Breast cancer screening implementation and reassurance

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Background: Women not offered screening mammography reported higher levels of negative psychosocial aspects than women offered screening. This was demonstrated in a questionnaire survey where 1000 women were included: 500 women living in areas where the public authorities had never offered screening mammography and 500 women living in areas where women had been invited to screening mammography for >10 years. After this baseline survey, nationwide screening mammography was implemented. The aim of this follow-up study was to resurvey the 1000 women and to investigate if the identified difference in reported psychosocial aspects had disappeared or been reduced because of the nationwide screening implementation. Methods: The 1000 women included in the previous survey were posted part I of the questionnaire Consequences of Screening in Breast Cancer (COS-BC1) in August 2011, nearly 5 years after they received the COS-BC1 the first time. Results: A total of 677 women returned the questionnaire. There was no statistically significant difference between the two groups in reported psychosocial aspects. Women new to screening reported less negative psychosocial aspects compared with the previous survey. Conclusion: An implementation of a screening mammography programme provides reassurance for those women invited to the screening. This reassurance is in contrast to the unbalanced proportion between the intended benefits and the unintended harms of the screening programme.

Introduction

The primary medical argument for cancer screening is early detection of tumours followed by a better prognosis because of early treatment and thereby a disease-specific mortality reduction in the population. Some adverse effects have been noted. These primarily consist of the probability of overdiagnosis and negative psychosocial consequences. Overdiagnosis occurs when a cancer is diagnosed that otherwise would not result in symptoms; slow or not growing tumours and carcinomas in situ are examples of this phenomenon. Negative psychosocial consequences have been reported, especially in relation to breast cancer, among screened women who receive a false-positive screening result. However, it also has been suggested that cancer screening—or being offered screening possibilities—is providing reassurance.

In Denmark, nationwide breast cancer screening was implemented starting 2007 in relation to a reform of the Danish municipalities and counties. Before this national implementation, breast cancer screening programmes had been implemented in the city of Copenhagen: in 1991 in the municipality of Copenhagen and in 1994 in the municipality of Frederiksberg. A screening programme was also implemented in the former County of Funen in 1993.

In December 2006, Brodersen et al. conducted a study where 1000 women, aged 50–69 years, were randomly drawn from the Danish Civil Registration System to receive part I of the questionnaire Consequences of Screening in Breast Cancer (COS-BC1), a condition-specific questionnaire developed to measure psychosocial aspects of mammography screening: 500 women living in geographical areas where screening mammography had been offered for >10 years, and another 500 women living in areas where the public health authorities had never invited women to breast cancer screening. The study indicated that those women living in areas where screening was not offered reported more negative psychosocial aspects compared with women living in areas where screening was offered. The women were not different with respect to sociodemographic characteristics between the two groups. The identified difference between the women in the two areas was therefore most probably caused by an increased feeling of reassurance among those women screened, or an increased insecurity among those not offered screening—or both. Five years later, all women surveyed in December 2006 should theoretically have been invited to screening.
mammography at least once. Therefore, the aim of the present study was to investigate if the difference in psychosocial aspects of the women living in the two areas identified in the December 2006 study had disappeared or been reduced as a result of the implementation of mammography screening nationwide in Denmark.

Methods

The same 1000 women included in the Brodersen et al. study from December 2006 were posted COS-BC1 in August 2011, nearly 5 years after they received the COS-BC1 the first time. The COS-BC1 is a condition-specific questionnaire including 29 items with high content validity measuring multi-dimensional psychosocial aspects of screening mammography, notably, consequences of abnormal and false-positive screening results. The COS-BC1 encompasses six scales measuring anxiety, sense of dejection; negative impact on behaviour, sleep and sexuality as well as the degree of breast self-examination. In addition, two single items 'Felt less attractive' and 'Busy to take my mind off things' are also included in the COS-BC1. The two single items and all the items in the six psychosocial scales have four response categories: 'not at all', 'a bit', 'quite a bit' and 'a lot' scored 0, 1, 2 or 3, respectively. The higher the score of the outcome, the more negative psychosocial consequences the person has experienced. The COS-BC1 has been found applicable to women in the general population, both for those invited and those not invited to breast screening. Apart from the six scales and the two single items in the COS-BC1, a generic item about self-rated health represented nine psychosocial outcomes. Information was obtained about age, employment status, social class and whether the woman was living alone. On the subject of breast cancer and screening, the woman was asked whether she had previously had an X-ray examination of the breasts, whether she had been invited to screening, whether she had accepted such an invitation and whether she had received a diagnosis of breast cancer.

