

# National study of the impact of patient information and involvement in decision-making on immediate breast reconstruction rates

A. Frisell<sup>1</sup>, J. Lagergren<sup>2,4</sup> and J. de Boniface<sup>3,4</sup>

<sup>1</sup>Department of Emergency Medicine and Surgery, Karolinska University Hospital Huddinge, Departments of <sup>2</sup>Reconstructive Plastic Surgery and

<sup>3</sup>Breast and Endocrine Surgery, Karolinska University Hospital, and <sup>4</sup>Department of Molecular Medicine and Surgery, Karolinska Institute, Stockholm, Sweden

Correspondence to: Associate Professor J. de Boniface, Department of Breast and Endocrine Surgery, Karolinska University Hospital, P9:03, SE-17 176 Stockholm, Sweden (e-mail: Jana.De-Boniface@ki.se)

**Background:** Reconstructive alternatives should be discussed with women facing mastectomy for breast cancer. These include immediate and delayed reconstruction, which both have inherent advantages and disadvantages. Immediate reconstruction rates vary considerably in Swedish healthcare regions, and the aim of the study was to analyse reasons for this disparity.

**Methods:** All women who underwent mastectomy for primary breast cancer in Sweden in 2013 were included. Tumour data were retrieved from the Swedish National Breast Cancer Registry and from questionnaires regarding patient information and involvement in preoperative decision-making sent to women who were still alive in 2015.

**Results:** Of 2929 women who had undergone 2996 mastectomies, 2906 were still alive. The questionnaire response rate was 76.3 per cent. Immediate reconstruction rates varied regionally, between 3.0 and 26.4 per cent. Tumour characteristics impacted on reconstruction rates but did not explain regional differences. Patient participation in decision-making, availability of plastic surgery services and patient information, however, were independent predictors of immediate breast reconstruction, and varied significantly between regions. Even in younger patients with low-risk tumours, rates of patient information ranged between 34.3 and 83.3 per cent.

**Conclusion:** Significant regional differences in immediate reconstruction rates were not explained by differences in tumour characteristics, but by disparities in patient information, availability of plastic surgery services and involvement in decision-making.

Paper accepted 1 July 2016

Published online 23 August 2016 in Wiley Online Library (www.bjs.co.uk). DOI: 10.1002/bjs.10286

## Introduction

More than 8500 new cases of breast cancer are diagnosed in Sweden each year<sup>1</sup>. The surgical alternatives are breast-conserving surgery and mastectomy, which is performed in about 35–50 per cent of patients. The choice of surgical intervention in the breast is based mainly on patient and tumour characteristics, as well as surgeon skills and patient preference.

Mastectomy may be experienced as a mutilating intervention and can, especially in younger women, have negative psychological effects such as reduced self-esteem, changed body image and sexual problems<sup>2</sup>. Breast reconstruction may improve body image and quality of life<sup>3,4</sup>, and can be performed either at primary cancer surgery

(immediate breast reconstruction, IBR) or at a later date (secondary or delayed reconstruction, DBR). The breast shape and volume may be recreated using an implant, autologous tissue, or a combination of both. The patient should be made aware that all methods have their inherent advantages and disadvantages. Swedish national guidelines state that any woman scheduled for mastectomy should be offered information about the possibility of breast reconstruction. The same is stated in the UK National Institute for Health and Care Excellence (NICE) guidelines, which point out that this information is independent of locally available options<sup>5,6</sup>.

The patient–surgeon relationship has evolved from the surgeon-dominant (paternalistic) model to the informed

(consumerist) and shared decision-making model<sup>7,8</sup>. The level of patient involvement in this decision-making process has been shown to influence patient satisfaction and quality of life<sup>9</sup>. The frequency with which general surgeons discuss breast reconstruction at the time of surgical treatment decision-making, and the quality of such information, may vary considerably, yet this has an undeniable impact on patients' choice, postdecision regret and satisfaction<sup>10–12</sup>.

Regional variations in IBR rates are an international problem. In a national audit performed in England, regional rates of immediate reconstruction varied between 9 and 43 per cent, with a national average of 21 per cent<sup>13</sup>. In Sweden, the proportion of women who underwent IBR per region in 2014 (the year of the most recently reported national audit) lies between 1.7 and 25.4 per cent, with a national average of only 8.7 per cent. IBR rates of individual breast clinics ranged from 0 to 49.5 per cent in that year. Interestingly, the frequency of primary reconstruction was highest in hospitals and regions with the largest proportion of breast-conserving surgery, suggesting a generally more frequent use of oncoplastic and reconstructive techniques<sup>1</sup>.

