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EPIDEMIOLOGY

Pattern of follow-up care and early relapse detection in breast cancer patients

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Abstract Routine breast cancer follow-up aims at detecting second primary breast cancers and loco regional recurrences preclinically. We studied breast cancer follow-up practice and mode of relapse detection during the first 5 years of follow-up to determine the efficiency of the follow-up schedule. The Netherlands Cancer Registry provided data of 6,509 women, operated for invasive non-metastatic breast cancer in 2003–2004. In a random sample including 144 patients, adherence to follow-up guideline recommendations was studied. Mode of relapse detection was studied in 124 patients with a second primary breast cancer and 160 patients with a loco regional recurrence. On average 13 visits were performed during the first 5 years of the follow-up, whereas nine were recommended. With one, two and three medical disciplines involved, the number of visits was 9, 14 and 18, respectively. Seventy-five percent (93/124) of patients with a second primary breast cancer, 42 % (31/74) of patients with a loco regional recurrence after breast conserving surgery and 28 % (24/86) of patients with a loco regional recurrence after mastectomy had no symptoms at detection. To detect one loco regional recurrence or second primary breast cancer preclinically, 1,349 physical examinations versus 262 mammography and/or MRI tests were performed. Follow-up provided by only one discipline may decrease the number of unnecessary follow-up visits. Breast imaging plays a major and physical examination a minor role in the early detection of second primary breast cancers and loco regional recurrences. The yield of physical examination to detect relapses early is low and should therefore be minimised.

Keywords Breast cancer · Mammography · Physical examination · Relapse · Routine follow-up

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Introduction

Routine follow-up after curative-intent treatment for breast cancer is standard medical practice [1]. Routine follow-up aims at providing psychosocial care and monitoring the side-effects of primary treatment. Another prominent objective is the early detection of a second primary breast cancer (SPBC) or local or regional recurrence (LRR) by means of routine physical examination and mammography. Early detection of a SPBC or LRR yields a survival benefit when compared with symptomatic relapses [2, 3]. Detection of distant metastases in the preclinical phase is no primary aim of routine follow-up because early initiation of treatment does not prolong survival time [4].

The yield of breast cancer follow-up can be estimated by the number of relapses detected asymptomatically and

depends on the actual number of tests applied in practice. Recently, two studies in the Netherlands and one in Canada reported more follow-up visits in clinical practice than recommended, whereas yearly breast imaging was under use [5–7]. The degree of over- and under-use varied between the studies. The proportion of relapses detected in the asymptomatic phase differs between SPBCs and LRRs and varied over time [8, 9]. Studies on whether physical examination or mammography gave the first sign of recurrence were limited by sample size or outdated [9, 10].

The aim of this study was to compare current daily follow-up practice with the guideline recommendations and to assess the mode of relapse detection in patients treated for invasive breast cancer with curative intent in 2003–2004 in the Netherlands.

Patients and methods

The inception cohort comprises all women consecutively diagnosed and operated for non-metastatic invasive breast cancer in 2003–2004 in 37 hospitals in four regions of the Netherlands Cancer Registry (NCR) (Fig. 1). Patients with a history of invasive cancer of any type, with the exception of basal cell carcinoma of the skin, were not eligible. From the inception cohort we selected 666 patients with a relapse diagnosed within 5 years after the primary diagnosis, including all 148 patients with SPBCs, all 260 patients with LRRs and 258 patients with distant metastases (44 % randomly selected for efficiency reasons) as first relapse (Fig. 1).

For efficiency reasons breast cancer follow-up practice was studied in 144 breast cancer patients who were randomly selected from 15 hospitals, named the 'random cohort sample' (Fig. 1). The hospitals were selected based on geographical location, namely eastern Netherlands, and include university, teaching and non-teaching hospitals.

Patient, tumour and treatment characteristics and the incidence of relapse within 5 years after diagnosis were available from the NCR. Detailed information regarding follow-up visits, tests and mode of detection was retrospectively collected from medical records between September 2010 and May 2011 by registry clerks of the NCR.