The 1000 women receiving the COS-BC1 in December 2006 and again in August 2011 were in 2006 randomly drawn from the Danish Civil Registration System; 250 women living in the municipality of Copenhagen and Frederiksberg, 250 women living in Funen (where screening mammography had been offered for >10 years) and 500 women from two former counties where the public health authorities had never invited women to breast cancer screening. The latter group was composed of 250 women from the Copenhagen suburbs and 250 women from Århus County, including the second largest city in Denmark. Nationwide screening mammography was implemented in 2007, so the new screening group had at our follow-up survey round been invited to screening mammography for nearly 5 years, whereas the established screening group had been invited for at least 15 years. The 1000 women were in December 2006 aged 50–69 years. All women were sent the COS-BC1 by post, including a covering letter with a statement about voluntariness of responding. Anonymity was guaranteed. The women were asked to complete and return the questionnaire in an enclosed stamped, addressed envelope. Reminders were posted to those who had not returned the questionnaire within 3 weeks.

For the analyses in the present article we defined an intention-to-treat sample, where women diagnosed with breast cancer before the corresponding survey round were excluded. Analyses on the full sample were also done, but are not reported. The answers were all considered in the same way, despite some women being too old to receive a screening mammography invitation in 2011. Covariates were compared between the established screening and new screening groups using chi-squared tests. The nine psychosocial outcomes were compared between the established screening and the new screening groups for each survey round with Kruskal–Wallis non-parametric tests. The increase in average negative psychosocial aspects between the baseline and follow-up survey round for each of the two groups, and the difference in average negative psychosocial aspects in the established screening group as compared with the new screening group at the follow-up survey round (all denoted Δ in the following), were estimated from linear regression analyses using a person random effect to account for repeated measurement on the same woman. The analysis was adjusted for possible confounding by including age, employment status, social status, living alone and the four geographical areas as additional independent variables in the regression model. A P-value <0.01 was taken as significant.

Results

Of the 1000 posted questionnaires, 677 (67.7%) were completed and returned in the follow-up survey round (figure 1). Of these, 42 had had a breast cancer diagnosis previous to the follow-up survey round (equally distributed between the two screening areas) and were excluded from the follow-up survey sample; 22 had had a breast cancer diagnosis in between the two survey rounds (figure 1) and were not excluded from the baseline survey sample.

Neither at baseline nor at the follow-up survey round were there sociodemographic differences between the respondents from the two screening groups (table 1). A persistent larger use of X-ray examinations of the breast is noted in the established screening group. Although the difference in being invited to screening has disappeared at the follow-up survey round, still more women from the established screening group participate in the screening (table 1). In the follow-up survey, 92.8% in the new screening group and 95.8% in the established screening group had been invited to screening mammography.

Figure 2 shows the development of the reported negative psychosocial aspects for the established screening group and the new screening group from baseline to follow-up 5 years later. The new screening group consistently reported lower levels of negative psychosocial aspects at follow-up. There was no significant difference between the two groups at follow-up in any of the nine outcomes (table 2). The analysis for the full sample gave similar results.

Discussion

Women in the new screening group living in areas where screening was not offered before 2007 reported lower levels of negative psychosocial aspects in 2011 compared with 2006. Furthermore, these women reported similar level of negative psychosocial aspects in 2011 as women in the established screening group from areas where screening has been offered for >15 years. As the same 1000 women were included in both survey rounds, and both groups of woman now had been invited to mammography screening, we can conclude that a mammography screening invitation provides reassurance for women.

This is a longitudinal study as a result of two rounds of data collection from the same 1000 women in both questionnaire rounds. This gives the possibility to conclude screening mammography as a reassuring factor. A longitudinal study also solves a potential confounding problem because the subjects serve as their own controls. A partial turnover of women returning the questionnaire can be explained by the decease of some women and a generally older age. This tendency is present in both groups, so we do not consider it a major weakness in this study. Another possible weakness is the lack of invitation to some of the women because they were too old to receive a screening invitation in 2011 because of a 5-year period to follow-up. In contrast, some of the youngest women in the study might not yet have been invited at the time of the survey in 2006. We regard a high screening invitation percentage as a solid basis for our study.

