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Primary breast cancer therapy in six regions of Germany☆

J. Engel[a,*], G. Nagel[b], E. Breuer[c], C. Meisner[d], U.-S. Albert[e], K. Strelocke[f], H. Sauer[a], D. Katenkamp[b], Ch. Mittermayer[c], E. Heidemann[g], K.-D. Schulz[e], H. Kunath[f], W. Lorenz[e], D. Hölzel[a]

[a]*Cancer Registry of the Comprehensive Cancer Center Munich, Marchioninistraße 15, 81377 Munich, Germany*
[b]*Comprehensive Cancer Center Jena e.V., Ziegelmühlenweg 1, 07740 Jena, Germany*
[c]*Comprehensive Cancer Center and Department of Pathology Aachen, Pauwelsstraße 30, 52074 Aachen, Germany*
[d]*Institute for Medical Informatic Processing (IMI), Westbahnhofstraße 55, 74070 Tübingen, Germany*
[e]*Comprehensive Cancer Center Marburg, Pilgrimstein 3, 35037 Marburg, Germany*
[f]*Cancer Registry of the Comprehensive Cancer Center Dresden, Fetscherstraße 74, 01307 Dresden, Germany*
[g]*Comprehensive Cancer Center (OSP), Stuttgart, Rosenbergstraße 38, 70176 Stuttgart, Germany*

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Abstract

Studies from six regions of Germany (Aachen (W1), Dresden (E1), Jena (E2), Marburg (W2), Munich (W3), and Stuttgart (C1)) have been compared to verify and assess the quality of healthcare using breast cancer as an example. All of the data collection was carried out in comprehensive cancer centres and is population-based, with the exception of C1. Classic prognostic factors and the initial treatment of 8661 women with breast cancer, diagnosed between 1996 and 1998, were examined. Primary therapy, breast conserving therapy (BCT), and the use of subsequent local radiation and/or systemic therapy (chemotherapy or hormonal therapy) were analysed. BCT was performed on 39.3–57.7% of patients. By pT-category, the proportion of BCT in the six regions were as follows: for pTis between 37.8 and 64.3%, for pT1 between 51.7 and 71.5%, for pT2 between 25.9 and 51.1%, for pT3 between 0 and 13.1% and for pT4 between 0 and 15.2%. Multivariate analyses, adjusted for age and biological factors, showed a significant influence of the treating hospital on the mastectomy rate. The use of radiotherapy after BCT (80%) was quite homogeneous in the six regions. The application of radiotherapy after mastectomy, however, varied between 10.4 and 32.2%. In all regions, for pre-menopausal patients, the use of adjuvant systemic therapy almost reflected the St. Gallen-Consensus recommendations. In contrast, post-menopausal women with positive lymph nodes were not always treated according to these standards. In all regions, age had an influence on the administration of treatment: elderly breast cancer patients received less BCT, less radiotherapy and less adjuvant therapy than recommended in the St. Gallen-Consensus. Feedback of the results was made available to each hospital, providing a comparative summary of patient care that could be used by the participating hospitals for self-assessment and quality-control.

Keywords: Breast cancer; Population-based; Primary therapy; Quality assurance; Epidemiology

1. Introduction

The evaluation of healthcare quality has become increasingly important. Regularly updated guidelines, the increasing complexity of interdisciplinary healthcare delivery, and discussion about volume-related outcomes raise questions as to how 'state-of-the-art' healthcare is achieved at present. Unclear recommendations, as well as the increasing involvement of patients in therapy decisions, justify assessments of healthcare delivery. The value of monitoring results could be increased if population-based evaluations were attained. For such cohorts, 5- and 10-year follow-up may also be available. To achieve this would be a further step for Germany towards the EUROCARE goal of describing the healthcare outcomes for cancer in European countries [1–3].

☆ The cooperating cancer centres (CCC) and their personnel are listed in Section 5.

* Corresponding author at: Tumorregister des Tumorzentrum München, Institut für Medizinische Informationsverarbeitung, Biometrie und Epidemiologie (IBE), LMU-München, Klinikum Grosshadern, Marchioninistraße 15, D- 81377 München, Germany. Tel.: +49-89-7095-4750; fax: +49-89-7095-4753.

E-mail address: engel@ibe.med.uni-muenchen.de (J. Engel).

