

The effect of being informed on receiving immediate breast reconstruction in breast cancer patients



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ABSTRACT

Introduction: In previous research from the NABON breast cancer audit, observed hospital variation in immediate breast reconstruction (IBR) rates in the Netherlands could not be fully explained by tumour, patient, and hospital factors. The process of information provision and decision-making may also contribute to the observed variation; the objective of the current study was to give insight in the underlying decision-making process for IBR and to determine the effect of being informed about IBR on receiving IBR.

Methods: A total of 502 patients with IBR and 716 without IBR treated at twenty-nine hospitals were invited to complete an online questionnaire on obtained information and decision-making regarding IBR. The effect of being informed about IBR on receiving IBR was determined by logistic regression analysis.

Results: Responses from five hundred and ten patients ($n = 229$ IBR, $n = 281$ without IBR) were analysed. Patients with IBR compared to patients without reconstruction showed a difference in patient, tumour, treatment (including radiotherapy), and hospital characteristics. Patients with IBR were more often informed about IBR as a treatment option (99% vs 73%), they discussed (dis)advantages more often with their physician (86% vs 68%), and they were more often involved in shared decision-making (91% vs 67%) compared to patients without IBR. Multivariate logistic regression analysis, corrected for confounders, showed that being informed about IBR increased the odds for receiving IBR fourteen times ($p < 0.001$).

Conclusions: The positive effect of being informed about IBR on receiving IBR stresses the importance of treatment information in the decision-making process for IBR.

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Abbreviation: BMI, Body mass index; CCMO, Central Committee on Research involving Human Subjects; DBR, Delayed breast reconstruction; DCIS, Ductal carcinoma in situ; DIEP, Deep Inferior Epigastric artery Perforator; IBR, Immediate breast reconstruction; NCR, Netherlands Cancer Registry; PROFILES, Patient Reported Outcomes Following Initial treatment and Long term Evaluation of Survivorship; PROM, Patient reported outcome measures; SDM, Shared decision-making; SES, Socioeconomic status; SGAP, Superior Gluteal Artery Perforator.

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Introduction

In 2014, about 14,500 women were diagnosed with invasive breast cancer and 2300 with Ductal Carcinoma in Situ (DCIS) in the Netherlands [1]. Surgical procedures as mastectomy and breast conserving therapy combined with adjuvant radiotherapy have been shown to offer equivalent survival [2,3]. However, loss of one or both breasts mutilates the female appearance and consequently, mastectomy may negatively impact body image and sexuality, leading to feelings of anxiety and depression [4,5]. These effects may be minimized by restoring the contour of the breast with a breast reconstruction [6–8]. Breast reconstruction may be performed either directly after mastectomy in the same operation, which is known as immediate breast reconstruction (IBR), or in a separate operation, some time after the mastectomy, which is called a delayed breast reconstruction (DBR) [9]. IBR can be safely performed without affecting patient survival [10,11] or hampering detection of local recurrences [10–12].

Although in the Netherlands the national guideline on breast cancer treatment recommends considering IBR for every patient needing mastectomy [3], the average IBR-rate of about 20% was rather low in 2014 [13], albeit comparable to other countries [14]. In the NABON ('National Breast Cancer Consultation the Netherlands') Breast Cancer Audit (NBCA) [15] we previously demonstrated varying IBR-rates between Dutch hospitals from 0 to 83% (DCIS) and 0–64% (invasive breast cancer), which could not be fully explained by tumour, patient, and hospital factors [13,16]. However, it could well be that other reasons for this observed variation exist, such as preoperative information provision about IBR, shared decision-making (SDM), and patient or physician preferences.

Aside from the recommendation to consider IBR in every mastectomy patient, the guideline also recommends physicians to provide sufficient and timely information to patients [3]. In the Netherlands, IBR is performed by plastic surgeons; therefore, consultation between surgeon and plastic surgeon and referral of patients for a consultation with a plastic surgeon is recommended [17]. Although information facilitates SDM [18], current information provision about IBR may be insufficient [19–21]. Considering the positive effects of both IBR and SDM (for instance about treatment decisions) on the quality of life [7,22–24], psychosocial functioning [25–28], and patient satisfaction [29–31] of mastectomy patients, breast reconstruction should ideally be performed whenever feasible [22] and more importantly, preoperatively discussed with patients in a process of SDM. Therefore, the objective of the present study was to investigate the underlying decision-making processes patients experienced during the preoperative consultations for their breast cancer surgery with or without IBR in the Netherlands. The second aim was to determine the effect of being informed about IBR on actually receiving IBR.

Methods

Study population

Twenty-nine hospitals (1/3rd of the total number of hospitals in the Netherlands) volunteered to participate in the study. These hospitals were general ($n = 15$), teaching ($n = 10$), academic hospitals ($n = 4$, including a cancer-specific hospital), and all offered IBR in-house or referring to IBR-performing hospitals based on the national guideline as mentioned in the introduction. All patients that fit the inclusion criteria (female, aged ≥ 18 years, diagnosed with DCIS or invasive breast cancer, treated with mastectomy between January 2013 and October 2014, no distant metastases) were selected from the Netherlands Cancer Registry (NCR), a national