In the new screening group, statistically significant differences of 0.07–0.62 in mean scores of the psychosocial outcomes were
identified between the two survey rounds. If there had been a decrease in mean scores of 1.0, then all women would, for example, have changed their response in one item in each scale from ‘a bit’ (scored 1) to ‘not at all’ (scored 0). A decrease of 0.07–0.62 in mean scores corresponds to every fourteenth to every second participant shifting their response from ‘a bit’ in the baseline survey to a response to ‘not at all’ in the follow-up survey. Notice that we investigated a sample of healthy women, where the only impact was an invitation to mammography screening.

We observed a general tendency towards a reduction in negative psychosocial aspects in both the established and the new screening group even after the analyses were adjusted for age. The fact that the women included in the survey were 5 years older in the second survey round is consistent with older age as a reported sociodemographic factor associated with reduced adverse psychological outcome during screening mammography.

The desired effect of screening mammography is primarily a mortality reduction in breast cancer. However, this positive aspect of screening is only measurable on a public health level. In contrast, the individual benefits of breast cancer screening are not measurable: the absolute mortality risk reduction with screening mammography is 0.05%, which means that for 2000 women invited to screening for 10 years, one will have a prolonged life. Studies also indicate that most women with screen-detected breast cancer do not have their prognosis changed due to screening. The probability that a woman with screen-detected breast cancer avoids a breast cancer death because of mammography is 4.8–13%. However, the unintended harmful effects are serious and indeed measurable. Overdiagnosis in relation to screening mammography is substantial. Healthy women are turned into cancer patients. The magnitude of overdiagnosis has been estimated to 25%, but also estimates as high as 52% in publicly organized screening programmes have been reported. Overdiagnosis is inextricably linked to overtreatment. The net result is screening mammography leading to six more tumorectomies and four more mastectomies for every breast cancer death that is prevented through screening. Adverse psychosocial effects also have to be considered. These appear when the screening result is false-positive. The women receiving false-positive screening results experience anxiety, worry and sleeping problems, among other negative psychosocial consequences. Some of the women report negative psychosocial consequences up to 3 years after declared free from cancer after a false-positive finding. The identified feeling of reassurance among women receiving an invitation for screening mammography is most likely based on the belief that it has been confirmed that breast cancer is not present. In fact, cancer screening tests cannot give participants such a confirmation. Given the uncertainty of the results, cancer screening can only increase the probability of being healthy, i.e. reduce the likelihood that cancer is present in the screened individual. How much this likelihood is reduced can be calculated as the difference between the pre-screening likelihood of not having breast cancer and the post-screening likelihood of not having breast cancer. Of these, approximately 3 in 10 (30%) are overdiagnosed with inconsequential breast cancer. Hence, women whose screening results are negative have achieved an absolute reduction of 7 in 2000 (0.35%) for the likelihood of having breast cancer. This small reduction in the screened women’s absolute likelihood of having breast cancer stands in contrast to the women’s perceived reassurance after being invited to screening mammography. Therefore, an explanation of the identified feeling of reassurance must exist in aspects different from the individual gain of the screening and different from the balance between benefits and harms of breast cancer screening.

People generally tend to like the feeling of possession of some measure of control over life events and the ability to take
reactivity to stressors in daily life. Research has also shown personal control has been shown to be associated with lower outcomes, psychological well-being mentioned as one of that perception of personal control is associated with a variety of reassurance by focusing on prevention of diseases, e.g. in cervical cancer screening, women participated to acquire feelings of confidence and security and returned regularly for screening for confirmation that they were healthy. This behaviour is probably also due to the media’s presentation of screening.

Extrapolating this could lead to an inference that one purpose of medical screening is to make the general population feel satisfied, confident and assured of being healthy. However, if this is the argument for implementing a screening programme, then the same argument could be used for all screening programmes—even those that clearly do more harm than good. Following such inference, an infinite number of screening programmes should be implemented because there are no limits to what medical technology can check the human body for and there is no limit to how often to screen.

Invitation leaflets to breast screening have been criticized for providing unbalanced information where information about the harms is omitted and the benefits are exaggerated. In countries where screening mammography is publicly funded, the information is provided by those responsible for the success of the programme.

