Survival outcome of care by specialist surgeons in breast cancer: a study of 3786 patients in the west of Scotland

Charles R Gillis, David J Hole

Abstract

Objective—To compare survival outcome for patients with breast cancer cared for by specialist and non-specialist surgeons in a geographically defined area.

Design—Retrospective study of all female patients aged under 75 years in the area treated between 1980 and June 1988 (before breast screening began). Patients were identified from the cancer registry and from pathology records of all hospitals in the area. Specialist surgeons were identified by one author. All other surgeons caring for patients from the area were considered non-specialists.

Setting—A geographically defined population in urban west of Scotland.

Subjects—3786 patients with histologically verified breast cancer operated on between 1 January 1980 and 30 June 1988 and followed to 31 December 1993.

Main outcome measures—Five and 10 year survival rates for specialists and non-specialists; relative hazard ratios derived from Cox's proportional hazards model adjusted for prognostic factors—age, socioeconomic status, tumour size, and nodal involvement.

Results—The five year survival rate was 9% higher and the 10 year survival 8% higher for patients cared for by specialist surgeons. A reduction in risk of dying of 16% (95% confidence interval 6% to 25%) was found after adjustment for age, tumour size, socioeconomic status, and nodal involvement. The benefit of specialist care was apparent for all age groups, for small and large tumours, and for tumours that did and did not affect the nodes and was consistent across all socioeconomic categories.

Conclusions—Survival differences of the magnitude demonstrated have implications for the provision of services for the treatment of women with breast cancer. There is a need to improve equity in the treatment of breast cancer.

Introduction

Accounting for variations in survival outcome in cancer treatment could lead to improvements in survival. The first stage is an accurate definition of the problem. Breast cancer affects one in 12 women in the United Kingdom. It is more a disease of the affluent than the deprived.¹ We have shown that the affluent survive better even though the distribution of stage at presentation is the same in all socioeconomic categories.² This present study arose from an attempt to investigate one aspect of this finding: whether the better survival observed in the affluent relates more to their treatment than to factors relating to socioeconomic status. We had information on patient identification, social class, stage of disease, and survival. We knew surgeons considered to have a

specialist interest in breast cancer, thus identification of survival outcomes in relation to specialist and non-specialist care seemed the way forward.

Patients and methods

We identified all patients with breast cancer aged under 75 years whose disease was recorded in the west of Scotland cancer registry as histologically verified and who lived in a geographically defined area between 1 January 1980 and 30 June 1988 (when the United Kingdom national breast screening programme began locally).

The study population was defined by identifying the postcode sectors that formed the natural catchment areas for each of 10 hospitals concerned, which remain anonymous for reasons of confidentiality.

This procedure produced a population base of 1.5 million and 3786 histologically verified cases of breast cancer in women. We were unable to find the pathology records for only 2% of cases. Cases which were not histologically verified were excluded from the study. Of patients with breast cancer within the study area, 89% or more were treated at their local hospital. The pathology departments of all hospitals in the study area gave access to their data on tumour size and nodal involvement. Histological grade³ was available from only two of the 10 hospitals studied and applied to 412 patients from these.

The specialist surgeons were chosen by local perception. Over the time period of the study they each demonstrated the following indicators of specialist interest. These were setting up of a dedicated breast clinic; a defined association with pathologists and oncologists; organising and facilitating clinical trials; and maintaining a separate record of all patients with breast cancer in their care.

They kindly supplied the names of all patients in the care of their teams within the time period 1980 to mid-1988. A total of 918 patients were categorised in this way. The 2868 remaining patients were considered to have received non-specialist care. An independent scrutiny of surgeons' names on the pathology reports confirmed that the names of the patients supplied by the specialists were accurate and complete. We also confirmed that the remaining patients were indeed cared for by those categorised as non-specialists. The names of the non-specialists in the hospitals studied were not abstracted. Survival of all patients up to the end of 1993 was ascertained from death certificates provided by the registrar general (Scotland) to the cancer registration system. Information on socioeconomic status was derived for the postcode sectors included in the study area by using the Carstairs deprivation index.⁴

We carried out an initial analysis of survival outcome with adjustment for prognostic factors—age (entered as a continuous variable), deprivation category (as

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three separate categories), and tumour size (as three separate categories) but not nodal involvement—using Cox's proportional hazards model.⁵ An additional analysis was carried out that included nodal involvement as a prognostic factor with the categories node negative (based on four or more nodes sampled), node negative (based on one to three nodes sampled), and node positive. This took account of concern about

the comparability of nodal information for patients cared for by specialists and non-specialists. Tumour size and the state of the nodes were used in preference to conventional staging as they provide a more precise measure of prognosis for an individual patient.⁶

Results

Table 1 shows the five and 10 year survival rates together with the relative hazard ratios for specialist: non-specialist care. Survival of all patients aged under 75 years was 9% higher at five years and 8% higher at 10 years among those cared for by specialists compared with non-specialists. When the results were adjusted for the prognostic factors of age, deprivation category, and tumour size, a 17% reduction in the risk of dying (relative hazard ratio 0.83) was apparent for those cared for by specialist surgeons. These results remained virtually the same (relative hazard ratio 0.84) when nodal involvement was included as an additional prognostic factor.