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The Federal Ministry of Health funds so-called field studies with the aim of describing and, if necessary, optimising the quality of healthcare delivery, using breast cancer as an example, in six regions of Germany (in the former and new German Federal states). This amounts to approximately 10% of new breast cancer patients annually in Germany. The aim of the studies was to develop models for quality management which can then be transferred to other regions and other tumour diseases. Each comprehensive cancer centre has to evaluate its data independently to provide feedback of the results to all of the healthcare providers involved, for their own management of quality control. The treatment guidelines of the regional cancer centres in Germany are comparable and are adopted from the US National Institutes of Health (NIH) for the operation procedure [4] and from the St. Gallen Consensus for adjuvant systemic therapy [5,6]. The following article compares primary healthcare provision for breast cancer patients in the six regions, using selected quality indicators.

2. Patients and methods

The German Ministry of Health announced this field study programme and selected six regions (Aachen (W1), Dresden (E1), Jena (E2), Marburg (W2), Munich (W3) and Stuttgart (C1)) out of 30 applicants. In non-adjacent regions of Germany, in the period from 1996 to 1998, all women with breast cancer with their place of residence in one of the defined regions (with the exception of C1), were, as far as possible, recruited (Table 1(a)). The data collection was (and still is) carried out at established comprehensive cancer centres (CCCs). These CCCs have been incorporated into medical faculties. For the studies, they attempted to include all hospitals in each region in order to describe healthcare delivery in that area. The healthcare of common tumours is organised decentrally in Germany. Thus, the field studies were observational studies describing and, with the results, optimising healthcare delivery. They were population-based (with the exception of C1) and there was no experimental approach. The data collection varied slightly regarding the method and content. Basic conditions also diverged, partly because of different data protection acts in the regions. In the data analysis of regions W1 and E2, only patients who had given written consent could be considered. In one study region (C1), recruiting was from the hospital-based cancer registry of the cancer treatment centre, independent of the patient's place of residence. Two regions were in the former East Germany (E1 and E2) and their participation allowed the evaluation of healthcare delivery after the re-unification of Germany.

The patients' records were created from independent data submitted by pathologists, gynaecologists and surgeons, and radiotherapists. The centres received the original reports from the respective regional pathology institutes, so that the number of new cases treated in the region was known. With the help of additional data from the clinicians, including the place of residence, reliable incidence rates could be estimated. This cross-referencing also promoted completeness of case ascertainment and a high quality of data. In all regions, the data-set included TNM-category, number of examined and positive lymph nodes, grading and hormone receptor status. As indicators of therapeutic healthcare, the operation procedure, the usage of radiotherapy and adjuvant systemic therapy in node-positive patients were analysed. Each region analysed their own data for the region and for the individual participating hospitals.

Table 1
(a) Demographic characteristics[a]

Characteristics	Aachen W1	Dresden E1	Jena E2	Marburg W2	Munich W3	Stuttgart C1
Population (inhabitants in millions)	1	1.3	1	0.25	2.3	Patients of the cancer registry
Age-standardised incidence rate (world standard) (invasive female breast cancer)	71.0	55.4	66.9	69.1	75.2	Not population-based

(b) Study parameters in the six regions

Characteristics	W1	E1	E2	W2	W3	C1
Study start date	1/96	1/96	1/96	4/96	4/96	12/95
Study end date	12/97	12/97	12/97	3/98	3/98	11/97
Recruited patients (total 9210)	1344	1307	1109	389	3320	1741
Evaluated patients (total 8661)	1124	1307	934	389	3166	1741
Number of participating hospitals	32	18	11	3	50	14
Number of participating pathology laboratories	4	9	7	2	14	3
Patient's written consent required	Yes	No	Yes	No	No	No

[a] Regions in West Germany: W1, W2, W3; incidence rates computed from study data; regions in former East Germany: E1, E2; incidence rates computed from routine statistics (GKR, Gemeinsame Krebsregister der Neuen Bundesländer, co-operation of the cancer registries of the five new states in Germany); clinical-based register in West Germany: C1. All regions mainly have service industries.

