

Shorter hospital stays for breast cancer

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Abstract

Objectives

This article examines trends in and factors influencing the length of stay for female breast cancer patients who were hospitalized between 1981 and 2000.

Data sources

The hospital data are from the Hospital Morbidity Database and the Health Person-oriented Information Database, both maintained by Statistics Canada. Data on new cases of breast cancer are from the Canadian Cancer Registry and the National Cancer Incidence Reporting System.

Analytical techniques

Descriptive analyses present length of stay for all hospital admissions with a primary diagnosis of breast cancer, by four-year period and by the patient's age, cancer stage, comorbid conditions and surgical procedures. Logistic regression is used to examine associations between these factors and length of stay.

Main results

Since the early 1980s, the average length of stay in hospital for female breast cancer has fallen from 15.1 to 4.5 days. Declines occurred regardless of age group, cancer stage, procedure and comorbid conditions. Average stays first began to fall for less serious cases, but were eventually apparent for even the most serious.

Key words

mastectomy, breast-conserving surgery, comorbidity

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Over the last two decades, the incidence of female breast cancer—the number of new cases diagnosed each year—has risen.¹ Yet when health care resources allocated to breast cancer are measured in annual hospital days, a consistent and considerable decline is evident. This examination of 20 years of breast cancer hospitalization data suggests that the decrease was largely implemented through a reduction in breast cancer patients' average length of stay. Since length of stay is key in determining hospital use,² this decrease in the use of hospital resources, which coincided with an apparent increase in the demand for treatment for breast cancer, may have implications for health care planning.

With information from Statistics Canada's Hospital Morbidity Database, this article traces trends in length of stay for female breast cancer patients between 1981 and 2000, identifies determinants of length of stay, and examines whether the importance of these determinants changed over the period (see *Methods and Definitions*). Based on data for 1994 to 2000, 60-day readmission rates for women who had a mastectomy or breast-conserving surgery are also presented.

Methods

Data sources

The data are from the Hospital Morbidity Database, which is maintained by Statistics Canada. This database contains records for all in-patient hospitalizations in each province. At the time of discharge, hospitals complete a discharge summary for each hospital stay. In this analysis, these records were accumulated for fiscal years 1981/82 to 2000/01 (April 1, 1981 to March 31, 2001) (Appendix Table A). For readability, fiscal years are referred to as single years; for example, fiscal year April 1, 1981 to March 31, 1982 is 1981.

Some results are based on data from the Health Person-oriented Information Database, which allow analysis of records for individual patients. These data are available beginning in 1994/95.

Data on new cases of breast cancer are from the Canadian Cancer Registry and its predecessor, the National Cancer Incidence Reporting System.

Analytical techniques

The analysis includes all in-patient hospital admissions with a primary diagnosis of breast cancer, regardless of the type of treatment or surgery patients received. All hospital visits with a primary diagnosis of breast cancer, based on the *International Classification of Diseases, Ninth Revision* (ICD-9),³ were selected. These codes were also used to categorize admissions by breast cancer stage: in-situ, localized, regional or distant.

The descriptive analyses are presented as frequencies and percentages. Mean length of stay was calculated by dividing the total number of days that women admitted for breast cancer spent in hospital by the number of admissions. Because a small proportion of hospital stays were very long (sometimes several years), length of stay was capped at 365 days.

Except for the rehospitalization data, the unit of analysis is hospital admissions rather than individuals, so women hospitalized more than once in a year are counted separately each time.

Using logistic regression models, the effect of selected variables on length of stay was estimated. Length of stay was dichotomized at the median (lower than/equal to or higher than) so that it could be used as a categorical rather than continuous variable.⁴ For each variable, the category associated with the shorter length of stay was designated as the reference group.

The time that breast cancer patients spend in hospital is affected by the presence of other medical conditions, even when those

conditions are unrelated to breast cancer.⁵ To control for comorbidity in this analysis, the Charlson Index was used.⁶⁻⁹ This index assigns a value to each condition according to severity. The values are then accumulated to produce a total score.

Limitations

The analysis is limited by the data available from the Hospital Morbidity Database and the Health Person-oriented Information Database, both of which are based on administrative data and consist of relatively few variables. For example, cancer stages for this study were derived from ICD-9 diagnostic coding, although the more precise staging done for cancer clinic visits would have been preferable. If breast cancer was not the primary diagnosis, but was recorded in another field, that record would have been excluded from this study. However, it is not always possible to disentangle the relationships between diagnoses (for example, between a metastatic tumour and another primary cancer). As well, hospital records do not contain complete data on co-morbid conditions. Information is recorded only for conditions that pertain to the care delivered (and billed for) during a patient's hospital stay.