It may be argued that variations in IBR rates are due to regional variations in age, patient preferences, tumour stage, healthcare infrastructure or the use of postoperative radiotherapy. Another hypothesis is that the lack of patient information and involvement in decision-making before breast cancer surgery may play a significant role. The aim of this study was to analyse the causes of the observed regional variations in IBR rates in Sweden, based on both tumour data and patient-reported experience of information and decision-making before surgery.

## Methods

This study was designed as a cross-sectional retrospective audit, covering all women with a newly diagnosed primary breast cancer who were registered as having had a mastectomy as the final surgical intervention in Sweden in 2013. Data were extracted from the Swedish National Breast Cancer Registry, which covers 99–100 per cent of all new breast cancer cases. Data on tumour and patient characteristics, diagnostic findings, surgical procedure and treating hospital, nodal status and oncological treatment were requested. Personal identification numbers were then used to obtain postal addresses from the tax authority for the distribution of questionnaires.

All patients alive according to the Population Registry at study initiation in spring 2015 received a postal questionnaire about the preoperative information given regarding reconstructive possibilities and the experience of

participation in the decision-making process before surgery (*Fig. S1*, supporting information). The questionnaire also covered hereditary risks and the patient's own desire to have a breast reconstruction. Additional questions regarding the choice of mastectomy instead of breast-conserving treatment will be covered in an upcoming report. One questionnaire reminder was sent after 3 months to women who had not yet replied. The study was closed on 30 October 2015. The database is managed and protected in accordance with the Swedish Data Protection Act.

A synchronous postal questionnaire was sent to all members of the Swedish Association of Breast Surgery (*Fig. S2*, supporting information). Here, information on breast surgeons' oncoplastic and reconstructive experience and skills, as well as the availability of oncoplastic and reconstructive services at their own hospital, was requested. Answers were anonymous and could not be linked to specific individuals or institutions.

The study was approved by the Ethics Review Board at Karolinska Institute, Stockholm, in 2014 (2014/2106-31/1).

## Statistical analysis

Descriptive data are presented as numbers with percentages, or as median (range) values. Comparison of median values for continuous variables in more than two groups was performed using the Kruskal–Wallis test; for two groups, the Mann–Whitney *U* test was employed.  $\chi^2$  or Fisher's exact test was used to analyse the distribution of categorical variables between groups.

Univariable and multivariable analysis of the outcome effect of the performance of IBR was performed by binary logistic regression. Results are presented as hazard ratios (HRs) with their respective 95 per cent confidence intervals (c.i.).

All data analysis was performed using SPSS<sup>®</sup> version 22 (IBM, Armonk, New York, USA). Statistical significance was set at a level of 5 per cent for all analyses.

## Results

Overall, 2929 women were identified through the Swedish National Breast Cancer Registry as having undergone 2996 mastectomies as the final surgical intervention for newly diagnosed breast cancer in Sweden in the year 2013; thus, 67 women had a bilateral mastectomy. In 412 women (13.8 per cent), breast conservation was attempted primarily and the mastectomy was performed at a second session. Preoperative and postoperative patient and tumour characteristics for women who had IBR and those who did not have IBR are shown in *Table 1*.

**Table 1** Patient and tumour characteristics for 2996 mastectomies (2929 women)

	No immediate reconstruction (n = 2726)	Immediate reconstruction (n = 270)	P†
Age (years)*	66 (21–97)	49 (21–80)	< 0.001‡
Preoperative T category			< 0.001
cTis ( <i>in situ</i> only)	97 (3.6)	46 (17.0)	
cT1 (≤ 20 mm)	988 (36.2)	81 (30.0)	
cT2 (21–50 mm)	1065 (39.1)	67 (24.8)	
cT3 (> 50 mm)	240 (8.8)	21 (7.8)	
cT4	43 (1.6)	3 (1.1)	
Missing or unknown	293 (10.7)	52 (19.3)	
Preoperative node status			< 0.001
Negative	2214 (81.2)	250 (92.6)	
Positive	484 (17.8)	19 (7.0)	
Missing	28 (1.0)	1 (0.4)	
Postoperative invasive tumour size (mm)*	22 (1–150)	17 (1–245)	< 0.001‡
Postoperative node status			< 0.001
Negative	1478 (54.2)	188 (69.6)	
Positive	1096 (40.2)	60 (22.2)	
Missing	152 (5.6)	22 (8.1)	
Histological subtype			0.018
Ductal	1877 (68.9)	151 (55.9)	
Lobular	471 (17.3)	17 (6.3)	
Other	140 (5.1)	7 (2.6)	
Missing	238 (8.7)	95 (35.2)	
Presence of multifocality	674 (24.7)	47 (17.4)	0.858
Nottingham histological grade			0.131
1	361 (13.2)	34 (12.6)	
2	1323 (48.5)	115 (42.6)	
3	921 (33.8)	106 (39.3)	
Missing	121 (4.4)	15 (5.6)	
Oestrogen receptor status			0.406
Positive	2107 (77.3)	165 (61.1)	
Negative	390 (14.3)	25 (9.3)	
Missing	229 (8.4)	80 (29.6)	
Progesterone receptor status			0.093
Positive	1766 (64.8)	143 (53.0)	
Negative	719 (26.4)	43 (15.9)	
Missing	241 (8.8)	84 (31.1)	
Her2/neu status			0.915
Positive	392 (14.4)	27 (10.0)	
Negative	2064 (75.7)	149 (55.2)	
Missing	270 (9.9)	94 (34.8)	
Proliferation (Ki-67)*	24 (0–100)	20 (0–95)	0.019‡