Patients with unknown pathological TNM staging were classified according to their clinical TNM stage. Synchronous bilateral breast cancer was defined as a contralateral breast cancer diagnosed within 3 months from the first breast cancer. The tumour with the highest Nottingham Prognostic Index was included as the primary tumour [11]. All secondary contralateral breast cancers diagnosed more than 3 months after the first breast cancer were defined as a SPBC, as were second primaries in the ipsilateral breast based on pathological findings. A local recurrence was defined as a relapse in the ipsilateral breast, scar, skin or chest wall. A regional recurrence was defined as a relapse in the supraclavicular, infraclavicular, internal mammary or axillary lymph nodes [12]. A distant metastasis included all distant bone and visceral relapses, distant lymph nodes and extended skin recurrences. Relapse was defined as a SPBC, LRR or distant metastasis. If a new relapse was diagnosed within the treatment period of the previous one, both relapses were considered to be diagnosed simultaneously.

Follow-up practice was studied in the random cohort sample. Consultations by a surgeon, medical oncologist, radiotherapist or oncology nurse were considered as follow-up visits. Patients were grouped according to the number of medical disciplines involved at least once during follow-up. A visit was registered as a follow-up visit if physical examination was performed, in accordance with a judgement about disease status. Visits related to wound control or the surveillance of other diseases were excluded. Visits at which only a test was performed, e.g. mammography, were not counted, but included in the consultation where the result of the exam was discussed with the patient. Interval visits were defined as patient initiated once. Complaints at visits were defined as reported patient symptoms that might indicate breast cancer relapse.

Guideline recommendations

According to the Dutch guideline on breast cancer treatment, which was in use between 2002 and 2008, breast cancer patients should be clinically examined every 3 months during the first year, every 6 months during the second year, and yearly up to and including year 5 after primary treatment [1]. In addition, annual mammography is advised, and also MRI for patients with a BRCA1 or BRCA2 mutation. For women aged 60–75 years, mammography may be offered biennially. Since 2008 yearly mammography was advised to all patients, irrespective of age [13].

Data analyses

Start of follow-up was defined as the last date of primary loco regional or chemotherapeutic treatment and may, therefore, start before hormonal or targeted therapy. The end of follow-up was set at first relapse, death, or last date of follow-up.

Guideline adherence was evaluated by comparing the mean number of follow-up visits and mammograms or MRIs performed with the recommendations. Adherence rates for follow-up visits were categorized as fewer visits than recommended, consistent with recommendations and more visits than recommended [7]. Patients discharged from routine follow-up during the fifth year of follow-up were