registry in which all newly diagnosed cancer patients are registered annually. Based on our power calculation (Appendix 1), fifty patients (25 with IBR and 25 without IBR) were randomly selected from every participating hospital by assigning them a random value between 0 and 1 and including those with the lowest values. In consultation with each hospital, we then excluded patients with recent recurrent disease (we did not want to bother patients currently receiving treatment) and patients who were unfit to fill in a questionnaire (due to psychological difficulties (dementia, depression) or language limitations). Since information about DBR is not collected in the NCR, we could not exclude patients with DBR on beforehand. The survey was hosted in PROFILES ('Patient Reported Outcomes Following Initial treatment and Long term Evaluation of Survivorship'), an online secured environment which facilitates data collection on patient-reported outcome measures (PROMs) from cancer survivors [32]. Paper questionnaires were provided on request. Invitations were sent out to selected patients from January 8th to May 29th 2015; responses were collected until July 30th, 2015. Respondents gave consent for processing their completed questionnaires and to merge them with the clinical data available in the NCR and NBCA. According to the Central Committee on Research involving Human Subjects (CCMO), this type of study does not require approval from an ethics committee in the Netherlands. This study was approved by the Privacy Review Board of the NCR.

Questionnaire

The questionnaire was specifically developed for this study and included items on patient characteristics, general health, breast cancer treatment, and breast reconstruction (Appendix 2). In addition, questions about SDM were categorized according to the definition of SDM: acknowledging a decision is required by knowing that IBR is an option, understanding and weighing all available information about the treatment options, and incorporating the patients' preferences in the final decision [18]. The questionnaire was tested for readability and comprehensibility by a panel of former breast cancer patients (members of the Dutch Breast Cancer Patient Association, 'Borstkankervereniging Nederland') before deployment.

Analysis

Patients who reported they had had DBR were excluded. Statistical analyses were performed in three steps. First, characteristics of respondents with IBR versus without IBR were compared using Pearson Chi-square tests. Second, patient responses regarding information provision and decision-making items were described and compared using Chi-square tests. In the third step, a multivariate logistic regression analysis was performed to determine the effect of being informed about IBR on receiving IBR, controlled for patient, tumour, and treatment characteristics that appeared to have a statistically significant relation with IBR in univariate analyses (relaxed significance level $p < 0.10$); the significance level within the multivariate analyses was $p < 0.05$. The following variables were included in the univariate analysis: age, body mass index (BMI), number of comorbidities, highest completed education, stage of disease (clinical), multifocality, unilateral or bilateral mastectomy, axillary dissection, neoadjuvant chemotherapy, radiotherapy, and IBR hospital volume. Variables were selected based on our previous research [13,17] and literature on factors affecting the use of IBR [32].

All statistical analyses were performed using STATA (STATA Version 14) [33].

Results

Respondents

Five hundred and two patients with IBR and 716 without IBR received an invitation. Two hundred and fifty-three patients who had received IBR and 305 patients without IBR responded, giving a total of 558 responses (46%). Twenty-four patients were excluded due to incomplete questionnaires, leading to valid data from 534 patients ($n = 229$ IBR, $n = 305$ without IBR). Twenty-four patients who reported they had had DBR were excluded for the analyses, leaving 281 patients without IBR. No statistically significant differences between respondents and non-respondent groups were found in baseline characteristics (tumour morphology, year of surgery, IBR hospital volume) other than that respondents were younger than non-respondents ($p < 0.001$). The respondent group consisted of relatively more patients who had received IBR compared to the non-respondent group ($p = 0.027$; data not shown). Respondents with IBR compared to respondents without IBR significantly differed in patient (age, education, socioeconomic status, comorbidities, BMI), tumour (stage, grade, lymph node status, multifocality), and treatment characteristics (unilateral or bilateral (prophylactic) mastectomy, radiotherapy), as well as hospital factors (IBR hospital volume, hospital type; all p -values < 0.05). Both groups were equally treated with chemotherapy (46% vs 51%, $p = 0.301$) and equally received neoadjuvant treatment (11% vs 17%, borderline significance: $p = 0.085$; Table 1).

The majority of patients with IBR either had received a tissue expander followed by a definite implant (55%) or a direct-to-implant (32%) reconstruction; other reconstruction types were latissimus dorsi flap (4%), DIEP flap (5%), or Superior Gluteal Artery Perforator (SGAP) flap (1%; 3% unknown; data not shown in Table 1).

Shared decision-making for patients who had received IBR versus no IBR

Patients with IBR compared to patients without IBR were more often preoperatively informed about the opportunity for IBR (99% vs 75%; $p < 0.001$), were just as often informed about DBR (77% vs 73%; $p = 0.534$), and they were less often informed about the possibility of an external breast prosthesis to conceal the missing breast when dressed (64% vs 81%; $p < 0.001$).

Of all patients who had received preoperative information about IBR, 86% of the patients with IBR versus 68% of the patients without IBR had discussed the advantages and disadvantages of IBR with their physician ($p < 0.001$). Moreover, patients with IBR more often reported that the information about breast reconstruction had been comprehensible ($p < 0.001$) and they felt more often than patients without IBR they had had the opportunity to ask questions about breast reconstruction issues ($p < 0.001$). More patients with IBR (91%) than patients without IBR (67%) felt they had shared the decision-making with their physicians ($p < 0.001$; Table 2).

Most patients reported they had chosen their treatment based on their preferences (IBR: 53%, without IBR 68%) or their physician had recommended the received treatment (IBR: 41%, without IBR: 10%; Fig. 1).

For both patients with IBR and without IBR, 41% of patients who had been treated with radiotherapy had received a preoperative consultation with a radiation oncologist. Furthermore, for patients who were treated with radiotherapy and had received information about IBR, 63% of patients with IBR and 51% without IBR had been informed about the effects of radiotherapy on breast reconstruction ($p = 0.082$, Table 2).