Values in parentheses are percentages unless indicated otherwise: \*values are median (range). One woman with no information on immediate reconstruction was excluded. † $\chi^2$  or Fisher's exact test, except ‡Mann–Whitney *U* test.

Excluding 23 women who, according to the Population Registry, had died between the operation and initiation of the study, 2906 women were then sent a postal questionnaire regarding their preoperative experience of information and decision-making. The response rate was 76.3 per cent (2217 of 2906) after one postal reminder.

### Immediate breast reconstruction rates

Overall, IBR was performed in 270 (9.0 per cent) of 2996 mastectomies. The differences in reconstruction rates between regions were marked ( $P < 0.001$ ) (Table 2). To find

an explanation for these differences, the distribution of factors increasing the likelihood of postoperative radiotherapy was studied. Actual rates of planned postoperative radiotherapy and age at surgery were also analysed. Even though there were significant differences in preoperative tumour stage, rates of neoadjuvant treatment and the frequency of planned postoperative radiotherapy (as discussed at the postoperative multidisciplinary team meeting), these differences could not explain variations in reconstruction rates. The region with the highest IBR rate (Stockholm/Gotland) also had the highest rate of neoadjuvant therapy and highest percentage of more advanced

**Table 2** Immediate reconstruction rates and preoperative patient and tumour characteristics for 2996 mastectomies, in each Swedish healthcare region

	Swedish healthcare region						P <sup>¶</sup>
	North (n = 213)	Stockholm/Gotland (n = 571)	South (n = 629)	South-east (n = 379)	Uppsala/Örebro (n = 630)	West (n = 574)	
Immediate breast reconstruction rate	10 (4.7)	151 (26.4)	30 (4.8)	23 (6.1)	39 (6.2)	17 (3.0)	< 0.001
Preoperative T category <sup>†</sup>							< 0.001
cT1	85 (39.9)	145 (25.4)	248 (39.4)	138 (36.4)	205 (32.5)	248 (43.2)	
cT2	71 (33.3)	227 (39.8)	226 (35.9)	127 (33.5)	258 (41.0)	223 (38.9)	
cT3	18 (8.5)	72 (12.6)	34 (5.4)	33 (8.7)	69 (11.0)	35 (6.1)	
cT4	9 (4.2)	11 (1.9)	6 (1.0)	4 (1.1)	11 (1.7)	5 (0.9)	
<i>In situ</i> only	8 (3.8)	27 (4.7)	49 (7.8)	6 (1.6)	25 (4.0)	28 (4.9)	
Unknown or missing	22 (10.3)	89 (15.6)	66 (10.5)	71 (18.7)	62 (9.8)	35 (6.1)	
Preoperative N category <sup>†</sup>							0.082
cN0	170 (79.8)	480 (84.1)	513 (81.6)	316 (83.4)	523 (83.0)	462 (80.5)	
cN1	31 (14.6)	84 (14.7)	96 (15.3)	60 (15.8)	92 (14.6)	106 (18.5)	
cN2	5 (2.3)	3 (0.5)	7 (1.1)	0 (0)	7 (1.1)	1 (0.2)	
cN3	0 (0)	2 (0.3)	3 (0.5)	0 (0)	4 (0.6)	2 (0.3)	
Missing	7 (3.3)	2 (0.3)	10 (1.6)	3 (0.8)	4 (0.6)	3 (0.5)	
Neoadjuvant therapy <sup>‡</sup>	26 (12.2)	94 (16.5)	60 (9.5)	41 (10.8)	32 (5.1)	26 (4.5)	< 0.001
Postoperative radiotherapy planned <sup>§</sup>	91 (42.7)	279 (48.9)	201 (32.0)	174 (45.9)	274 (43.5)	176 (30.7)	< 0.001
Age at surgery (years)*	65 (28–93)	62 (21–96)	65 (26–94)	63 (21–93)	65 (24–94)	66 (26–97)	0.052 <sup>#</sup>

Values in parentheses are percentages unless indicated otherwise; \*values are median (range) for individual patients per region. <sup>†</sup>Based on clinical examination and imaging modalities, following the TNM classification system. <sup>‡</sup>Includes both endocrine and cytostatic treatments. <sup>§</sup>As recommended by the multidisciplinary team; includes both local and locoregional radiotherapy. <sup>¶</sup> $\chi^2$  test, except <sup>#</sup>Kruskal–Wallis test.

tumours (cT3–4), whereas the region with the lowest IBR rate (West) had the highest percentage of smaller tumours and the lowest rate of both neoadjuvant therapy and postoperative radiotherapy. Median patient age did not differ between regions.