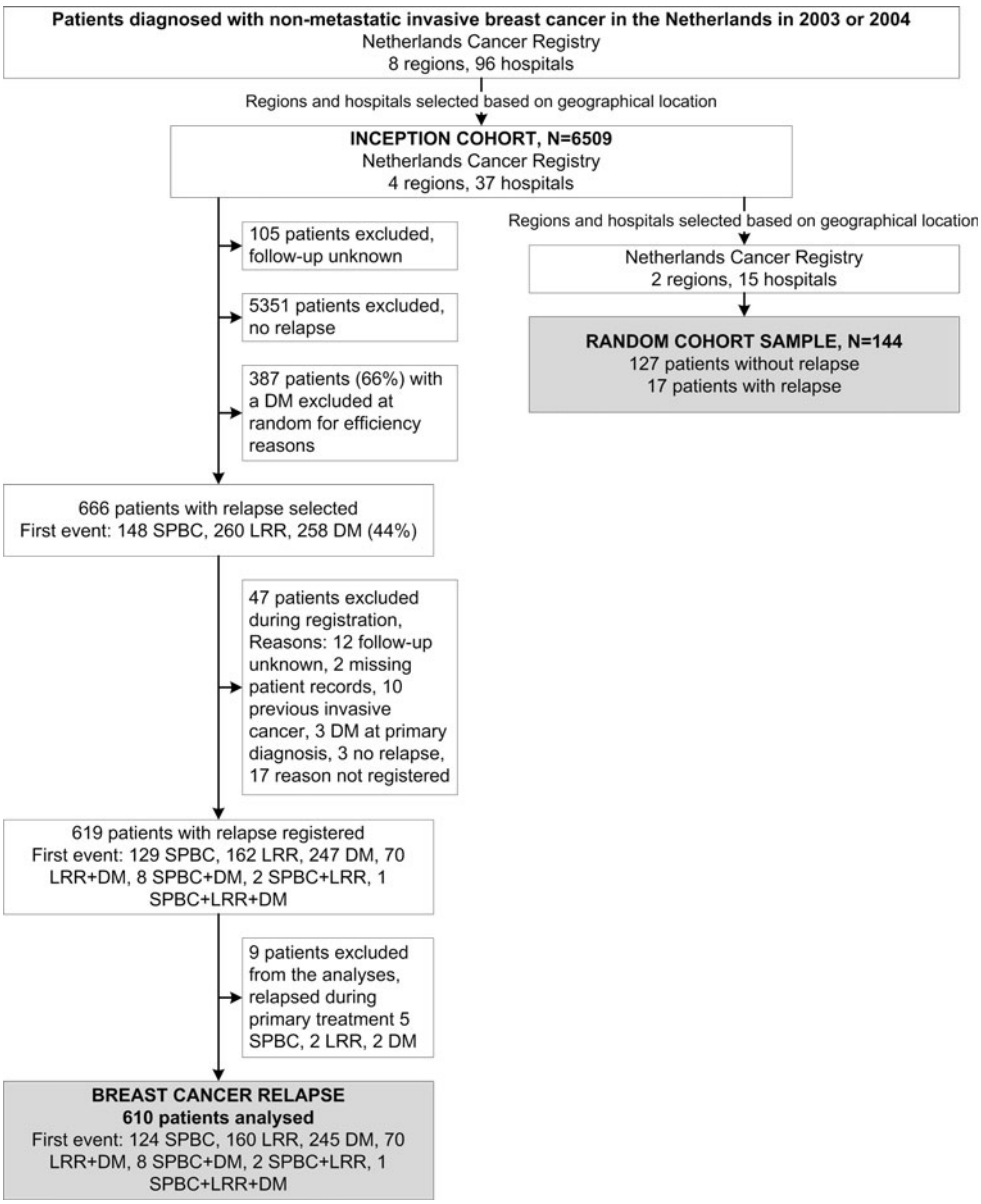

Fig. 1 Flow chart for breast cancer patients' inclusion, selection, registration and analysis based on minimal five years of follow-up

included in the analyses until the end of year 5. Patients who stopped to attend the routine follow-up for no specific reason were considered non-attendant for the remainder of the 5-year follow-up period. All mammographic and breast MRI examinations performed during the follow-up period, i.e. routine or indicated, were included in the analyses. Patients with at least 1 mammogram or breast MRI examination per year were considered to be compliant to yearly breast imaging. Compliance to breast imaging during the first 5 years of follow-up was defined as at least 4 exams.

Relapses were categorised according to the presence of symptoms at diagnosis, whether the corresponding visit was routine or interval and which test, e.g. physical examination or breast imaging, raised the first suspicion for relapsed breast cancer. This mode of relapse detection was outlined by site of isolated SPBC and LRR. Mode of LRR detection was displayed by the type of primary surgery.

Results

The characteristics of the inception cohort and the random patient cohort sample were comparable (Table 1). In the random cohort sample, genetic testing was performed in 12 (8 %) patients; in 2 (1 %) patients a BRCA1 mutation was found. During the first 5 years 1,645 visits were performed: 1,552 routine, 83 interval and 10 indefinable visits. In the same period 15 patients died, 17 patients relapsed, one patient emigrated and one patient did not undergo further follow-up exams because of co-morbidity.

The mean number of visits decreased during follow-up: from 3.9 in year 1 to 1.8 in year 5 (Table 2). Throughout follow-up years 1–5, respectively 31, 50, 76, 75 and 62 % of patients underwent more visits than recommended. When one discipline performed routine follow-up controls, 9.1 visits were performed during the first 5 years of follow-up. The follow-up frequency increased when more disciplines were involved in routine follow-up: 13.7 visits in case of two disciplines and 18.0 visits when the surgeon, radiotherapist and medical oncologist all provided follow-up care.