For the comparative evaluation, common methods were provided by the authors in that, among other things, categorisation and the management of missing values were given. Differences between regions in the aggregated data were assessed with Chi square tests. Separate logistic regression analyses were used to evaluate the data for regions E2 and W3 for the indications for surgical therapy (dependent variable breast-conserving therapy (BCT)/mastectomy). The aim of these two multivariate analyses was to clarify whether individual hospitals had an influence on the surgical treatment when controlling for tumour characteristics. These two regions were selected because the intraductal component and multiple tumour growth were additionally documented as important factors for the surgical procedure and these factors could also be compared between the two data-sets. The modelling was conducted with the covariates age, pT category, grading, histological criteria, i.e. intraductal component and multiple tumour growth, as well as hospitals with 35 or more patients as the independent factor 'hospital'. The cut-off point of 35 was chosen to provide sufficient numbers for the analysis. The final model was established through backward selection at the 5% level.

3. Results

Table 1(a) and (b) show the demographic characteristics of the regions and the recruiting period, the number of patients recruited and evaluated for the six regions, as well as the number of the participating hospitals and pathology laboratories.

In Table 2, the age distribution and the distribution of the classic prognostic factors are presented. Approximately 50% of patients were aged 50–69 years. For three regions (E2, W2, W3), significant differences in the distribution of the pT category could be seen with shifts from pT2 to pT1. Differences were also revealed in the number of lymph nodes examined (data not shown) and the grading, which were examined by two to 14 different pathological institutions, depending upon the region. The proportion of patients with a negative receptor status varied from 14% (C1) to 20.9% (E1).

Table 2
Age distribution and classical prognostic factors

Characteristics		W1	E1	E2	W2	W3	C1
Age* (years)							
<50	%	21.8	17.1	20.6	25.2	20.6	27.0
50–69	%	49.3	50.2	49.5	47.3	51.8	51.8
$\geqslant 70$	%	28.9	32.7	29.9	27.5	27.6	21.3
pT category*	%[a]	99.1	95.9	96.8	100	89.5	96.9
pTis	%	3.9	3.4	6.7	6.2	5.2	2.3
pT1	%	40.8	46.4	52.1	52.4	51.9	46
pT2	%	39.5	36.6	30.7	30.6	32.8	39.2
pT3	%	4.8	5.1	4.2	2.1	4.9	4.3
pT4	%	11.0	8.5	6.2	8.7	5.2	8.2
Lymph node-status (pN-positive)**	%	36.0	36.6	39.6	37.8	37.4	35.2
Positive lymph nodes (LN)*	%[a,b]	89.9	73.1	80.8	90.2	77.4	89.3
0 LN (pN0)	%	61.0	62.9	60.2	58.1	58.0	62.4
1–3 LN	%	18.2	20.6	19.2	21.6	22.7	19.9
4–10 LN	%	13.9	11.7	11.5	11.7	11.6	10.4
>10 LN	%	7.1	4.8	9.1	8.6	7.7	7.3
UICC-stages*	%	90.4	95.9	95.6	100	89.5	94.4
Stage 0	%	3.7	3.4	6.6	5.7	5.1	2.1
Stage I	%	31.8	35.3	38.3	36.2	37.9	36.6
Stage II A	%	29.5	30.4	25.2	29.0	27.8	29.6
Stage II B	%	17.2	16.1	15.9	13.4	15.0	17.6
Stage III A	%	3.8	3.9	3.5	1.8	5.1	4.6
Stage III B	%	8.4	7.3	5.6	8.2	3.6	6.6
Stage IV	%	5.6	3.6	4.9	5.7	5.5	2.9
Grading (G)*	%[a]	94.9	84.4	88.9	93.8	86.1	93.6
G1	%	5.9	12.7	17.3	6.0	11.7	8.9
G2	%	57.5	58.8	46.0	46.1	51.3	65.3
G3	%	36.6	28.5	36.6	47.7	37.0	25.8
Hormone receptor status (HR)*	%[a]	75.5	76.7	88.9	99.2	84.2	88.8
HR-positive	%	80.7	79.1	79.4	83.4	84.7	86.0
HR-negative	%	19.3	20.9	20.6	16.6	15.3	14.0

UICC, Union Internationale Contre le Cancer. *$P<0.001$, **$P>0.05$, non-significant (n.s.).
[a] Percentage of the total sample with valid data.
[b] The missing values include pNX cases.

The quality of the primary medical treatment is described in three ways: the operation procedure, (BCT versus mastectomy), the implementation of local radiotherapy and/or of adjuvant systemic therapy.