### Factors affecting the likelihood of immediate breast reconstruction

Independent predictors of undergoing IBR were surgery in the Stockholm/Gotland region, undergoing operation at a hospital with in-house plastic surgery services, and having a preoperative working diagnosis of *in situ* disease only (Table 3). Clinically involved lymph nodes and age above 60 years decreased the likelihood of IBR. Women who reported no participation in the preoperative decision-making process and those not informed about immediate reconstructive options had a low likelihood of IBR.

The in-house availability of plastic surgery services was distributed unevenly between regions: although 95.3 per cent of all patients in the Stockholm/Gotland region had surgery in units with in-house plastic surgery services, the rate ranged between 30.0 and 57.8 per cent for the other regions. As evident from Table 3, however, the availability of in-house plastic surgery services did not suffice to explain regional differences, but did increase the chance of being informed about IBR options (HR 0.74, 95 per cent c.i. 0.62 to 0.87).

In-house plastic surgery services may be provided by an institution's own department of plastic surgery, by plastic surgeons employed by the department of general surgery or by consultation services only. Interestingly, IBR rates were significantly higher in regional hospitals with a plastic surgeon available but without a department of plastic surgery than in university hospitals with their own departments of plastic surgery (17.2 versus 11.5 per cent;  $P < 0.001$ ). Where there was no plastic surgery service, the IBR rate decreased to 3.0 per cent (41 of 1365).

### Patient information and participation in the decision-making process

Of all responding women who did not have IBR, 33.7 per cent (657 of 1947) reported not wanting any breast reconstruction, and the proportion of women wishing to wait for breast reconstruction until a later date was only 8.0 per cent (155 of 1947).

In a second step, only those women with a low likelihood of relative contraindications for IBR were selected (clinically node-negative patients with small tumours (cT1), *in situ* disease only (cTis) or no clinical signs of primary tumour (cT0)). To take age into consideration, only women aged up to 65 years were then selected from this 'low tumour burden' group. Patient participation and information still varied extensively between Swedish healthcare regions, further contradicting the assumption

**Table 3** Univariable and multivariable binary logistic regression analysis of factors, with performance of immediate breast reconstruction as the binary outcome effect measure

	Univariable analysis		Multivariable analysis	
	Hazard ratio	P	Hazard ratio	P
Preoperative tumour size (TNM)				
cT1 ( $\leq 20$ mm)	1.00 (reference)			
cT2 (21–50 mm)	0.77 (0.55, 1.07)	0.123	0.68 (0.41, 1.15)	0.156
cT3 ( $> 50$ mm)	1.07 (0.65, 1.76)	0.802	1.01 (0.46, 2.19)	0.983
cT4	0.85 (0.26, 2.80)	0.790	0.92 (0.08, 10.43)	0.947
<i>In situ</i> only	5.78 (3.81, 8.77)	$< 0.001$	3.21 (1.69, 6.10)	$< 0.001$
Unknown primary	2.22 (1.52, 3.24)	$< 0.001$	1.68 (0.95, 2.98)	0.074
Preoperative N category				
cN–	1.00 (reference)			
cN+	0.35 (0.22, 0.56)	$< 0.001$	0.31 (0.13, 0.73)	0.007
Age (years)				
$< 41$	1.00 (reference)			
41–50	0.82 (0.55, 1.21)	0.322	0.93 (0.46, 1.88)	0.848
51–60	0.50 (0.33, 0.75)	0.001	0.58 (0.28, 1.17)	0.129
61–70	0.13 (0.08, 0.22)	$< 0.001$	0.16 (0.07, 0.36)	$< 0.001$
$> 70$	0.01 (0.01, 0.04)	$< 0.001$	0.02 (0.00, 0.08)	$< 0.001$
Swedish healthcare region				
North	1.00 (reference)			
Stockholm/Gotland	7.30 (3.77, 14.14)	$< 0.001$	4.91 (1.85, 13.06)	0.001
South	1.02 (0.49, 2.13)	0.954	1.07 (0.40, 2.88)	0.885
South-east	1.31 (0.61, 2.81)	0.486	1.20 (0.42, 3.43)	0.738
Uppsala/Örebro	1.34 (0.66, 2.73)	0.421	1.05 (0.38, 2.95)	0.919
West	0.62 (0.62, 1.38)	0.239	0.60 (0.19, 1.90)	0.381
Neoadjuvant treatment				
No	1.00 (reference)			
Yes	0.77 (0.48, 1.24)	0.289	0.72 (0.30, 1.77)	0.480
Hereditary factors				
No	1.00 (reference)			
Yes	1.35 (0.92, 1.99)	0.121	1.33 (0.80, 2.22)	0.274
Patient participation in decision-making regarding reconstruction				
Yes	1.00 (reference)			
No	0.07 (0.04, 0.14)	$< 0.001$	0.41 (0.18, 0.90)	0.026
Patient informed about immediate reconstructive options				
Yes	1.00 (reference)			
No	0.05 (0.25, 0.11)	$< 0.001$	0.10 (0.05, 0.21)	$< 0.001$
In-house plastic surgery services available at operating hospital				
Yes	1.00 (reference)			
No	0.19 (0.13, 0.27)	$< 0.001$	0.39 (0.23, 0.66)	$< 0.001$