During the first 5 years of follow-up 533 mammograms and 54 breast MRIs were performed. In this period, 8 % of

Table 1 Patient, tumour and treatment characteristics at initial breast cancer diagnosis in 2003 and 2004

Characteristic	Inception cohort	Random cohort sample	Breast cancer relapse	
	$n = 6{,}509$	$n = 144$	SPBC $n = 124$	LRR $n = 160$
Age at surgery, median (range) years	58 (20–96)	57 (28–88)	58 (31–85)	55 (20–89)
Tumour stage, n (%)				
pT1	3,805 (58)	91 (63)	85 (69)	90 (56)
pT2	2,375 (36)	47 (33)	36 (29)	65 (40)
pT3	220 (3)	3 (2)	2 (2)	1 (1)
pT4	106 (2)	3 (2)	1 (1)	4 (3)
Unknown	3 (0)			
Nodal stage, n (%)				
pN0	3,757 (58)	91 (64)	97 (78)	94 (59)
pN1	1,805 (28)	36 (25)	17 (14)	46 (29)
pN2	552 (8)	8 (6)	6 (5)	9 (6)
pN3	285 (4)	4 (3)	3 (2)	9 (6)
Unknown	110 (2)	5 (3)	1 (1)	2 (1)
Tumour grade, n (%)				
Grade 1	1,161 (18)	30 (21)	27 (22)	20 (13)
Grade 2	2,649 (41)	60 (42)	64 (52)	63 (39)
Grade 3	1,989 (31)	41 (28)	19 (15)	63 (39)
Unknown	710 (11)	13 (9)	14 (11)	14 (9)
Histology, n (%)				
Ductal	5,022 (77)	119 (83)	90 (73)	133 (83)
Lobular	737 (11)	17 (12)	22 (18)	8 (5)
Other	750 (12)	8 (6)	12 (10)	19 (12)
Bilateral breast cancer, n (%)				
Yes	97 (1)	1 (1)	NA	3 (2)
Receptor status, n (%)				
ER and/or PR positive	2,894 (77)	123 (85)	103 (83)	105 (66)
ER and PR negative	627 (17)	18 (13)	13 (10)	45 (28)
Unknown	240 (6)	3 (2)	8 (7)	10 (6)
Not registered	2,748			
Surgery, n (%)				
Breast conserving	3,444 (53)	68 (47)	71 (57)	74 (46)
Mastectomy	3,060 (47)	76 (53)	53 (43)	86 (54)
Unknown	5 (0)			
Radiotherapy, n (%)				
Yes	4,239 (65)	83 (58)	83 (67)	86 (54)
Chemotherapy, n (%)				
Yes	2,430 (37)	45 (31)	27 (22)	54 (34)
Hormonal therapy, n (%)				
Yes	2,722 (42)	64 (44)	26 (21)	45 (28)

ER oestrogen receptor, *LRR* loco regional recurrence, *NA* not applicable, *PR* progesterone receptor, *SPBC* second primary breast cancer

Table 2 Pattern of follow-up visits during the first 5 years of post-treatment follow-up in the random cohort sample comprising 144 breast cancer patients

Follow-up visits	Year 1		Year 2		Year 3		Year 4		Year 5		Year 1-5[a]	
	134 patients		123 patients		118 patients		118 patients		110 patients		110 patients	
	No. patients ≥1 visit	Mean (range) visits	No. patients ≥1 visit	Mean (range) visits	No. patients ≥1 visit	Mean (range) visits	No. patients ≥1 visit	Mean (range) visits	No. patients ≥1 visit	Mean (range) visits	No. patients ≥1 visit	Mean (range) visits
Guideline recommendations		4		2		1		1		1		9
Follow-up practice	134	3.9 (1–9)	123	2.8 (1–8)	115	2.2 (0–6)	113	2.1 (0–6)	104	1.8 (0–5)	110	12.9 (4–31)
Visit												
Routine	134	3.7 (1–9)	123	2.7 (1–8)	113	2.1 (0–5)	111	2.0 (0–5)	103	1.7 (0–5)	110	12.2 (3–29)
Interval	22	0.2 (0–4)	10	0.1 (0–2)	8	0.1 (0–2)	11	0.1 (0–2)	9	0.1 (0–2)	40	0.6 (0–5)
Unknown	2	0.0 (0–2)	3	0.0 (0–2)	1	0.0 (0–1)	2	0.0 (0–1)		–	4	0.1 (0–5)
Complaints at visit												
Yes	38	0.5 (0–7)	39	0.4 (0–3)	25	0.2 (0–2)	23	0.2 (0–2)	18	0.2 (0–3)	69	1.5 (0–8)
No	134	3.4 (1–8)	122	2.3 (0–6)	110	2.0 (0–5)	104	1.8 (0–5)	102	1.6 (0–4)	110	11.2 (3–24)
Unknown	9	0.1 (0–1)	4	0.0 (0–2)	1	0.0 (0–1)	2	0.0 (0–1)		–	9	0.1 (0–4)
No. of disciplines involved in follow-up												
One ($n = 47$)	41	2.6 (1–6)	39	2.2 (1–4)	35	1.5 (0–3)	35	1.4 (0–3)	32	1.2 (0–3)	35	9.1 (4–14)
Two ($n = 73$)	70	4.2 (2–9)	64	2.9 (1–8)	61	2.3 (1–6)	59	2.2 (0–6)	55	1.9 (0–5)	58	13.7 (8–31)
Three ($n = 24$)	23	5.5 (4–9)	20	3.7 (2–6)	19	3.4 (2–6)	19	3.1 (2–5)	17	2.6 (1–5)	17	18.0 (12–25)