Table 3 shows the proportion of BCT according to pT-category. For *in situ* carcinoma, pT1 and pT2 tumours, the proportion of BCT varied between the regions, the highest rate was approximately 20–25% higher than the lowest rate. The overall rate of BCT depended strongly on the stage of distribution and, among other factors, on the individual decision of the patient. BCT at an advanced age was undertaken less often in all of the regions.

In the regions E2 and W3, two additional important tumour characteristics were recorded; the extent of the intraductal components and multifocal tumour growths. For these two regions, multivariate analyses were conducted (Table 4). The univariate view of the data was confirmed: in E2 the mastectomy rate was generally higher than in W3 for tumours >2 cm and for patients 70 years and over. The odds ratio (OR) for pT2 in E2 was 5.0 versus 2.2 in W3 and, in the age group

Table 3
Proportion of breast-conserving therapy according to pT category

Breast-conserving therapy (BCT) according to pT category		W1	E1	E2	W2	W3	C1
For all age groups	%[a]	89.9	94.3	96.7	100	88.9	96.7
pTis**	%	59.1	64.3	52.5	43.5	59.9	37.8
pT1*	%	66.7	57.9	58.4	51.7	70.0	71.5
pT2*	%	34.1	25.9	30.9	31.1	51.1	41.8
pT3**	%	7.4	4.7	0	0	13.1	5.6
pT4**	%	10.7	15.2	5.4	0	13.8	11.0
All pT	%	44.6	40.1	44.0	39.3	57.7	51.3
For patients $\geqslant 70$ years							
pT1*	%	57.1	35.7	42.5	43.6	58.2	58.0
pT2*	%	23.2	14.8	22.0	43.6	39.1	20.0
All pT	%	31.1	23.1	32.1	33.6	43.6	34.1

*$P<0.001$; **$P>0.05$; non-significant (n.s.).
[a] Percentage of the total sample with data about the operation procedure and pT category.

Table 4
Logistic regression of mastectomy rate in comparison with breast-conserving therapy (BCT) for the two regions Jena and Munich

Factors	E2	W3
	%[a] = 59.2	%[a] = 64.2
	Dependent variable: mastectomy Odds ratio (95% CI)	Dependent variable: mastectomy Odds ratio (95% CI)
Age (years)		
<50 years	1 (reference)	1 (reference)
50–69 years	1.6 (0.9–2.9)	1.1 (0.8–1.5)
$\geqslant 70$ years	4.0 (2.1–7.4)	2.5 (1.8–3.5)
pT category		
pT1	1 (reference)	1 (reference)
pT2	5.0 (3.1–8.0)	2.2 (1.7–2.8)
pT3	49.0 (5.9–407.8)	22.9 (12.5–42.0)
pT4	66.2 (8.4–522.2)	19.4 (9.6–39.2)
Grading (G)		
G1	0.8 (0.4–1.4)	0.4 (0.3–0.6)
G2	1 (reference)	1 (reference)
G3	0.9 (0.5–1.5)	1.2 (0.9–1.5)
Histological criteria		
Extensive or predominant intraductal component	2.6 (1.1–6.1)	3.9 (2.7–5.6)
Multi-focal	9.5 (4.4–20.2)	9.2 (6.8–12.6)
Hospitals		
Hospitals not significantly different to the referent group	1–2.7 (0.6–8.3) (3 hospitals)	0.5- 2.8 (0.2- 8.6) (8 hospitals)
Hospitals significantly different to the referent group	3.2–9.5 (1.4–30.2) (3 hospitals)	3.3–32.3 (1.1–118.0) (12 hospitals)

95% CI, 95% Confidence Interval.
[a] Percentage of patients with data about all covariables, from the biggest hospitals in each region, defined as hospitals and/or departments with 35 or more treated patients (i.e. six hospitals in Jena and 20 in Munich).

over 70 years, was 4.0 in E2 versus 2.5 in W3. The influence of histological factors was almost comparable. The independent factor 'hospital' was significant in both regions.

As a quality of care indicator, radiotherapy after BCT was evaluated. The use of radiotherapy after BCT was very high, particularly for patients under the age of 70 years, and showed only a small variability between the regions (Table 5). The use of radiotherapy after mastectomy varied between 10.4 and 32.2%.