Factors affecting receiving IBR

The following variables were significantly related to having undergone IBR in univariate analyses and were therefore included in the multivariate analysis: informed about IBR, age, BMI ≥ 25 , highest completed education, two or more comorbidities, stage II or III tumour, multifocal tumour, bilateral mastectomy, neoadjuvant chemotherapy, radiotherapy, and IBR hospital volume.

In the multivariate logistic regression analyses, receiving IBR was significantly and positively affected by preoperatively being informed about IBR: these women had a 14 fold higher chance of receiving IBR (OR 13.87, CI: 3.75–51.30). Other significant factors were age over 60, BMI over 25, stage II and III, multifocality, bilateral mastectomy, and radiotherapy, and IBR hospital volume (Table 3).

Discussion

The objectives of the current study were to gain insight into the underlying decision-making process of IBR and to determine the effect of preoperative information provision about IBR on receiving IBR.

Based on more than five hundred completed questionnaires, we found that patients treated with IBR had been better informed about IBR, more often had weighed the advantages and disadvantages of IBR in discussion with their physician, and more often had experienced shared decision-making regarding IBR compared to patients without IBR. Furthermore, our multivariate logistic regression showed that being informed about IBR increased the probability for receiving IBR fourteen-fold. Because of our large sample, we were able to statistically control this relation for patient, tumour, treatment, and hospital factors.

Since we found that being informed about IBR had a large effect on receiving IBR, it may well be that the uninformed mastectomy patients would have opted for IBR if they had received information about IBR. A prospective study by Ananian et al. reported that patients who opted for breast reconstruction more frequently recognized the importance of discussing breast reconstruction with their surgeon, and women who had benefited more frequently from discussions with their physician in general tended to prefer IBR over DBR [34]. Other factors that significantly reduced the chance of receiving IBR in the multivariate regression analysis, mainly were risk-factors for postoperative complications after IBR (age over 55, BMI over 30, radiotherapy), as stated in the national guideline [17].

We found that patients without IBR were less often informed about IBR as a treatment option and its advantages and disadvantages than patients with IBR. However, it is the preoperative information discussed between patient and physician that is particularly considered carefully when making a choice [34,35] and not so much the information the patient collects herself from other resources. Guidelines, including the Dutch guideline on breast reconstruction published in 2015, already stress the importance of starting the discussion on different BR possibilities at the same time when mastectomy is offered to the patient by the surgeon [17,36].

It has already been found that low satisfaction with preoperative information is associated with an increased likelihood of decisional regret [37]. However, in our questionnaire almost 70% of patients without IBR stated they preferred not to have IBR, and 10% indicated their physician advised this. After analysing the free text field in the survey of the latter patients, it became evident the advice to postpone breast reconstruction was based on severity of tumour characteristics or the increased risk of surgical complications. This suggests that mainly those patients with strong contra-indications for IBR were recommended mastectomy without IBR by their

Table 1
Patient, tumour, treatment, and hospital characteristics.

Item		IBR(n = 229)	%	No IBR (n = 281)	%	P ^a
<i>Patient characteristics</i>						
Age in years (at diagnosis)	<40	31	14%	9	3%	<0.001
	40–59	163	71%	118	42%	
	60+	35	15%	154	55%	
Highest completed education ^{b,c}	Secondary school intermediate level or less	60	26%	135	48%	<0.001
	Medium vocational training (MBO), secondary school high level	81	36%	77	28%	
	Higher vocational training (HBO)/university	87	38%	68	24%	
Marital status ^c	Married/living together	180	79%	202	72%	0.082
	Divorced/partner deceased	49	21%	79	28%	
Socio-economic status (SES) ^d	Low	58	25%	105	37%	0.014
	Medium	93	41%	99	35%	
	High	77	34%	78	28%	
Comorbidities ^c	Yes	61	27%	102	36%	0.020
BMI ^{b,c,e}	Healthy weight (BMI<25)	153	67%	123	44%	<0.001
	Overweight (25 ≤ BMI >30)	59	26%	100	36%	
	Obese (BMI>30)	15	7%	57	20%	
Smoking ^c	Yes	43	19%	42	15%	0.248
<i>Tumour characteristics</i>						
Stage (clinical) ^c	0	70	31%	62	22%	<0.001
	I	85	37%	61	22%	
	II	64	28%	118	42%	
	III	3	1%	28	10%	
Receptor status ^b	Triple negative	12	5%	21	7%	0.347
	Hormone-negative, Her2-positive	10	4%	20	7%	
	Hormone-positive, Her2-positive	120	52%	129	46%	
	Hormone-positive, Her2-negative	84	37%	104	37%	
	Unknown	3	1%	7	2%	
Grade ^c	Grade I	34	15%	32	11%	0.012
	Grade II	98	43%	129	46%	
	Grade III	83	36%	81	29%	
Lymph node status	N0/unknown	171	75%	163	58%	<0.001
	>N0	58	25%	118	42%	
Multifocality	Yes	78	34%	63	22%	0.010
<i>Treatment characteristics</i>						
Mastectomy ^c	Bilateral therapeutic mastectomy	14	6%	14	5%	<0.001
	Therapeutic and contralateral prophylactic mastectomy	41	18%	11	4%	
	Unilateral therapeutic mastectomy	174	76%	256	91%	
Radiotherapy	Yes	39	17%	95	34%	<0.001
Hormone therapy	Yes	106	46%	149	53%	0.130
Chemotherapy	Yes	106	46%	143	51%	0.301
Neoadjuvant chemotherapy	Yes	26	11%	47	17%	0.085
<i>Hospital characteristics</i>						
IBR hospital volume ^f	Low	22	10%	51	18%	0.001
	Medium	70	31%	106	38%	
	High	137	60%	124	44%	
Breast cancer surgery hospital volume ^g	Low	74	32%	114	40%	0.125
	Medium	88	38%	101	36%	
	High	67	30%	66	24%	
Hospital type ^h	General hospital	84	37%	135	48%	0.002
	Top clinical hospital	111	48%	127	45%	
	Academic hospital (including breast cancer-specialized hospital)	34	15%	19	7%	

IBR: mastectomy with immediate breast reconstruction. No IBR: mastectomy without IBR.