Table 2 shows five year survival rates by tumour size, extent of nodal involvement, nodal status, and number of affected nodes found in patients cared for by specialist and non-specialist surgeons. The benefit of specialist care was apparent regardless of the size of the tumour, the extent of nodal involvement, nodal status, and the number of affected nodes found. This benefit was most obvious among the intermediate group of patients—that is, those with tumour sizes between 20 and 39 mm and those with affected nodes who had fewer than half the nodes affected. Those patients with information missing on both tumour size and nodal status were a group with a poor prognosis whether cared for by specialists or non-specialists.

Table 3 shows improvements in survival at all ages for those treated by specialist surgeons. The most clear difference occurred among those aged 50 to 64 years and the smallest among those between 65 and 74 years. The differences in survival were also consistent across the deprivation categories. The affluent were more likely to survive five years than the deprived, whether they were treated by a specialist or a non-specialist.

Table 4 shows the distribution of prognostic factors examined among patients cared for by specialists and non-specialists. The distribution of tumour size, where stated, was the same for specialists and non-specialists. Although specialists treated a slightly higher proportion of patients whose nodes were unaffected, when node status was reported there was a difference in the reporting, this being unavailable in 17% of patients cared for by specialists and 39% of those cared for by non-specialists. There was no significant trend in the proportion of cases from different socioeconomic groups seen by specialists and non-specialists.

Table 5 shows the number of nodes sampled for those women who were cared for by specialists and those cared for by non-specialists. Only 10% of women cared for by specialists had three or fewer nodes sampled whereas this figure rose to 38% for those cared for by non-specialists. These figures remained constant over the time period of the study.

Discussion

The main finding in this paper is that in a geographically defined population (1.5 million men and women) the survival advantage of specialist care was 9% better at five years and 8% better at 10 years. This benefit was clear for large as well as small tumours, for patients with no nodes affected as well as extensive involvement, for each age group studied, and for the deprived as well as the affluent. The size of the improvement in survival is of the same order of magnitude as that found for systemic treatment in early

Table 1—Survival in women with breast cancer according to whether they were treated by surgeon with specialist interest

Detail	Surgeons with specialist interest	Surgeons with no specialist interest	All patients
No of women	918	2868	3786
Percentage (SE) surviving at 5 years	67% (1.6%)	58% (0.9%)	60% (0.8%)
Percentage (SE) surviving at 10 years	49% (1.9%)	41% (1.0%)	43% (0.9%)
Relative hazard ratio (95% confidence interval) adjusted for age, deprivation, and tumour size	0.83 (0.74 to 0.92)	1.0 (baseline)	
Relative hazard ratio (95% confidence interval) adjusted for age, deprivation, tumour size, and nodal involvement	0.84 (0.75 to 0.94)	1.0 (baseline)	

Table 2—Survival at five years in women with breast cancer according to size of tumour, nodal involvement, and type of care

Factor	Patients cared for by surgeons with a specialist interest		Patients cared for by surgeons with no specialist interest		% Difference in 5 year survival
	No	% Surviving 5 years	No	% Surviving 5 years	
Tumour size (mm):					
< 20	214	79	611	71	8
20-39	335	69	950	58	11
≥ 40	166	49	428	45	4
Node involvement (%):					
0	378	81	809	77	4
1-50	213	71	360	61	10
51-100	168	42	535	37	5
> 0 (inadequately defined)	5	60	65	42	*
Nodal status:					
Negative	378	81	809	77	4
Positive	386	58	960	47	11
No of affected nodes:					
1	119	73	322	60	13
2	67	67	176	48	19
3	40	63	116	49	14
4-7	89	47	178	34	13
≥ 8	69	36	81	31	5
Groups with information missing:					
Size only missing	120	75	339	66	9
Nodes only missing	71	56	559	60	-4
Both missing	83	49	540	47	2

*Number of cases too small to obtain reliable estimate.