Table 6 describes the use of systemic therapy for breast cancer patients with a positive lymph node status. For pre-menopausal patients, who constitute approximately 20% of all breast cancer patients, the recommendation of St. Gallen (1995 and 1998) was for chemotherapy treatment and since 1998, tamoxifen has also been used in addition for women with a positive receptor status. In this sub-group, which only had a few cases, compliance with the guideline was high. The percentage of no therapy and hormonal therapy alone was 25.3% in W1, 16.3% in W3 and under 10% in the other regions. For those patients with a negative receptor status, one sees a similar picture. In post-menopausal patients, compliance with the guidelines was less evident. For patients with a positive receptor status, the

Table 5
Proportion receiving adjuvant radiotherapy (breast or chest wall) according to the operation procedure

Radiotherapy according to operation procedure		W1	E1	E2	W2	W3	C1
For all age groups	%[a]	99.1	95.1	96.0	100	93.0	99.0
Breast-conserving therapy**	%	80.6	83.6	84.3	85.0	82.2	82.6
Mastectomy*	%	32.2	10.4	27.4	15.7	23.1	27.6
Any operation	%	53.9	39.8	52.2	41.9	57.2	55.5
For patients $\geqslant 70$ years							
Breast-conserving therapy**	%	63.7	59.6	59.3	61.1	56.5	67.2
Mastectomy*	%	23.9	7.0	22.5	9.8	15.3	15.1
Any operation	%	26.6	19.4	34.9	27.1	33.6	32.7

*$P < 0.001$; **$P > 0.05$; non-significant (n.s.).
[a] Percentage of the total sample with data about the operation procedure and radiotherapy.

Table 6
Systemic therapy according to menopausal and receptor status for patients with positive lymph nodes

Characteristics			W1	E1	E2	W2	W3	C1
Percent of patients with pN-positive[a]		%	25.9	22.7	31.5	37.8	28.3	30.7
Pre-menopausal*								
Receptor-positive (proportion in %)			(20.6)	(13.1)	(13.3)	(19.0)	(21.9)	(26.2)
	No therapy	%	2.2	0	5.1	0	6.6	5.0
(rec. '95)	Chemotherapy (chemo)	%	52.7	84.6	43.6	42.9	74	70.7
	Hormonal therapy (HT)	%	23.1	5.1	2.6	0	9.7	2.9
(rec. '98)	Chemo and HT	%	22.0	10.3	48.7	57.1	9.7	21.5
Pre-menopausal*								
Receptor-negative (proportion in %)			(5.0)	(4.4)	(7.1)	(8.8)	(4.9)	(5.0)
	No therapy	%	9.2	7.7	4.8	0	11.5	3.7
(rec.'95/'98)	Chemotherapy (chemo)	%	63.6	92.3	66.7	69.2	88.6	88.9
	Hormonal therapy (HT)	%	13.6	0	4.8	0	0	0
	Chemo and HT	%	13.6	0	23.8	30.8	0	7.4
Post-menopausal*								
Receptor-positive (proportion in %)								
	No therapy	%	3.2	12.6	13.4	5.4	9.3	16.4
	Chemotherapy (chemo)	%	33.2	31.7	21.0	10.8	20.0	40.4
(rec. '95)	Hormonal therapy (HT)	%	43.0	39.7	42.5	51.6	61.5	30.1
(rec. '98)	Chemo and HT	%	20.6	16.1	23.1	32.2	9.1	13.1
Post-menopausal*								
Receptor-negative (proportion in %)			(11.6)	(15.5)	(16.3)	(8.9)	(11.0)	(10.5)
	No therapy	%	9.8	15.2	8.3	0	20.2	12.5
(rec. '95/'98)	Chemotherapy (chemo)		43.1	52.2	41.7	38.5	56.6	69.6
	Hormonal therapy (HT)	%	31.4	15.2	27.1	15.4	17.2	7.1
	Chemo and HT	%	15.7	17.4	22.9	46.1	6.0	10.7

*$P < 0.001$; **$P > 0.05$, non-significant (n.s.).
[a] Excluded are patients with *in situ* carcinoma, inflammatory cancer or primary metastasisation, with the exception of W2 patients. The recommendations of St. Gallen 1995 and 1998 for systemic therapy are marked as *rec. '95* or *rec. '98* or *rec. '95/'98*.

proportion given chemotherapy alone was relatively high. The number of investigated lymph nodes or participation in the studies should be considered. For postmenopausal women, although hormonal therapy was not standard for those patients with a negative receptor status, it was given remarkably often. However, there were only a few patients in this subgroup.