[a] 34 patients had a follow-up period shorter than 5 years: 15 patients died, 17 patients relapsed, 1 patient emigrated and 1 patient did not undergo further follow-up exams because of co-morbidity

Table 3 Breast imaging during the first 5 years of post-treatment follow-up and adherence to guideline recommendations in the random cohort sample comprising 144 breast cancer patients

Breast imaging	Year 1			Year 2			Year 3			Year 4		
	134 patients			123 patients			118 patients			118 patients		
	No. patients	Mean (range) exams	%of patients ≥1 exam	No. patients	Mean (range) exams	%of patients ≥1 exam	No. patients	Mean (range) exams	%of patients ≥1 exam	No. patients	Mean (range) exams	%of patients ≥1 exam
Guideline recommendations		1			1			1			1	
≤59 years		1			1			1			1	
60–74 years		0.5			0.5			0.5			0.5	
≥75 years		0			0			0			0	
Mammography	134	0.8 (0–2)	77 %	123	0.9 (0–2)	88 %	118	0.9 (0–2)	81 %	118	0.8 (0–2)	82 %
Mammography or MRI	134	0.8 (0–2)	78 %	123	1.0 (0–2)	92 %	118	0.9 (0–2)	85 %	118	0.9 (0–2)	86 %
Age at diagnosis												
≤59 years ($n = 86$)	84	0.9 (0–2)	85 %	78	0.9 (0–2)	90 %	73	0.9 (0–2)	88 %	73	1.0 (0–2)	92 %
60–74 years ($n = 38$)	37	0.8 (0–2)	78 %	34	1.1 (0–2)	94 %	34	0.9 (0–2)	33 %	34	0.9 (0–2)	85 %
≥75 years ($n = 20$)	13	0.4 (0–1)	38 %	11	1.0 (1–1)	100 %	11	0.8 (0–2)	73 %	11	0.5 (0–1)	55 %
No. of disciplines involved in follow-up												
One ($n = 47$)	41	0.5 (0–2)	46 %	39	1.0 (0–2)	89 %	35	0.8 (0–2)	80 %	35	0.9 (0–2)	86 %
Two ($n = 73$)	70	0.9 (0–2)	90 %	64	1.0 (0–2)	92 %	61	1.0 (0–2)	89 %	59	0.9 (0–2)	93 %
Three ($n = 24$)	23	1.0 (0–2)	100 %	20	1.0 (0–1)	95 %	19	1.0 (0–2)	95 %	19	0.9 (0–2)	89 %

Table 3 continued

Breast imaging	Year 5			Year 1–5[a]		
	110 patients			110 patients		
	No. patients	Mean (range) exams	%of patients ≥1 exam	No. patients	Mean (range) exams	%of patients ≥1 exam
Guideline recommendations		1			4–5	
≤59 years		1			4–5	
60–74 years		0.5			2–3	
≥75 years		0			0	
Mammography	110	0.8 (0–2)	83 %	110	4.3 (0–6)	85 %
Mammography or MRI	110	0.9 (0–2)	86 %	110	4.6 (0–7)	92 %
Age at diagnosis						
≤59 years ($n = 86$)	71	1.0 (0–2)	93 %	71	4.7 (1–7)	89 %
60–74 years ($n = 38$)	31	0.8 (0–2)	77 %	31	4.5 (0–6)	97 %[b]
≥75 years ($n = 20$)	8	0.8 (0–2)	63 %	8	3.8 (2–5)	NA
No. of disciplines involved in follow-up						
One ($n = 47$)	32	0.9 (0–1)	88 %	35	3.9 (0–5)	83 %
Two ($n = 73$)	55	1.0 (0–1)	95 %	58	4.8 (2–7)	95 %
Three ($n = 24$)	17	0.9 (0–1)	88 %	17	5.0 (4–6)	100 %