BMI: body mass index.

^a Chi-square tested.

^b Totals do not match up due to missing values.

^c Self-reported.

^d Socio-economic status (SES) of the patients was based on four-digit postal code at time of surgery. SES-scores are provided by the Netherlands Institute for Social Research (Sociaal Cultureel Planbureau) and divided into three groups based on the delivered rank numbers: low (1st–3rd deciles), intermediate (4th–7th) and high (8th–10th) SES.

^e Body Mass Index (BMI) based on body length and weight, according to WHO-definition.

^f Percentage of annual IBR for mastectomy patients per hospital, categorised as low (0% IBR), middle (1–15%) or high volume (>15%); respectively 12, 43, and 37 hospitals in the Netherlands had low, middle, and high volume IBR.

^g Number of surgical treated breast cancer patients per year (average over 2012–2014), categorised as low (<150), middle (150–249), and high (>250) volume.

^h Hospitals were categorised as either general, teaching, or academic hospitals (including breast cancer-specialized hospital).

physician; therefore, we would be jumping to conclusions by merely stating that patients without IBR were not informed about IBR. Patients knowing about IBR as a treatment option, could have rejected this option immediately, therefore not receiving any further information. Contradictory to this, patients without IBR less often felt they shared the decision with their physician. Since patients without IBR in our study were older and lower educated, it

could well be these patients did not want to share the decision, which was found in patients with these characteristics before [38,39]. A previous study reported that surgeons tend to predict their patients' preferences fairly accurately [34]. For one fifth of the mastectomy patients in our study, the choice had not been based on their preferences or on a medical necessity; these patients possibly may have missed their chance of receiving IBR. As women vary in

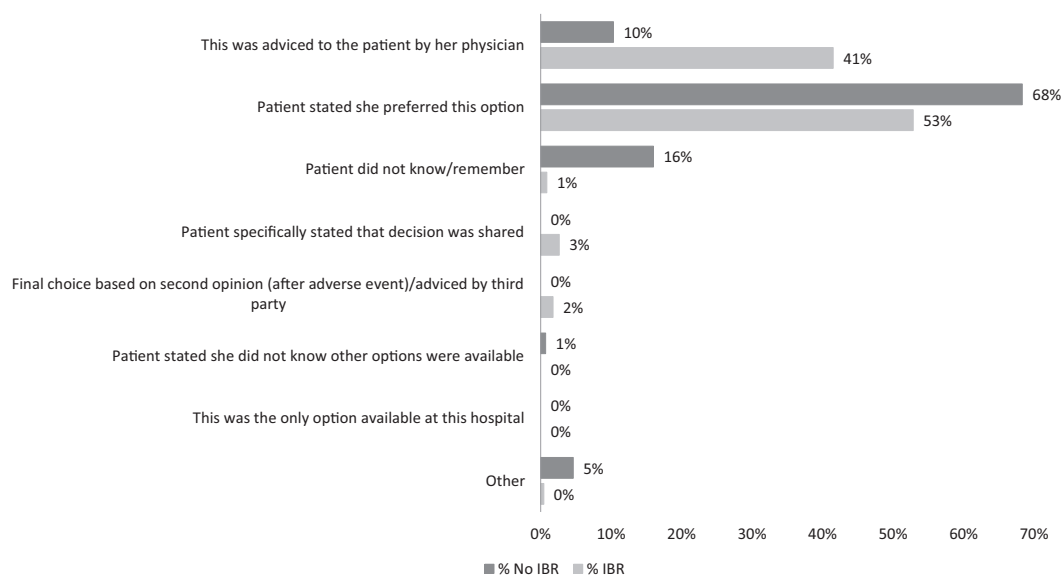
Table 2

Patient-reported experience with information provision on treatment options, on pros and cons of treatment options, and shared decision-making about IBR.

Item in questionnaire	IBR (n = 229)	%	No IBR (n = 281)	%	P ^a
<i>Information on available treatment options</i>					
Patient was preoperatively informed about possible treatment with:					
> IBR	226	99%	204	73%	<0.001
> DBR	176	77%	204	73%	0.534
> External breast prosthesis	147	64%	228	81%	<0.001
<i>Patient received information on pros and cons of reconstruction</i>					
Pros and cons of IBR were discussed between patient and physician (if received information on IBR)	n = 226		n = 204		
	194	86%	139	68%	<0.001
Patient regarded information about BR was comprehensible (if information received about IBR)	n = 224		n = 227		
	224	100%	191	85%	<0.001
Patient had opportunity to ask questions about BR (if information received about IBR)	n = 226		n = 204		
	226	100%	189	84%	<0.001
<i>Discussing effects of radiotherapy on breast reconstructive surgery:</i>					
Patient had a preoperative consultation with radiation oncologist (if treated with radiotherapy)	n = 39		n = 95		
	16	41%	39	41%	0.784
Patient received information on effect of radiotherapy on BR (if information received about IBR and treated with radiotherapy)	n = 38		n = 74		
	24	63%	38	51%	0.082
<i>Experienced shared decision-making</i>					
Patient felt she could share the decision regarding BR	208	91%	187	67%	<0.001

IBR: mastectomy with immediate breast reconstruction. No IBR: mastectomy without IBR.