4. Discussion

The field studies had three goals: firstly, to recruit a population-based cohort of breast cancer patients, secondly, to collect various data on disease and treatment and, thirdly, to make a contribution to quality assurance. The incidence rates (world standard) presented here, from 55.4 to 75.2 (Table 1a), were comparable with other European countries: European Union 68.6; Austria 65.1; Denmark 83.8; Finland 77.1; Germany 70.1; The Netherlands 89.1; Portugal 53.8; Sweden 77.9; United Kingdom 71.6 [7]. For the USA (Surveillance, Epidemiology and End Results (SEER), white, 1997), a world standard of 97.4 has been published [8].

Detailed clinical data (Table 2) were collected for a high percentage of patients in comparison with previous studies [9,10]. The field studies succeeded with this high quality of data in population-based samples due to three reasons: First, almost all of the breast cancer patients were operated on and therefore pathology reports were available. Nevertheless, in a decentralised healthcare system, some clinical data, including data about adjuvant therapy, were not so easily available. Furthermore, until reports from multiple sources are in hand, a good data set cannot be reached. Finally, the collection and processing of these data is dependent on the manpower available, which in this study was funded. Thus, if these requirements are fulfilled, cancer registries may become the only reliable data source for evaluating population healthcare delivery.

The pT distribution showed frequent variations between the subgroups pT1 and pT2, up to around 10% between the regions. It seems there are regional differences in the access to programmes that could help in the early detection of breast cancer. These different distributions could result in a survival difference between regions such as W1 and E2, for example. If we assume, however, an identical 15-year survival for pT1–pT4 as for the region W3 where survival rates are available (for W3: pT1 62%, pT2 41%, pT3 26% and pT4 16%), only a small survival range of 46% (W1) to 50% (E2) would be a consequence of the different pT distributions. The European Network of Cancer Registries (ENCR [7]) estimated for 1996 an age-standardised mortality rate (European standard) of 32.0, comparable to one of our regions (W3: 29.9). Results of approximately 23–25 (Finland, Sweden) require a population-based early detection programme with approximately 70% with pT1, 20% with pT2 and pT3-4 approximately 5% (for each group), figures that are very different from our distributions. The nodal positive results varied between 35.2 and 39.6% and were therefore, in contrast to the pT percentages, fairly homogenous. Grading was an important prognostic factor and is one factor used in the decision-making process for adjuvant therapy. The variability in grading may be caused by the different findings of the pathological departments, as well as variability in the hormone receptor status. Compared with the SEER data [8], the stage distribution showed a smaller percentage of *in situ* carcinoma and stage I patients, which might be due, in part, to the lack of an early detection programme, including mammography, in Germany. Compared with the USA [11,12], where from 1985 to 1995 the incidence of *in situ* carcinoma nearly doubled (from 7.4 to 14.3%) and the incidence of stage I cancers increased approximately 6.8% (from 35.1 to 41.9%), the stage distribution of the six German regions in 1996–1998 is very homogeneous across the regions and corresponds to the USA data from 1985.

Differences in the BCT rates were also observed between the regions (Table 3). Breast conservation is the current standard of care for eligible patients with stage I and II breast cancer, essentially those with pT1 and pT2 cancers [4,13]. Because of the age dependency of the indication for BCT [14–16], data were also presented for patients 70 years and over. In the total group and in the subgroups, significantly different rates were observed. Within the regions in the 70 years and over age group between approximately 10 and 30% more patients were mastectomised. The dependency of the surgical procedure on the tumour size and, in particular, the rise of BCT in the last 15 years [4,17–19] makes the comparison of the available data and the literature more difficult. In addition, overall mastectomy rates [19] and stage-specific aggregated data [4] do not give an adequate picture of the variations in the treatment.