Values in parentheses are 95 per cent confidence intervals.

that younger women with a low probability of postoperative radiotherapy would receive sufficient information on IBR (Table 4). Even though patient information regarding DBR also varied significantly in the low tumour burden group, the percentage of patients receiving information on DBR was generally higher.

### Education and skill level in reconstructive techniques among breast surgeons

The response rate of surgeons registered as members of the Swedish Association of Breast Surgery was 60.3 per cent (91 of 151). Five surgeons reported they had either

retired or stopped working with patients with breast cancer. Thus, the number of completed questionnaires was 86. All respondents had completed their training in general surgery, and eight also had completed plastic surgery training (9 per cent). The majority of respondents were senior surgeons with more than 5 years as a consultant (72 of 86; 84 per cent), and with breast surgery representing more than 50 per cent of their daily clinical activities (64 of 86; 74 per cent). A majority (76 per cent) reported IBR to be available at their own hospital, and a further 17 per cent could refer the patient to a different unit. The availability of IBR was no different between university and regional hospitals ( $P = 0.330$ ). Less than half of respondents could perform

**Table 4** Preoperative patient-reported perception of information about breast reconstruction and involvement in treatment decision, in each Swedish healthcare region

	Swedish healthcare region						P*
	North	Stockholm/ Gotland	South	South-east	Uppsala/ Örebro	West	
<b>Any age</b>							
Did you receive information about the possibility of immediate reconstruction of the breast?							
Group 1	36 (45.6)	123 (67.2)	120 (48.4)	64 (41.0)	69 (35.8)	63 (31.0)	<0.001
Group 2	16 (25.0)	130 (56.3)	60 (27.8)	43 (33.6)	68 (26.4)	53 (24.8)	<0.001
Did you receive information about the possibility of delayed reconstruction of the breast in a second setting?							
Group 1	47 (59.5)	127 (67.9)	160 (65.3)	91 (57.6)	122 (62.6)	127 (62.6)	0.008
Group 2	33 (49.3)	157 (67.7)	120 (55.3)	74 (57.4)	135 (52.5)	130 (60.7)	0.425
Did you feel involved in the decision-making process whether or not to perform breast reconstruction?							
Group 1	52 (72.2)	136 (75.1)	156 (66.1)	88 (59.9)	104 (58.1)	114 (61.3)	0.005
Group 2	33 (53.2)	164 (74.5)	101 (50.0)	61 (54.5)	133 (59.1)	108 (55.1)	<0.001
<b>Age up to 65 years</b>							
Did you receive information about the possibility of immediate reconstruction of the breast?							
Group 1	28 (58.3)	95 (83.3)	84 (59.6)	48 (56.5)	55 (47.8)	35 (34.3)	<0.001
Group 2	12 (36.4)	98 (73.7)	40 (35.7)	34 (42.5)	45 (36.3)	29 (27.1)	<0.001
Did you receive information about the possibility of delayed reconstruction of the breast in a second setting?							
Group 1	40 (83.3)	97 (84.3)	118 (84.9)	70 (81.4)	102 (87.2)	85 (82.5)	0.903
Group 2	26 (74.3)	119 (88.8)	91 (81.3)	66 (81.5)	99 (80.5)	88 (81.5)	0.314
Did you feel involved in the decision-making process whether or not to perform breast reconstruction?							
Group 1	36 (76.6)	94 (83.9)	100 (72.5)	57 (68.7)	78 (68.4)	57 (62.6)	<0.001
Group 2	17 (53.1)	112 (85.5)	58 (53.2)	46 (62.2)	81 (69.2)	62 (61.4)	0.018

Values are numbers of women who answered 'Yes' or 'Yes, but not enough' to each question, with percentages in parentheses. Group 1 (low tumour burden) consisted of women with clinically node-negative cT1, cTis (*in situ*) or cT0 tumours. Group 2 (higher tumour burden) consisted of all remaining women. \* $\chi^2$  test.

an IBR independently (36 of 86; 42 per cent). Median age was 55 (range 34–71) years, and the distribution between regional/county hospitals and university hospitals was even. A large majority (81 per cent) wished to gain more training in oncoplastic breast surgery. As questionnaires were returned anonymously, it was not possible to link data of individual surgeons to their respective units and regions.