The lack of information about day surgery is a major limitation of this analysis. Over the last decade, a growing proportion of breast-conserving surgery has been performed as day surgery,¹⁰ and in some places, this is even occurring for mastectomies.¹¹ Consequently, the results of this analysis are likely skewed, since presumably, the least severe and least complex cases are selected for day surgery, while the in-hospital cases may be expected to have a different case-mix. However, from the perspective of resources allocated to hospital inpatients, the results remain valid.

Information about many other variables that can affect length of stay was not available: for instance, the supply of acute care hospital beds, the availability of alternate facilities for the most serious cases, and staffing levels. Local variations in access to services that might affect stays, such as home care, could not be taken into account. Nor was information available about clinical practice styles, which can vary from physician to physician, from hospital to hospital, and from region to region. And factors relating to the efficiency of running a hospital,¹² such as admission and discharge procedures, could not be considered.

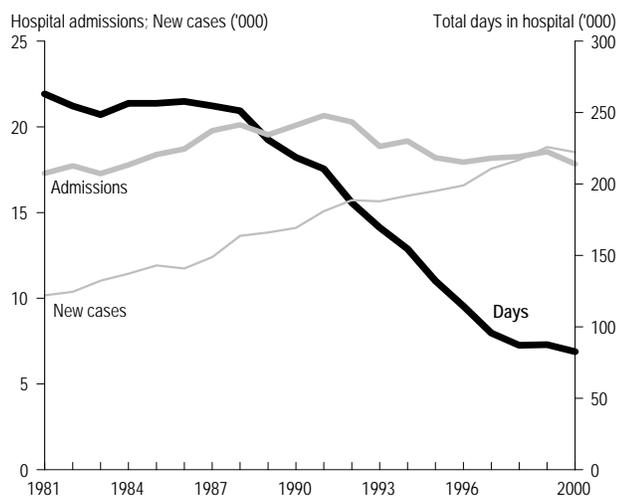
Person-linked information is available only from 1994/95, so readmission rates could not be calculated for the same period as the rest of the study (from 1981/82).

Shorter stays/Fewer days

Between 1981 and 2000, the number of new breast cancer cases diagnosed each year almost doubled, rising from 10,175 to 18,523 (Chart 1). The number of hospital admissions that were attributable to breast cancer rose during the first 10 years of this period, but then levelled off. In the 1980s, the annual number of hospital admissions for breast cancer exceeded the annual number of new cases by about 50%. By 2000, new cases of breast cancer slightly outnumbered hospital admissions for the disease.

The two decades from 1981 through 2000 saw a total of 388,146 hospital admissions with a primary diagnosis of breast cancer; together, these admissions accounted for 3.87 million hospital days. The admissions were distributed relatively equally over the 20 years, with each four-year period representing about 20% of the total (Table 1). The distribution of days was much less even: the earliest period, 1981-1984, accounted for 27% of the total number of hospital days, while the most recent, 1997-2000, represented just 9%. The difference between the distribution of hospital admissions and hospital days is essentially an effect of a decline in breast cancer patients' average length of stay, which

Chart 1
Annual number of hospital admissions, days in hospital and new cases, breast cancer, Canada, 1981 to 2000



Data sources: Hospital Morbidity Database, 1981/82 to 2000/01; National Cancer Incidence Reporting System, 1981 to 1991; Canadian Cancer Registry, 1992 to 2000

Table 1
Percentage distribution of hospital admissions and hospital days for breast cancer,[†] Canada, by four-year period, 1981-1984 to 1997-2000

	Admissions	Days
Total 1981-2000 (number)	388,146	3,865,730
	%	%
	100.0	100.0
1981-1984	18.2	26.0
1985-1988	20.2	26.0
1989-1992	21.5	22.3
1993-1996	20.1	15.1
1997-2000	20.0	9.4

Data source: Hospital Morbidity Database, 1981/82 to 2000/01

Note: Because of rounding, detail may not add to total

[†] Primary diagnosis

fell from 14.5 days in the first period to 4.7 days in the last (Table 2).

Of course, during these two decades, the average length of stay for all causes of hospitalization dropped as advancements in surgical techniques and a general move toward day surgery reduced the need for prolonged hospital care. Nonetheless, the decline for breast cancer patients was much steeper than the decline in average length of stay for all causes combined, which fell from around 11.5 days to just under 9 days.

