previous mammogram and were returning for re-screening.

It is possible that these women were already following recommended screening practices and that additional information about their breast cancer risk simply reinforced their actions.

We thought that dietary changes would result from the provision of information about MBD status along with recent evidence that a low-fat diet may reduce breast density and be an important risk-reduction factor. This did not appear to be the case. The majority of participants reported that their diet was "healthy" or "very healthy," in both the intervention group (90.5% at 4 weeks; 86.6% at 6 months) and the control group (90.7% at 4 weeks; 87.9% at 6 months). Although it is possible that the women did not need to introduce dietary changes such as reduced fat content because they already had a "healthy diet," a more detailed evaluation of dietary fat intake would be needed in order to tailor dietary interventions.

The findings of this study should be considered in light of several limitations. Because the study was conducted in the context of a Canadian provincial mammography screening program, the findings may not be generalizable to other settings, particularly those where free screening is not offered or re-screening reminders are not provided. The women who participated in this study all had previous screening mammograms and their current mammograms were normal. Information about MBD could have different consequences for those receiving their first screening mammogram or for those with suspicious or abnormal screening results. The period of the study did not permit long-term follow-up to assess actual participation in mammography re-screening following receipt of MBD information.

As increasingly accurate measures of MBD are introduced in clinical practice, it is likely that MBD information will be used more frequently in decision-making. Concerns that providing MBD information will result in the need for extra staff time in mammography screening programs, to address women's questions and concerns, appear to be unwarranted. Emerging evidence that breast density is hormonally responsive and may be influenced by lifestyle factors such as alcohol intake and diet (Harvey & Bovbjerg, 2004; Knight et al., 1999; Weinstein, 1999) indicates that it is important that women know their MBD status. This knowledge could influence decisions about postmenopausal hormone therapy. The majority of participants in this study believed that it was important women be informed about their breast density. Nurses and other health professionals are in key positions to support women in using personal information about MBD to understand their risk for breast cancer and to guide decisions related to risk reduction.

Conclusion

Our findings suggest that provision of information about MBD with the results of mammography screening is not associated with negative psychological outcomes and is a cost-effective way of providing women with personalized information on breast cancer risk. The effect of supplying risk information related to MBD status on women's use of screening mammography warrants further study. Further research on the relationship between understanding personal risk factors for breast cancer and changing behaviour is also needed.

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