NA not applicable

[a] 34 patients had a follow-up period shorter than 5 years: 15 patients died, 17 patients relapsed, 1 patient emigrated and 1 patient did not undergo further follow-up exams because of co-morbidity

[b] Adherence was defined as 2 or more breast imaging examinations

Table 4 Mode of first relapse detection in 374 relapsed breast cancer patients: the first test that raised suspicion for relapsed breast cancer, *N* (%)

Mode of detection	SPBC $n = 124$	LRR after BCS $n = 74$	LRR after mastectomy $n = 86$
Asymptomatic	93 (75 %)	31 (42 %)	24 (28 %)
Detected at a routine visit	85	31	22
Physical examination	11	13	18
Local imaging[a]	66	17	3
Physical examination and local imaging	8	1	1
Blood tests	–	–	–
Chance finding	7	–	2
Unknown	1	–	–
Symptomatic	31 (25 %)	42 (57 %)	62 (72 %)
Detected at a routine visit	16	9	16
Detected at an interval visit	15	33	45
Unknown	–	–	1
Unknown	–	1 (1 %)	–

BCS breast conserving surgery, *LRR* loco regional recurrence, *SPBC* second primary breast cancer

[a] local imaging includes mammography or breast MRI

patients received less than 4 breast imaging tests, 32 % received four exams, 48 % received five tests and 13 % more than five examinations. No difference in breast imaging frequency was observed between patients aged ≤59 years and those aged 60–74 years (Table 3). Patients aged 75^{+} years received less breast imaging tests compared with younger patients. Adherence to yearly breast imaging tended to be better when more than one discipline were involved. Patients followed up by one discipline were older than patients with two or three disciplines involved in follow-up care: the median (range) age at diagnosis was 64 (38–86) years, 55 (28–88) years and 51 (33–70) years, respectively.

The mode of relapse detection was assessed in 124 patients with a SPBC and 160 patients with a LRR (Fig. 1). SPBCs were mainly detected in an early stage: 14 % were in situ, 52 % stage I, 24 % stage II, 5 % stage III and 6 % unknown. Three in four SPBCs were detected asymptomatically at a routine visit of which 71 % (66/93) by local breast imaging alone (Table 4). The proportion of SPBCs detected asymptomatically decreased with the SPBC stage: 16 (94 %) of in situ cancers, 49 (77 %) of SPBCs detected in stage I, 20 (67 %) in stage II, 4 (67 %) in stage III and 4 (57 %) for SPBCs of unknown stage.

Of the 160 LRRs, 59 % were local, 33 % were regional and 8 % were loco regional. After breast conserving surgery (BCS), 42 % of LRRs were detected asymptomatically of which 55 % (18/31) by local breast imaging modalities (Table 4). In patients who underwent mastectomy, 28 % of LRRs were detected asymptomatically of which 75 % (18/24) by physical examination.

In general, there was no trend observed between the number of disciplines involved in a patient's follow-up and the proportion of relapses detected asymptomatically (data not shown).

In total, 10.8 routine visits (1,552 routine visits in 144 patients) and 3.9 breast imaging procedures (562 exams in 144 patients) were performed per patient during the first 5 years of follow-up. An asymptomatic recurrence was detected in 2.1 % of patients (85 SPBCs and 53 LRRs detected asymptomatically in 6,509 patients). Forty-two asymptomatic patients had their LRR or SPBC detected by physical examination alone, 86 patients by breast imaging alone and 10 patients by both modalities (Table 4). Correspondingly, 1,349 physical exams were performed to detect 1 LRR or SPBC before symptoms occur. Regarding breast imaging, 262 mammographies and/or breast MRIs were performed to detect 1 LRR or SPBC early.

Discussion

We observed an overuse of breast cancer follow-up visits in 15 hospitals in the Netherlands in 2003–2011, which was also observed previously in the Netherlands [5, 6] and Canada [7]. Follow-up frequency remarkably increased with the number of medical disciplines involved in routine follow-up. In line with our findings, Grandjean et al. [6] observed a slight underuse of yearly breast imaging in patients diagnosed in 2003 in two hospitals in the Netherlands. Adherence was, however, better than in patients diagnosed in 1989–2002 in the Netherlands [5] and in 1998–1999 in Canada [7].