BR: breast reconstructive surgery. DBR: delayed breast reconstruction.

^a Chi-square tested.**Fig. 1.** Patient-reported reasons for the choice for IBR, patients with IBR (n = 229) versus no IBR (n = 281). IBR: immediate breast reconstruction. No IBR: mastectomy without IBR.

information seeking behaviour [40], tailoring information to individual patients [41] may be helpful here. Furthermore, we suggest that it should be documented in every patient's file whether and which breast reconstruction options were discussed; this is already recommended in the national guideline on breast reconstruction as well [17]. Often, this documentation is lacking [42], while it could help the physician in revealing unmet needs in patient information as well as education [42].

Harcourt et al. reported that only 15% of respondents searched for further information before making a decision, while 82% made 'instant' decisions (during the consultation where the reconstruction was first discussed) [35]. Opting for DBR creates a time span for patients in which they can explore their possibilities considering different breast reconstruction types and which provides professionals with the ability to assess whether patients are fully prepared for the outcomes [43]. Neo-adjuvant therapy creates a

time span to surgery as well [43]. Based on our selection, we did not know on beforehand who had DBR or was considering this; it turned out 24 patients had had DBR. Thirty-eight respondents that had mastectomy without IBR in our study stated they were currently considering DBR; twenty-five of these patients (70%) were informed about IBR before receiving mastectomy. Since time between diagnosis and completing the questionnaire was short for some patients, we presume that more mastectomy patients in our sample eventually will receive DBR.

We found that patients with IBR more often felt the decision-making had been shared between themselves and their physician compared to patients without IBR. Several studies have reported variation between actual and preferred involvement in decision-making for breast cancer treatment [31,44,45]. As described above, some mastectomy patients were denied IBR based on tumour or treatment characteristics. Therefore, they might feel

Table 3
Effect of information provision about IBR on receiving IBR, corrected for patient, tumour, and treatment characteristics.^a

	n	Univariable		Multivariable		p ^b
		OR	95% CI	OR	95% CI	
<i>Information about IBR</i>						
Patient received information about IBR ^a	No/don't know	90	ref		ref	
	Yes	444	28.43	8.84–91.51	13.87	3.75–51.30 <0.001
<i>Patient characteristics</i>						
Age ^a	<40	44	2.49	1.14–5.43	1.84	0.66–5.19 0.246
	40–59	295	ref		Ref	
	60+	195	0.16	0.11–0.25	0.21	0.12–0.36 <0.001
BMI ^a	Healthy weight (BMI<25)	286	Ref		Ref	
	Overweight (25 ≤ BMI <30)	171	0.47	0.32–0.71	0.59	0.35–1.01 0.055
	Obese (BMI>30)	74	0.21	0.11–0.39	0.22	0.10–0.48 <0.001
Comorbidities ^a	None	351	Ref		Ref	
	One	139	0.67	0.44–1.01	1.11	0.64–1.95 0.708
	Two or more	33	0.42	0.19–0.94	0.91	0.29–2.90 0.879
Highest completed education ^a	Secondary school intermediate level or less	203	Ref		Ref	
	Medium vocational training (MBO), secondary school high level	168	2.37	1.53–3.66	1.54	0.86–2.78 0.149
	Higher vocational training (HBO) or university	160	2.88	1.85–4.47	1.62	0.88–2.97 0.123
<i>Tumour characteristics</i>						
Stage (clinical)	Stage 0 (DCIS)	135	Ref		Ref	
	Stage I	155	1.23	0.77–1.98	1.17	0.64–2.14 0.613
	Stage II	189	0.48	0.30–0.76	0.39	0.20–0.75 0.005
	Stage III	34	0.09	0.03–0.33	0.08	0.01–0.41 0.003
Multifocality	No	386	Ref		Ref	
	Yes	148	1.79	1.21–2.64	2.52	1.43–4.42 0.001
<i>Treatment characteristics</i>						
Mastectomy ^a	Unilateral mastectomy	448	Ref		Ref	
	Bilateral mastectomy	86	3.24	1.94–5.39	2.22	1.08–4.55 0.029
Axillary dissection	No	128	Ref		–	–
	Yes	406	Omit- ted	omitted	–	–
Neoadjuvant chemotherapy	No	460	Ref		Ref	
	Yes	74	0.63	0.37–1.07	0.99	0.41–2.40 0.994
Radiotherapy	No	394	Ref		Ref	
	Yes	140	0.40	0.26–0.61	0.52	0.28–0.98 0.045
<i>Hospital factors</i>						
IBR hospital volume ^c	Low	76	0.39	0.22–0.68	0.43	0.20–0.94 0.035
	Middle	186	0.60	0.41–0.88	0.41	0.24–0.69 0.001
	high	272	Ref		Ref	

IBR: immediate breast reconstruction.

^a Self-reported.

^b Chi-square tested.