## Discussion

In the present analysis, the marked differences in IBR rates in the six Swedish healthcare regions were not explained by differences in disease characteristics or age distribution. Although more advanced disease and other established risk factors for an inferior IBR outcome varied between healthcare regions, and predictably had an impact on IBR

rates in all regions, these factors could not explain regional variations in breast reconstruction rates as they did not follow the same pattern as the latter. Instead, significant deficits in patient information and participation in decision-making were found that were congruent with differences in immediate reconstruction rates. These deficits still persisted when studying a selected group of younger, low-risk women. Actual rates of DBR are unknown, but patient information regarding DBR was generally more frequent than that regarding IBR.

Some factors that are agreed to pose a risk to surgical and cosmetic outcome after IBR, such as smoking or obesity, could not be assessed in the present analysis, whereas others, such as the risk of postoperative radiotherapy, were studied in detail. It is important to remember that the decision to perform IBR or not is most commonly taken

before obtaining complete knowledge of the disease extent and biology, and thus prior to knowledge of postoperative treatment. Therefore, the analysis was based on clinical factors known to the surgeon before operation. It is also important to remember that the discussion whether or not to offer IBR lies in the hands of the breast surgeon scheduling the patient for surgery; in institutions where plastic surgeons rather than breast surgeons perform reconstructive surgery, information on reconstructive options has to be delivered by the breast surgeon, who may then confer with the plastic surgeon in case the patient opts for IBR or requires more information on different reconstructive options. Thus, the lack of patient information lies with the breast surgeon, and it may be hypothesized that surgeons trained in reconstructive breast surgery are more likely to inform about this surgical alternative than those who are not. Supporting this fact is the notion that rates of patient information and patient participation regarding IBR were significantly higher in the Stockholm region, where breast and plastic surgeons both independently and in collaboration routinely perform IBR<sup>14</sup>.

The lack of in-house plastic surgery services had a significant impact on IBR performance and also affected the rate of patient information negatively. This problem may be met by two principal proposals: the employment of plastic surgeons at non-university hospitals, which here was shown to result in higher IBR rates; and the oncoplastic and reconstructive training of breast surgeons, as called for by international consensus<sup>15</sup>. An increased collaboration between breast and plastic surgeons is crucial to address these issues<sup>16</sup>. Clearly, reconstructive resources would need to increase in order to meet an increasing demand for IBR most likely resulting from sufficient patient information.

Naturally, offering more women reconstructive options increases breast reconstruction rates<sup>17</sup>. It is tempting to think that a patient with risk factors for an inferior IBR outcome would not need to receive information on the different reconstructive options available, especially not those that the surgeon does not favour. A large number of publications are available on the surgical outcomes and cosmetic results after IBR, showing for example the negative effects of postmastectomy radiotherapy (PMRT) on reconstructive outcomes<sup>18,19</sup>. Few of these, however, report the patients' own attitudes towards IBR. It is therefore most noteworthy that, when presented with the choice of IBR or DBR *versus* no breast reconstruction, and with awareness of the potentially negative effects of PMRT, the majority women still choose IBR<sup>20,21</sup>, would choose it again<sup>22</sup>, and would recommend it to others<sup>23</sup>. This, in combination with the fact that there is still only sparse evidence favouring either IBR or DBR<sup>24</sup>, should encourage the surgeon to

discuss advantages and disadvantages of available options with the woman to offer her an evidence base on which to decide on her individual choice of breast cancer surgery.

Patient choices are complex and, although some women might focus on the aesthetic outcome of a reconstruction, others focus on practicalities, risk of complications, scarring and extent of the surgical procedure<sup>20,21,25,26</sup>. Patient involvement in the decision-making process is known to increase levels of satisfaction and quality of life, and a 'paternalistic' level of decision-making was clearly inferior to 'shared' and 'informed' levels<sup>9</sup>. This is true also for the elderly, who participate equally in the decision-making process<sup>27</sup>; in this special subgroup, cosmetic and patient satisfaction outcomes after breast reconstruction are as good as those achieved in younger patients, yet older women are far less likely to be offered these techniques<sup>28</sup>.