Only a multivariate analysis could show the strong influence of the hospital on the mastectomy rate. For the regions E2 and W3, such an analysis was possible due to the availability of additional data on histological criteria (Table 4). The differences in the BCT rates in advanced tumours and in the elderly observed in the univariate analyses were confirmed. Such a variability can also be found in the literature [20,21]. In the Dartmouth Atlas of Health Care for the USA, the use of mastectomy was declared as highly variable. Mastectomy rates varied between 25% under and 30% over the average in more than 300 hospital referral regions. The variability within a region with 10 or more hospitals was levelled off by aggregation. These results show that quality assurance is a regional task in a decentralised healthcare system. Each hospital should obtain its own results and compare its own data with that from

other hospitals. The therapeutic decisions of a hospital can depend on diverse factors: on 'individual determinants', i.e. on the knowledge and experience of the clinician and on the patients' decisions and social class. Another factor can be described by the question 'do specialists do it better?' [22,23]. A dependency on the hospital workload is also increasingly discussed [24–28], but these results should be interpreted with caution. In one example, a convincing workload effect [27] was no longer apparent in a multivariate analysis after controlling for social class [28]. Despite extensive recommendations for BCT [4], the attitude of the doctor seems to determine the mastectomy rate, particularly in cases of large deviations, more than biological or regional and demographic factors [29,30].

Part of the BCT concept is that these patients also receive local radiotherapy (Table 5). Because there is also a strong dependence on age [31] associated with the decision of whether to give radiotherapy or not, the data of the six regions was additionally shown for those aged 70 years and over. Within the age groups, the percentages of patients given radiotherapy after BCT varied only slightly. For patients under the age of 70 years, it was given in approximately 88% of cases and in approximately 60% of those aged 70 years and over. This also corresponds to the results of the SEER programme from 1985 to 1992 [31]. Thus, there exists a homogenous distribution in the rates of those given radiotherapy after BCT that is not seen after mastectomy.

For adjuvant systemic therapy, the recommendations of St. Gallen were propagated in all regions as the standard treatment [5,6]. The St. Gallen recommendations of 1995 and/or 1998 were practised to differing extents [32], even when age-dependency was taken into account [16]. As an example of compliance with the recommendations for adjuvant systemic therapy, the patients with positive lymph nodes of the six regions was analysed (Table 6). It should be acknowledged that data on systemic therapy are difficult to record and could be underestimated [10]. As for data on the operation or number of patients given radiotherapy, there is clearly a strong dependence of the therapy decision on age. Compliance was better in premenopausal patients. Variations in the adjuvant therapy were not as high as variations in surgical procedure between the regions.

In summary, valid data were acquired and the primary therapy was evaluated in six regions for approximately 10% of annual new cases in Germany. The patients are being followed-up in nearly all of the centres, so that local recurrence and survival rates for the different subgroups will be available. Cancer registration and the evaluation of healthcare are possible, if the necessary infrastructure is funded. At least for breast cancer, the field studies were able to contribute their data to the EUROCARE programme, which assembles survival data from different European countries and analyses them according to standard procedures [1–3]. The evaluation of the quality of health-care delivery [33,34] requires standards [6,35] and the availability of population-based data for the most important quality indicators [36,37]. The quality of the data can still be improved. This will be even more important if other cancers are to be included to create a complete cancer registration by the cancer centres with decreasing personnel. In this way, the implementation of standards for each region and for each hospital can then be shown. Feedback provides a comparative summary of patient care that can be used by the participating hospitals for self-assessment. Continuous monitoring by the cancer registries can show whether the necessary improvements are achieved.

5. The cooperating comprehensive cancer centres (CCC) and the equally contributing coworkers

CCC Aachen: E. Breuer, A. Gransow-Göv, G. Kroll, C. Goecke, Ch. Mittermayer

CCC Dresden: K. Strelocke, E. Roth, A. Niedostatek, M. Rößler, H. Kunath

CCC Jena: G. Nagel, B. Röhrig, H. Hoyer, D. Katenkamp

CCC Marburg:

Department of Gynecology: U.-S. Albert, K.-D. Schulz

Institute of Theoretical Surgery: M. Koller, W. Lorenz

CCC Munich: J. Engel, J. Baumert, H. Kalies, H. Sauer, D. Hölzel

CCC Stuttgart/Tübingen:

OSP Stuttgart: U. Handte-Daub, C. Regelmann, F. Brinkmann, E. Heidemann

IMI Tübingen: C. Meisner, C. Hügel, H.K. Selbmann

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