^c Hospital volume (%IBR) was based on percentage of annual IBR for mastectomy patients, and categorised as low (0% IBR), middle (0–15%) or high volume (>15%).

they did not have a choice. However, involving patients in the decision-making process should always be promoted, because of its positive effects on quality of life [24] and patient satisfaction [29–31]. Although we did not measure SDM-preferences, we expect that a majority of patients would have wanted to participate in decision making [30,31]. Besides, Lee et al. reported that the majority of patients in their study felt involved in decision-making, while their knowledge on the procedure of IBR could be improved [46]; shared decision-making is therefore not the sole result of providing information.

Radiotherapy is an accepted reason to omit IBR [20,47], as it has been shown to increase the risk of implant loss, complications, poorer aesthetic results and less satisfied patients [48]. However, these increased complication and failure rates did not seem to apply for immediate autologous reconstructions, with comparable (partly unpublished) results for pre-reconstructive and post-reconstructive exposure to radiation therapy [49,50]. Since implant-based reconstruction is the most applied form of breast reconstruction [48], which was applicable for our respondents as well, a majority of patients will face the trade-off between choosing IBR with a hazard of experiencing the negative effects of radiotherapy, or omitting IBR and therefore omitting its positive effects on quality of life and psychosocial functioning. Therefore, patients should be fully aware of these effects in order to make an informed decision. Interestingly, Flitcroft et al. reported that when patients

(two-stage with tissue expander) were informed about potential negative aesthetic side-effects of post-mastectomy radiotherapy on IBR, 63% still opted for IBR [51]. In our study, 39% of patients who had been informed about the effects of radiotherapy had undergone IBR.

Strengths and limitations

With a response of over five hundred patients from a large geographically diverse and randomly selected nationwide sample, we believe that we accurately reflected reconstructive care for mastectomy patients in the Netherlands. This was confirmed by our analysis of the characteristics of respondents versus non-respondents. Furthermore, patient experiences and clinical data were combined, therefore creating a broad dataset for each patient.

However, also some limitations in the design of our study can be identified. Because patients had undergone mastectomy in 2013 or 2014, whereas our survey was conducted in 2015, potential bias lies in the patients' ability to properly recall the exact process of decision-making and information provision [52]. In addition, there may have been a reduction of inconsistencies between current beliefs and previous decisions ('cognitive dissonance reduction') [53]. Finally, inherent to an online survey, and despite the possibility to provide paper based questionnaires, respondents were younger than non-respondents, leading to a slightly lower response

rate in the group without IBR. Since we used a non-validated questionnaire, not all invited patients responded, and respondents characteristics were not equal over both groups, which are limitations inherent to patient-reported data, interpretation of the results should be done with caution.

We recommend that every woman who faces mastectomy is informed about all relevant options for breast reconstruction [54]. She consequently also should receive this information, even if this means that she has to be referred to another hospital to undergo the type of IBR she desires. Only after knowing and understanding all options, a well-informed decision can be made by the patient. Ideally, all patients should be referred to a plastic surgeon for a completely balanced weighing of the decision whether or not to perform IBR, because another study recently conducted in the Netherlands revealed surgeons informed patients differently compared to plastic surgeons [50]. Physician education is important to accomplish continuity of care and proper referral. Furthermore, more implant IBR than autologous IBR can be performed within the same amount of time; thus, financial incentives made performing implant IBR more attractive for hospitals than autologous IBR [55], explaining the relative low number of respondents with autologous reconstruction. As IBR is covered by every patients' health insurance (except for the obligatory deductible excess of €385,- (2017)) [56], this does not hinder access.

Conclusions

Patients who received IBR had been better informed about IBR as a treatment option, more often had discussed advantages and disadvantages of IBR, and felt significantly more involved in SDM than patients without IBR. After correction for patient, tumour, treatment, and hospital factors, being informed about IBR significantly increased the odds of receiving IBR fourteen-fold.

Our results highlight the importance of providing sufficient information on all relevant treatment options.

Ethics committee approval

Approval to send questionnaires and collect patient data for analysis and reporting was obtained from the Committee of Privacy of the NCR. The Medical Ethical Committee of the University Medical Centre Groningen concluded that this type of study does not fall within the scope of Research Involving Human Subjects (CCMO).

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Role of the funding source

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Conflicts of interest statement

None.

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Appendix A. Supplementary data

Supplementary data related to this article can be found at <https://doi.org/10.1016/j.ejso.2018.01.226>.