The worried well is a well-known phenomenon in public health. It describes users of medical services who are not suffering from any diagnosable disease. They consult a doctor because of fear, seeking to be reassured. Considering the results of the current study, it can be argued that we are dealing with a tendency in our society where the whole population is characterized by a widespread embrace of ‘the worried well’ attitude. Half the women in our study did to some extent report being relatively worried, even though all the women in our intention-to-treat sample are considered healthy because of the absence of breast cancer. When these women received an invitation to screening mammography, their worry was reduced. A great deal of our health care systems’ resources are spent on supplying ‘the worried well’ population with a feeling of reassurance by focusing on prevention of diseases, e.g. in cervical mammography screening programme, the signals sent to women appeal to a feeling of insecurity and women tend to regard screening as an opportunity to be confirmed about being healthy. By using this method to appeal to women, they are misled and may have wrong expectations about the capability of a screening mammography.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Baseline</th>
<th>Follow-up</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total n (%)</td>
<td>Missing n (%)</td>
</tr>
<tr>
<td>Age b</td>
<td>730 (73.0)</td>
<td>0 (0.0)</td>
</tr>
<tr>
<td>50–55 years</td>
<td>189 (25.9)</td>
<td>101 (27.4)</td>
</tr>
<tr>
<td>56–60 years</td>
<td>191 (26.2)</td>
<td>85 (23.1)</td>
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<tr>
<td>61–65 years</td>
<td>216 (29.6)</td>
<td>105 (28.5)</td>
</tr>
<tr>
<td>66–70 years</td>
<td>134 (18.4)</td>
<td>77 (20.9)</td>
</tr>
<tr>
<td>Employment status</td>
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</tr>
<tr>
<td>Working</td>
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<td>6 (0.8)</td>
</tr>
<tr>
<td>Not working</td>
<td>355 (49.0)</td>
<td>176 (48.1)</td>
</tr>
<tr>
<td>Social class c</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>33 (4.8)</td>
<td>46 (6.3)</td>
</tr>
<tr>
<td>II</td>
<td>107 (15.6)</td>
<td>51 (14.6)</td>
</tr>
<tr>
<td>III</td>
<td>174 (25.4)</td>
<td>94 (26.9)</td>
</tr>
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<td>IV</td>
<td>236 (34.5)</td>
<td>117 (33.4)</td>
</tr>
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<td>V</td>
<td>134 (19.6)</td>
<td>69 (19.7)</td>
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<td>Living alone</td>
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<tr>
<td>No</td>
<td>498 (68.6)</td>
<td>4 (0.5)</td>
</tr>
<tr>
<td>Yes</td>
<td>228 (31.4)</td>
<td>101 (27.7)</td>
</tr>
<tr>
<td>X-ray examination d</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>456 (63.0)</td>
<td>6 (0.8)</td>
</tr>
<tr>
<td>Yes</td>
<td>268 (37.0)</td>
<td>147 (40.5)</td>
</tr>
<tr>
<td>Previously invited to screening</td>
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<td></td>
</tr>
<tr>
<td>No</td>
<td>377 (51.9)</td>
<td>3 (0.4)</td>
</tr>
<tr>
<td>Yes</td>
<td>350 (48.1)</td>
<td>37 (10.1)</td>
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<tr>
<td>Previously participated in screening</td>
<td></td>
<td></td>
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<tr>
<td>No</td>
<td>412 (56.7)</td>
<td>3 (0.7)</td>
</tr>
<tr>
<td>Yes</td>
<td>315 (43.3)</td>
<td>32 (8.7)</td>
</tr>
</tbody>
</table>

a: P-value of a χ² test on the association between screening and the corresponding baseline characteristic.

b: Age at baseline.
c: Social class at baseline. In some cases, the social class is derived from the answers to the follow-up questionnaire, i.e. when the woman only answered the follow-up questionnaire, or when the baseline social class information was missing, but not the follow-up social class information.
d: Whether the woman has had an X-ray examination of the breast in a context other than a screening programme.
not to reassure healthy women. The purpose is to find women with breast cancer and provide them with a better prognosis.

**Conclusion**

An implementation of a screening mammography programme provides reassurance for those women invited to the screening. This reassurance is in contrast to the unbalanced proportion between the intended benefits and the unintended harms of the screening programme.

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**Conflicts of interest:** None declared.

**Key points**

- Women invited to screening mammography report less negative psychosocial aspects than women not offered screening.
- Implementation of a screening mammography programme provides reassurance for the invited women.

**References**


Welch HG, Frankel BA. Likelihood that a woman with screen-detected breast cancer has had her “life saved” by that screening. Arch Intern Med 2011;171:2043–6.

Keen JD. Promoting screening mammography: insight or uptake? J Am Board Fam Med 2010;23:775–82.