The present results need to be interpreted in the light of some limitations. First, retrospective studies are subject to recall bias<sup>29</sup>, and the study included women who were surveyed up to 2 years after their surgical treatment. Recall bias is often directional, such that patients feel more informed than their knowledge level actually suggests; in other cases, recall bias may be an expression of recall deficit, which may be lacking direction<sup>30</sup>. Feeling well informed may also be dependent on socioeconomic factors<sup>31</sup>. Second, this study did not have access to socioeconomic and co-morbidity data, such as income, educational level, bodyweight, smoking and other concurrent diseases, that may influence the decision-making process for breast reconstruction. There is no evidence, however, that these factors would be sufficiently divergent in the studied Swedish healthcare regions to explain the observed differences: each region has its own university healthcare and combines urban and rural areas. Although counties and communes do diverge in terms of income and education<sup>32</sup>, the larger healthcare regions used should not. As there are no published reports comparing healthcare regions regarding socioeconomic factors, raw data will be obtained for the upcoming analysis of rates of breast-conserving surgery and patient information.

Regional differences in IBR rates were thus caused mainly by a lack of patient information and participation in the decision-making process, as well as a lack of in-house plastic surgery services. Older women were significantly less likely to receive information on IBR, and age was an independent predictor of not receiving IBR. Even though there are factors known negatively to affect the outcomes of IBR, informed decision-making and the availability of individual choices positively affect quality of life and levels of satisfaction, underlining the need for evidence-based, shared patient education in the face of

mastectomy planning. To reduce regional differences in patient information and IBR rates, a focus should be put on oncoplastic and reconstructive training as well as improved collaboration between breast and plastic surgeons.

## Acknowledgements

This study received funding from the Swedish Society for Medical Research and the Swedish Breast Cancer Association (BRO).

*Disclosure:* The authors declare no conflict of interest.

## References

- Register NBC. *Annual Report of the Swedish National Breast Cancer Register 2014* [in Swedish]. [http://www.cancercentrum.se/globalassets/cancerdiagnoser/brost/kvalitetsregister/nationell\\_rapport\\_2014-web.pdf](http://www.cancercentrum.se/globalassets/cancerdiagnoser/brost/kvalitetsregister/nationell_rapport_2014-web.pdf) [accessed 12 July 2016].
- Sun Y, Kim SW, Heo CY, Kim D, Hwang Y, Yom CK *et al.* Comparison of quality of life based on surgical technique in patients with breast cancer. *Jpn J Clin Oncol* 2014; **44**: 22–27.
- Al-Ghazal SK, Fallowfield L, Blamey RW. Comparison of psychological aspects and patient satisfaction following breast conserving surgery, simple mastectomy and breast reconstruction. *Eur J Cancer* 2000; **36**: 1938–1943.
- Al-Ghazal SK, Sully L, Fallowfield L, Blamey RW. The psychological impact of immediate rather than delayed breast reconstruction. *Eur J Surg Oncol* 2000; **26**: 17–19.
- National Institute for Health and Care Excellence (NICE). *Early and Locally Advanced Breast Cancer; Diagnosis and Treatment*; 2009. <http://www.nice.org.uk/nicemedia/pdf/cg80niceguideline.pdf> [accessed 12 July 2016].
- Thiruchelvam PT, McNeill F, Jallali N, Harris P, Hogben K. Post-mastectomy breast reconstruction. *BMJ* 2013; **347**: f5903.
- Benbassat J, Pilpel D, Tidhar M. Patients' preferences for participation in clinical decision making: a review of published surveys. *Behav Med* 1998; **24**: 81–88.
- Laine C, Davidoff F. Patient-centered medicine. A professional evolution. *JAMA* 1996; **275**: 152–156.
- Ashraf AA, Colakoglu S, Nguyen JT, Anastasopoulos AJ, Ibrahim AM, Yueh JH *et al.* Patient involvement in the decision-making process improves satisfaction and quality of life in postmastectomy breast reconstruction. *J Surg Res* 2013; **184**: 665–670.
- Alderman AK, Hawley ST, Waljee J, Mujahid M, Morrow M, Katz SJ. Understanding the impact of breast reconstruction on the surgical decision-making process for breast cancer. *Cancer* 2008; **112**: 489–494.
- Lee CN, Ubel PA, Deal AM, Blizard LB, Sepucha KR, Ollila DW *et al.* How informed is the decision about breast reconstruction after mastectomy?: a prospective, cross-sectional study. *Ann Surg* 2015; [Epub ahead of print].
- Sheehan J, Sherman KA, Lam T, Boyages J. Association of information satisfaction, psychological distress and monitoring coping style with post-decision regret following breast reconstruction. *Psychooncology* 2007; **16**: 342–351.
- Jeevan R, Cromwell DA, Browne JP, Caddy CM, Pereira J, Sheppard C *et al.* Findings of a national comparative audit of mastectomy and breast reconstruction surgery in England. *J Plast Reconstr Aesthet Surg* 2014; **67**: 1333–1344.
- Robertson S, Wengstrom Y, Eriksen C, Sandelin K. Breast surgeons performing immediate breast reconstruction with implants – assessment of resource-use and patient-reported outcome measures. *Breast* 2012; **21**: 590–596.
- Cardoso MJ, Macmillan RD, Merck B, Munhoz AM, Rainsbury R. Training in oncoplastic surgery: an international consensus. The 7th Portuguese Senology Congress, Vilamoura, 2009. *Breast* 2010; **19**: 538–540.
- Losken A, Nahabedian MY. Oncoplastic breast surgery: past, present, and future directions in the United States. *Plast Reconstr Surg* 2009; **124**: 969–972.
- Wong A, Snook K, Brennan M, Flitcroft K, Tucker M, Hiercz D *et al.* Increasing breast reconstruction rates by offering more women a choice. *ANZ J Surg* 2014; **84**: 31–36.
- Kronowitz SJ, Robb GL. Radiation therapy and breast reconstruction: a critical review of the literature. *Plast Reconstr Surg* 2009; **124**: 395–408.
- Barry M, Kell MR. Radiotherapy and breast reconstruction: a meta-analysis. *Breast Cancer Res Treat* 2011; **127**: 15–22.
- Ananian P, Houvenaeghel G, Protiere C, Rouanet P, Arnaud S, Moatti JP *et al.* Determinants of patients' choice of reconstruction with mastectomy for primary breast cancer. *Ann Surg Oncol* 2004; **11**: 762–771.
- Flitcroft K, Brennan M, Costa D, Wong A, Snook K, Spillane A. An evaluation of factors affecting preference for immediate, delayed or no breast reconstruction in women with high-risk breast cancer. *Psychooncology* 2016; [Epub ahead of print].
- Fernandez-Delgado J, Lopez-Pedraza MJ, Blasco JA, Andradas-Aragones E, Sanchez-Mendez JI, Sordo-Miralles G *et al.* Satisfaction with and psychological impact of immediate and deferred breast reconstruction. *Ann Oncol* 2008; **19**: 1430–1434.
- Eriksson M, Anveden L, Celebioglu F, Dahlberg K, Meldahl I, Lagergren J *et al.* Radiotherapy in implant-based immediate breast reconstruction: risk factors, surgical outcomes, and patient-reported outcome measures in a large Swedish multicenter cohort. *Breast Cancer Res Treat* 2013; **142**: 591–601.
- D'Souza N, Darmanin G, Fedorowicz Z. Immediate versus delayed reconstruction following surgery for breast cancer. *Cochrane Database Syst Rev* 2011; (7)CD008674.
- Manne SL, Topham N, Kirstein L, Virtue SM, Brill K, Devine KA *et al.* Attitudes and decisional conflict regarding