In this study, all patient records from the surgeon, radiotherapist and medical oncologist were meticulously examined by trained registry clerks from the NCR, which is an important strength of this study. The retrospective design may, however, have hampered correct classification of follow-up visits and tests. Degree of adherence should

be interpreted with caution. Patients may have advanced or delayed visits which may have led to fewer visits in 1 year and more visits in another. However, the total number of visits during the first 5 years of follow-up is probably estimated correctly. Furthermore, patient-initiated interval visits were included in the adherence calculations. One might argue whether these are advanced or extra visits. The impact of interval visits on guideline adherence was, however, small: on average 0.6 interval visits were observed in 5 years. The degree of adherence to yearly mammography may be overestimated as all mammograms and breast MRIs performed in the follow-up period were included. A study in the United States showed that 18 % of the 319 mammograms were diagnostic rather than routine [14]. In contrast, inclusion of patients who underwent bilateral mastectomy may have resulted in a slight underestimation of adherence to yearly breast imaging. The prevalence of patients who underwent bilateral mastectomy was not registered, but breast imaging was provided at least once to all but one patient.

Three out of four patients were asymptomatic at SPBC detection. Others reported an asymptomatic detection rate varying between 59 and 77 % [8, 10, 15, 16]. Breast imaging plays a prominent role in the early detection of SPBCs, as was reported previously [10, 16].

Thirty-four percent of LRRs were detected in the asymptomatic phase and this rate was higher in patients treated with BCS (42 %) than with mastectomy (28 %). A similar observation was made in 1989–2002: 69 and 30 %, respectively [10]. In contrast, a meta-analysis suggested a trend towards a higher proportion of LRRs detected asymptomatically in patients treated with mastectomy (47 %) than BCS (36 %), and in studies reported before 1995 (46 %) than in 1995 and later (32 %) [9]. Both findings may be explained by the steep increase in BCS since the mid 1980s [17, 18] and decreased risk of LRRs [19, 20]. After mastectomy, 21 % of recurrences were detected asymptomatically by physical examination. A slightly higher rate (30 %) was observed in the Netherlands in 1989–2002 [10]. For patients treated with BCS, physical examination seems to be of equal value for the asymptomatic detection of LRRs as yearly mammography [10, 21].

In the Netherlands, follow-up is advised to be coordinated by one medical discipline since 2012 [22]. The new monodisciplinary approach may improve guideline adherence, as the current study showed an overuse of follow-up services when two or three disciplines were involved. Routine follow-up, including physical examination and mammography, is advised to be performed once a year during the first 5-years, irrespective of age. The decrease in frequency of physical examination during follow-up was based on the findings published by Lu et al. [10] and Montgomery et al. [21]. In line with the present study, they observed that physical examination has only a modest role in the early detection of SPBCs and LRRs. The decrease in risk of LRR over time [19, 20] and the asymptomatic detection rate of approximately 20 % minimises the yield of routine physical examinations. Lu et al. [10] observed that during the first 5 years of follow-up 1,041 physical examinations were done to detect 1 LRR for patients diagnosed in the Netherlands in 1989–2002. In the present study, 1,349 physical exams were performed to detect 1 SPBC or LRR early. Although this seems to justify a less frequent follow-up programme, the impact on patient outcome is unknown and needs monitoring.

Yearly follow-up may be too infrequent to be able to provide psychosocial care adequately and to monitor the side-effects of primary treatment, especially during the first year following the treatment. It is important to incorporate these objectives in routine follow-up [23, 24]. Specialised nurses and general practitioners play an important role herein [25–27].

Follow-up tests themselves may cause psychosocial and physical harm in healthy survivors due to false positive findings, unnecessary investigations and overtreatment [28, 29]. Future studies should target at determining the optimal combination of breast cancer follow-up tests, timing and duration, based on the benefits, harms and costs of routine testing.

Conclusion

In the Netherlands, more follow-up visits are done than recommended. Follow-up provided by one discipline may improve guideline adherence. Breast imaging plays a major role in the early detection of SPBCs and LRRs. Although physical examination detects 20 % of LRRs asymptomatically, a less intensive frequency of the physical examination seems justifiable. Monitoring the pattern of follow-up care and mode of detection remains important in the future as guideline recommendations in the Netherlands changed in 2012.

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