Table 3—Survival at five years in women with breast cancer according to age group, deprivation category, and type of care

Factor	Patients cared for by surgeons with a specialist interest		Patients cared for by surgeons with no specialist interest		% Difference in 5 year survival
	No	% Surviving 5 years	No	% Surviving 5 years	
Age group (years):					
< 50	269	72	795	64	8
50-64	427	68	1184	57	11
65-74	222	59	889	54	5
Category of deprivation*:					
1, 2 (Affluent)	231	72	554	64	8
3, 4, 5 (Intermediate)	345	66	1365	58	8
6, 7 (Deprived)	342	65	949	54	11

*Carstairs deprivation index.⁴

Table 4—Pathological and demographic characteristics of patients with breast cancer cared for by specialists and non-specialists. Figures are numbers (percentages) of patients

Factor	Patients cared for by specialists	Patients cared for by non-specialists
Tumour size (mm):		
< 20	214 (30)	611 (31)
20-39	335 (47)	950 (48)
≥ 40	166 (23)	428 (22)
Nodal status:		
Negative	378 (49)	809 (46)
Positive	386 (51)	958 (54)
Histological grade:		
1	53 (19)	26 (19)
2	112 (41)	57 (41)
3	109 (40)	55 (40)
Missing information on tumour size/nodal status:		
Both tumour size and nodal status absent	83 (9)	540 (19)
Tumour size only missing	120 (13)	339 (12)
Nodal status only missing	71 (8)	559 (20)
Age group (years):		
< 50	269 (29)	795 (28)
50-64	427 (47)	1184 (41)
65-74	222 (24)	889 (31)
Deprivation category*:		
Affluent (1, 2)	231 (25)	554 (19)
Intermediate (3, 4, 5)	345 (38)	1365 (48)
Deprived (6, 7)	342 (37)	949 (33)

*Carstairs deprivation index.⁴

Table 5—Number of nodes sampled by specialists and non-specialists. Figures are numbers (percentages) of patients

No of nodes sampled	Surgeons with a specialist interest	Surgeons with no specialist interest
1-3	76 (10)	574 (38)
4-6	193 (26)	483 (32)
7-9	214 (29)	279 (18)
10-14	178 (24)	151 (10)
15-19	55 (7)	26 (2)
≥ 20	23 (3)	9 (1)

breast cancer.⁷ We do not have evidence on reasons for the differences we have observed as information on the methods of treatment used was not obtained. The results of our own previous studies^{8,9} and others^{10,11} in various cancers suggest that the benefit associated with care provided by specialists may be due not only to surgery but to the use of additional therapies.

The strength of this study is that it is population based, comprising virtually all (98%) histologically verified cases in a geographically defined area, and is not subject to the biases associated with a case series based on one or a group of hospitals. This study has been conducted on a confidential basis. We therefore cannot name the hospitals studied, the specialist surgeons, nor the catchment areas. Also, there has been a considerable change in surgical staff since this study closed in June 1988.

The main problem in interpreting our results is ensuring that cases cared for by specialists and non-specialists are comparable. The personal and pathological prognostic factors available to us in patients with breast cancer were age, socioeconomic status, tumour size, extent of nodal involvement, and histological grade. There was no difference in the distribution of tumour size among patients seen by specialists and non-specialists. Comparison of the distribution of nodal involvement between specialists and non-specialists presented two problems. Firstly, information on nodal status was less precisely recorded

and more often missing among patients cared for by non-specialists. Patients with data on both nodal status and tumour size missing had a poorer prognosis (five year survival rate 48%). Some of these presumably had advanced disease so had a diagnostic biopsy only. The information was unavailable to be recorded for these cases. Secondly, non-specialists were more likely to sample fewer nodes (table 5). This meant there was an increased likelihood of patients cared for by non-specialists being classified node negative when, had more nodes been sampled, they may have been node positive. Indeed, an analysis of survival among node negative patients, which included the number of nodes sampled as a predictive factor of mortality, showed an increased risk of dying when fewer than four nodes were sampled. Thus, two survival analyses, one with and one without nodal involvement as a prognostic factor, were carried out (table 1). The two analyses gave virtually identical answers for the magnitude of the benefit (relative hazard ratio 0.83 when nodal information was ignored and 0.84 when it was included). Thus our method of classifying nodal involvement as node negative (four or more nodes sampled), node negative (fewer than four nodes sampled), and node positive was a reasonable reflection of the distribution of nodal status.

Information on histological grade was available for only 412 patients. Its distribution was the same among patients cared for by specialists and non-specialists. Analysis of survival that included grade in these patients made no change to the size of the difference observed between specialists and non-specialists.

No data on other pathological prognostic factors were routinely collected over the time period of the study. There were no significant differences in the personal prognostic factors (age, socioeconomic status) of patients cared for by specialists and non-specialists. Thus, the benefit associated with specialist care was likely to be a true reflection of a better level of care provided by specialists rather than a reflection of the type of patients being seen by specialists.