- breast reconstruction among breast cancer patients. *Cancer Nurs* 2016; [Epub ahead of print].
- 26 Gopie JP, Hillhorst MT, Kleijne A, Timman R, Menke-Pluymers MB, Hofer SO *et al.* Women's motives to opt for either implant or DIEP-flap breast reconstruction. *J Plast Reconstr Aesthet Surg* 2011; **64**: 1062–1067.
- 27 Bleicher RJ, Abrahamse P, Hawley ST, Katz SJ, Morrow M. The influence of age on the breast surgery decision-making process. *Ann Surg Oncol* 2008; **15**: 854–862.
- 28 James R, McCulley SJ, Macmillan RD. Oncoplastic and reconstructive breast surgery in the elderly. *Br J Surg* 2015; **102**: 480–488.
- 29 Tourangeau R, Rips L, Rasinski K (eds). *The Psychology of Survey Response*. Cambridge University Press: New York, 2000.
- 30 Blome C, Augustin M. Measuring change in quality of life: bias in prospective and retrospective evaluation. *Value Health* 2015; **18**: 110–115.
- 31 Sepucha KR, Fagerlin A, Couper MP, Levin CA, Singer E, Zikmund-Fisher BJ. How does feeling informed relate to being informed? The DECISIONS survey. *Med Decis Making* 2010; **30**(Suppl): 77S–84S.
- 32 Statistics Sweden. *Statistikdatabasen*; 2016. <http://www.statistikdatabasen.scb.se/pxweb/sv/ssd/?rxid=21309244-35af-401d-86fd-e3d3a965d82e> [accessed 7 April 2016].

### Supporting information

Additional supporting information may be found in the online version of this article:

**Fig. S1** Patient questionnaire (Word document)

**Fig. S2** Surgeon questionnaire (Word document)

### Snapshot quiz

#### Snapshot quiz 16/13

**Answer:** Pretibial myxoedema associated with Graves' disease. Dermopathy affects fewer than 5 per cent of patients with Graves' disease. Typical lesions are diffuse, non-pitting oedema with orange-skin appearance involving the pretibial area (pretibial myxoedema). However, myxoedema is not always confined to this area, and can involve the hands, arms, shoulders, ears, ankles, face and sites of scars.