References

- [1] Integraal Kankercentrum Nederland (IKNL). Cijfers over kanker: incidentie borst. Integraal Kankercentrum Nederland (IKNL). Selection: incidence, female. 2014. Invasive and DCIS.
- [2] Morrow M, Strom EA, Bassett LW, Dershaw DD, Fowble B, Guiliano A, et al. Standard for breast conservation therapy in the management of invasive breast carcinoma. *CA Cancer J Clin* 2002;52:277–300.
- [3] Netherlands Comprehensive Cancer Organisation (IKNL). National guideline on breast cancer. Richtlijndatabase.nl. 2012.
- [4] Rowland JH, Desmond KA, Meyerowitz BE, Belin TR, Wyatt GE, Ganz PA. Role of breast reconstructive surgery in physical and emotional outcomes among breast cancer survivors. *J Natl Cancer Inst* 2000;92:1422–9.
- [5] Parker PA, Youssef A, Walker S, Basen-Engquist K, Cohen L, Gritz ER, et al. Short-term and long-term psychosocial adjustment and quality of life in women undergoing different surgical procedures for breast cancer. *Ann Surg Oncol* 2007;14:3078–89.
- [6] Cordeiro PG. Breast reconstruction after surgery for breast cancer. *N Engl J Med* 2008;1590–601.
- [7] Elder EE, Brandberg Y, Björklund T, Rylander R, Lagengren J, Jurell G, et al. Quality of life and patient satisfaction in breast cancer patients after immediate breast reconstruction: a prospective study. *Breast* 2005;14:201–8.
- [8] Howard MA, Polo K, Pusic AL, Cordeiro PG, Hidalgo DA, Mehrara B, et al. Breast cancer local recurrence after mastectomy and TRAM flap reconstruction: incidence and treatment options. *Plast Reconstr Surg* 2006;117:1381–6.
- [9] Robb GL. Reconstructive surgery. In: Hunt KK, Robb GL, Strom EA, Ueno NT, editors. *Breast cancer*. Springer; 2001. p. 223–53.
- [10] Zhang P, Li CZ, Wu CT, Jiao GM, Yan F, Zhu HC, et al. Comparison of immediate breast reconstruction after mastectomy and mastectomy alone for breast cancer: a meta-analysis. *Eur J Surg Oncol* 2017;43:285–93.
- [11] Yang X, Zhu C, Gu Y. The prognosis of breast cancer patients after mastectomy and immediate breast reconstruction: a meta-analysis. *PLoS One*; 2015. p. 10.
- [12] Murphy Jr RX, Wahhab S, Rovito PF, Harper G, Kimmel SR, Kleinman LC, et al. Impact of immediate reconstruction on the local recurrence of breast cancer after mastectomy. *Ann Plast Surg* 2003;50:333–8.
- [13] van Bommel ACM, Mureau MAM, Schreuder K, van Dalen T, Vrancken Peeters MTFD, Schrieks M, et al. Large variation between hospitals in immediate breast reconstruction rates after mastectomy for breast cancer in The Netherlands. *JPRAS* 2017;70:215–21.
- [14] Jeevan R, Mennie JC, Mohanna PN, O'Donoghue JM, Rainsbury RM, Cromwell DA. National trends and regional variation in immediate breast reconstruction rates. *Br J Surg* 2016;103:1147–56.
- [15] Dutch Institute for Clinical Auditing (DICA). Nabon breast cancer audit - NBCA. www.dica.nl/nbca.
- [16] Schreuder K, van Bommel ACM, de Ligt KM, Maduro JH, Vrancken Peeters MTFD, Mureau MAM, et al. Hospital organizational factors affect the use of immediate breast reconstruction after mastectomy for breast cancer in The Netherlands. *Breast* 2017;34:96–102.
- [17] Nederlandse Vereniging voor Plastische Chirurgie (NVPC). Guideline 'Breast reconstruction techniques after mastectomy'. Richtlijndatabase.nl. 2015.
- [18] Légaré F, Witteman HO. Shared decision making: examining key elements and barriers to adoption into routine clinical practice. *Health Aff* 2013;32:276–84.
- [19] Cohen WA, Ballard TNS, Hamill JB, Kim HM, Chen XBS, Klassen A, et al. Understanding and optimizing the patient experience in breast reconstruction. *Ann Plast Surg* 2016;77:237–41.
- [20] Nelson JA, Fischer JP, Radecki MA, Pasick C, McGrath J, Serletti JM, et al. Delayed autologous breast reconstruction: factors which influence patient decision making. *J Plast Reconstr Aesthet Surg* 2013;66:1513–20.
- [21] Mátrai Z, Kenessey I, Sávolt A, Ujhelyi M, Bartal A, Kásler M. Evaluation of patient knowledge, desire, and psychosocial background regarding post-mastectomy breast reconstruction in Hungary: a questionnaire study of 500 cases. *Med Sci Monit* 2014;12:2633–42.
- [22] Shekhawat L, Busheri L, Dixit S, Patel C, Dhar U, Koppiker C. Patient-reported outcomes following breast reconstruction surgery and therapeutic mammoplasty: prospective evaluation 1 year post-surgery with breast-Q questionnaire. *Indian J Surg Oncol* 2015;6:356–62.
- [23] Kim MK, Kim T, Moon HG, Jin US, Kim K, Kim J, et al. Effect of cosmetic outcome on quality of life after breast cancer surgery. *Eur J Surg Oncol* 2014;41:426–32.
- [24] Hack TF, Degner LF, Watson P, Sinha L. Do patients benefit from participating in medical decision making? Longitudinal follow-up of women with breast cancer. *Psycho Oncol* 2006;15:9–19.
- [25] Nissen MJ, Swenson KK, Kind EA. Quality of life after postmastectomy breast reconstruction. *Oncol Nurs Forum* 2002;29.