A case has been made by the King's Fund consensus development conference that management of women with breast cancer should be carried out through specialist units,¹² although there was no direct evidence then, or since, that survival was improved. Several studies have examined outcome in relation to other factors such as type of hospital,^{10,11} volume of patients,¹³ and use of chemotherapy^{13,14} and have observed a survival advantage associated with the more "specialist" approach (that is, treatment at a teaching hospital, larger workload, and greater use of adjuvant therapy). We believe that this paper is the first attempt to measure directly the benefit of being cared for by specialists.

How do we define specialist? This report is of a retrospective study based on cases diagnosed between 1980 and mid-1988 when specialisation was not an issue. It is difficult now to apply strict criteria for the definition of what then constituted a specialist because the pattern of care itself was also changing over the time period. The most important point to stress is that the specialists in this study were chosen without prior knowledge of the survival outcome of patients in their care but their special interest in breast cancer was known. In retrospect, specialist interest was characterised by their setting up dedicated breast clinics, having a defined association with pathologists and oncologists, and organising and facilitating clinical trials as well as maintaining a separate records' system of all breast cancer cases in their unit's care. Some evidence of the nature of the specialist approach lay in the complete correspondence of the specialists' own records and the relevant pathology records in accurately defining their own cases. Not all patients in the specialists' care group

Key messages

- Patients with breast cancer have 9% better survival at five years and 8% better survival at 10 years when cared for by specialist surgeons
- This finding is not a consequence of case mix or selective referral
- The maximum survival benefit for patients was seen in those aged 50-64 years and applied across all socioeconomic groups
- The findings could have implications for policies in cancer treatment and for purchasing cancer services

were operated on by the specialists themselves, which may indicate that training of junior staff by specialists is important.

We estimate specialist care could have improved survival over the nine year period of the study by 6.8 percentage points (specialists cared for 24.2% of the patients). This means an additional 253 patients would have survived five years in the study area, which would translate to over 850 patients in Scotland and many times that number in the United Kingdom as a whole if the same level of benefit occurred.

This study points to there being a substantial survival benefit for patients cared for by specialists. Thus we believe that future care of patients with breast cancer should be provided through specialist units. The advent of breast cancer screening has altered referral patterns but only for those between the ages of 50 and 64 years who are detected by screening. More cases of breast cancer (all ages) occur outside the

screening programme than within it. Thus, the equitable provision of specialist services for patients with breast cancer presents a challenge for the health service. If our results can be reproduced in other settings the next step is to define the components of specialist care with greater precision and to relate these to outcome.

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Prevention of respiratory complications after abdominal surgery: a randomised clinical trial

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Abstract

Objective—To evaluate the prevention of respiratory complications after abdominal surgery by a comparison of a global policy of incentive spirometry with a regimen consisting of deep breathing exercises for low risk patients and incentive spirometry plus physiotherapy for high risk patients.

Design—Stratified randomised trial.

Setting—General surgical service of an urban teaching hospital.

Patients—456 patients undergoing abdominal surgery. Patients less than 60 years of age with an American Society of Anesthesia classification of 1 were considered to be at low risk.

Outcome measures—Respiratory complications were defined as clinical features consistent with collapse or consolidation, a temperature above 38°C, plus either confirmatory chest radiology or positive results on sputum microbiology. We also recorded the time that staff devoted to prophylactic respiratory therapy.

Results—There was good baseline equivalence between the groups. The incidence of respiratory complications was 15% (35/231) for patients in the incentive spirometry group and 12% (28/225) for patients in the mixed therapy group ($P=0.40$; 95% confidence interval -3.6% to 9.0%). It required similar amounts of staff time to provide incentive

spirometry and deep breathing exercises for low risk patients. The inclusion of physiotherapy for high risk patients, however, resulted in the utilisation of an extra 30 minutes of staff time per patient.

Conclusions—When the use of resources is taken into account, the most efficient regimen of prophylaxis against respiratory complications after abdominal surgery is deep breathing exercises for low risk patients and incentive spirometry for high risk patients.

Introduction

Chest therapy after surgery is directed towards maximal inspiration in an attempt to prevent overt atelectasis and allow for the early re-expansion of collapsed alveoli. In a previous clinical trial we demonstrated equivalence when we compared incentive spirometry with physiotherapy for patients undergoing abdominal surgery.¹ Adoption of incentive spirometry as a global method of prophylaxis, however, raises concerns that high risk patients may be receiving inadequate treatment and that important resources are being wasted on low risk patients. The objective of this trial was to evaluate the prevention of respiratory complications by comparing a global policy of incentive spirometry with a regimen consisting of deep breathing exercises for low risk patients and

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