- [26] 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;36:1938–43.
- [27] Wilkins EG, Cederna PS, Lowery JC, Davis JA, Kim HM, Roth RS, et al. Prospective analysis of psychosocial outcomes in breast reconstruction: one-year postoperative results from the Michigan Breast Reconstruction Outcome Study. *Plast Reconstr Surg* 2000;106:1014–25.
- [28] Al-Ghazal SK, Sully L, Fallowfield L, Blamey RW. The psychological impact of immediate rather than delayed breast reconstruction. *Eur J Surg Oncol* 2000;26:17–9.
- [29] Mandelblatt JS, Edge SB, Meropol NJ, Senie R, Tsangaris T, Grey L, et al. Predictors of long-term outcomes in older breast cancer survivors: perceptions versus patterns of care. *J Clin Oncol* 2003;21:855–63.
- [30] Brown R, Butow P, Wilson-Genderson M, Bernhard J, Ribi K, Juraskova I. Meeting the decision-making preferences of patients with breast cancer in oncology consultations: impact on decision-related outcomes. *J Clin Oncol* 2012;30.
- [31] Gattellari M, Butow PN, Tattersall MH. Shared decisions in cancer care. *Soc Sci Med* 2001;52:1865–78.
- [32] van de Poll-Franse LV, Horevoorts N, Eenbergen M, Denollet J, Roukema JA, Aaronson NK, et al. The patient reported outcomes following initial treatment and long term evaluation of survivorship registry: scope, rationale and design of an infrastructure for the study of physical and psychosocial outcomes in cancer survivorship cohorts. *Eur J Cancer* 2011;47:2188–94.
- [33] StataCorp. Stata statistical software: release 14. In: College station, TX. StataCorp LP; 2015.
- [34] Ananian P, Houvenaeghel G, Protière 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;11:762–71.
- [35] Harcourt D, Rumsey N. Mastectomy patients' decision-making for or against immediate breast reconstruction. *Psycho Oncol* 2004;13:106–15.
- [36] Zhong T, Spithoff K, Kellett S, Boyd K, Brackstone M, Hanrahan R, et al. Breast cancer reconstruction surgery (immediate and delayed) across Ontario: patient indications and appropriate surgical options. Section 1: recommendations. Ontario Cancer Care: Action Cancer Ontario; 2016.
- [37] 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. *Psycho Oncol* 2007;16:342–51.
- [38] Janz NK, Wren PA, Copeland LA, Lowery JC, Goldfarb SL, Wilkins EG. Patient-physician concordance: preferences, perceptions, and factors influencing the breast cancer surgical decision. *J Clin Oncol* 2004;22:3091–8.
- [39] Wallberg B, Michelson H, Nystedt M, Bolund C, Degner LF, Wilking N. Information needs and preferences for participation in treatment decisions among Swedish breast cancer patients. *Acta Oncol* 2000;39:467–76.
- [40] Begum S, Grunfeld EA, Ho-Asjoe M, Farhadi J. An exploration of patient decision-making for autologous breast reconstructive surgery following a mastectomy. *Patient Educ Couns* 2011;84:105–10.
- [41] Temple-Oberle C, Ayeni O, Webb C, Bettger-Hahn M, Ayeni O, Mychalsychyn D. Shared decision-making: applying a person-centered approach to tailored breast reconstruction information provides high satisfaction across a variety of breast reconstruction options. *J Surg Oncol* 2014;110:796–800.
- [42] Ogrodnik A, MacLennan S, Weaver D, James T. Barriers to completing delayed breast reconstruction following mastectomy: a critical need for patient and clinician education. *J Canc Educ* 2016;32(4):700–6.
- [43] Greenall MJ. The timing of breast reconstruction. *Ann R Coll Surg Engl* 2006;89:754–9.
- [44] Hawley ST, Lantz OM, Janz NK, Salem B, Morrow M, Schwartz K, et al. Factors associated with patient involvement in surgical treatment decision making for breast cancer. *Patient Educ Couns* 2007;65:387–95.
- [45] Vogel BA, Helmes AW, Hasenburg A. Concordance between patients' desired and actual decision-making roles in breast cancer care. *Psycho Oncol* 2008;17:182–289.
- [46] Lee CN, Ubel PA, Deal AM, Burdick Blizard L, Sepucha KR, Ollila DW, et al. How informed is the decision about breast reconstruction after Mastectomy? A prospective, cross-sectional study. *Ann Surg* 2016;264:1103–9.
- [47] Musgrave KJ, Bochner M, Kollias J. Surgical decision-making in immediate breast reconstruction. *World J Surg* 2010;34:3029–35.
- [48] Magill LJ, Robertson FP, Jell G, Mosahebi A, Keshtgar M. Determining the outcomes of post-mastectomy radiation therapy delivered to the definitive implant in patients undergoing one- and two-stage implant-based breast reconstruction: A systematic review and meta-analysis. *JPRAS* 2017;70:1329–35.
- [49] Jagsi R, Li Y, Morrow M, Janz N, Alderman A, Graff J. Patient-reported quality of life and satisfaction with cosmetic outcomes after breast conservation and mastectomy with and without reconstruction: results of a survey of breast cancer survivors. *Ann Surg* 2015;261:1198–206.
- [50] Van Bommel ACM, Schreuder K, Veenstra RK, de Ligt KM, Vrancken Peeters MTFD, Maduro JH, et al. Discrepancies between surgical oncologists and plastic surgeons in patient information provision and personal opinions towards immediate breast reconstruction. [Unpublished results].
- [51] Flitcroft K, Brennan M, Costa D, Wong A, Snok K, Spillane A. An evaluation of factors affecting preference for immediate, delayed or no breast reconstruction in women with high-risk breast cancer. *Psycho Oncol* 2016;25:463–9.
- [52] Wolf L. The information needs of women who have undergone breast reconstruction. Part II: information giving and content of information. *Eur J Oncol Nurs* 2004;8:315–24.
- [53] Festinger L. Conflict, decision, and dissonance. Stanford. University Press; 1964.
- [54] Wolf L. The information needs of women who have undergone breast reconstruction. Part I: decision-making and sources of information. *Eur J Oncol Nurs* 2004;8:211–23.
- [55] Eftting M. Borstreconstructie steeds vaker met eigen weefsel. *Volkskrant*. Volkskrant; 2013.
- [56] ZorgverzekeringWijzer.nl. Vergoeding plaatsen van borst (mamma) prothesen. 2018. 2017.