This comparison with hospital stays overall is necessarily crude, as a variety of factors affect different diagnoses in different ways. Yet even in an era of general decline, the downturn in length of stay for breast cancer was perhaps somewhat steeper than might have been anticipated. In the early 1980s, the average stay for a breast cancer patient was about three days longer than the average for all hospital patients. However, by the end of the period, the average for breast cancer patients was only about half the overall average.

Provincial declines

Average hospital stays for breast cancer patients decreased in every province, but the extent of the decline varied. In the early 1980s, averages ranged from 11.6 days in British Columbia to 17.4 days in Québec (Table 2, Chart 2). By 1997-2000, the longest stays for breast cancer patients were in Nova Scotia and Québec, averaging 7.8 and 7.3 days, respectively. The shortest stays were in Alberta (2.9 days), Ontario (3.2) and British Columbia (3.4).

Over the two decades, the largest drops in average hospital stays for breast cancer patients were in Alberta and Ontario, and the smallest, in Nova Scotia. Québec started with the longest stays, and despite a considerable decrease, remained among the longest; stays in British Columbia were among the shortest throughout.

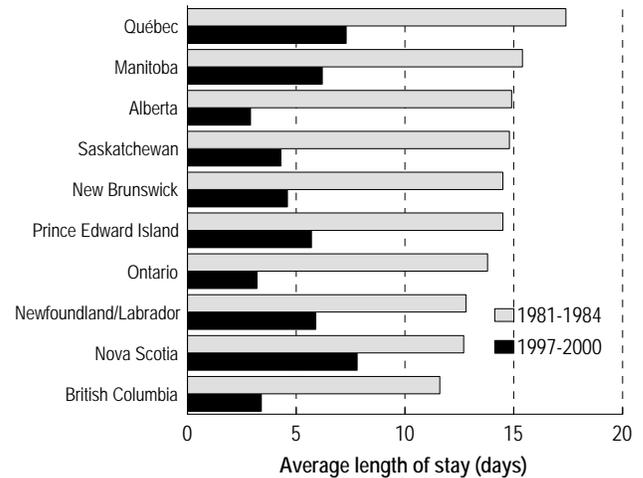
These provincial differences in length of stay may be attributable to variations in hospital procedures and treatment patterns and in the use of outpatient facilities,¹³ which can vary not only among provinces, but also among regions within a province,¹⁴ and between urban and rural areas.¹⁵

Table 2
Average length of stay for breast cancer,[†] by four-year period, province, stage, comorbidity, procedure and discharge status, Canada, 1981-1984 to 1997-2000

	1981-1984	1985-1988	1989-1992	1993-1996	1997-2000
	Days				
Total	14.5	13.1	10.3	7.5	4.7
Province					
Newfoundland	12.8	12.0	10.5	8.7	5.9
Prince Edward Island	14.5	13.6	12.5	8.7	5.7
Nova Scotia	12.7	12.6	9.1	8.8	7.8
New Brunswick	14.5	12.6	10.0	7.4	4.6
Québec	17.4	15.8	13.4	11.3	7.3
Ontario	13.8	12.2	8.9	5.6	3.2
Manitoba	15.4	14.0	11.3	7.8	6.2
Saskatchewan	14.8	13.2	11.8	7.4	4.3
Alberta	14.9	13.1	8.0	4.5	2.9
British Columbia	11.6	9.8	7.7	5.1	3.4
Cancer stage					
In situ	8.2	6.6	4.8	3.2	2.3
Localized	12.3	10.5	7.8	5.3	3.2
Regional	11.3	10.1	7.7	5.1	3.2
Distant	21.0	21.6	21.4	20.2	16.2
Comorbid conditions (Charlson Index)					
0	13.8	12.4	9.7	7.0	4.4
1-2	22.6	20.9	17.1	12.0	7.2
3+	25.7	23.3	21.8	21.9	10.0
Procedure					
Breast-conserving surgery	7.9	7.2	5.7	3.5	2.2
Mastectomy	11.2	10.0	7.9	5.1	3.3
Other	17.3	18.7	15.6	14.7	12.5
None	23.1	21.1	20.2	19.2	12.7
Discharge status					
Alive	12.0	10.6	8.2	5.7	3.8
Dead	33.5	33.4	29.7	28.7	20.6

Data source: Hospital Morbidity Database, 1981/82 to 2000/01
† Primary diagnosis

Chart 2
Average length of stay for breast cancer,[†] by province, 1981-1984 and 1997-2000



Data source: Hospital Morbidity Database, 1981/82 to 1984/85 and 1997/98 to 2000/01
† Primary diagnosis

Regardless of age

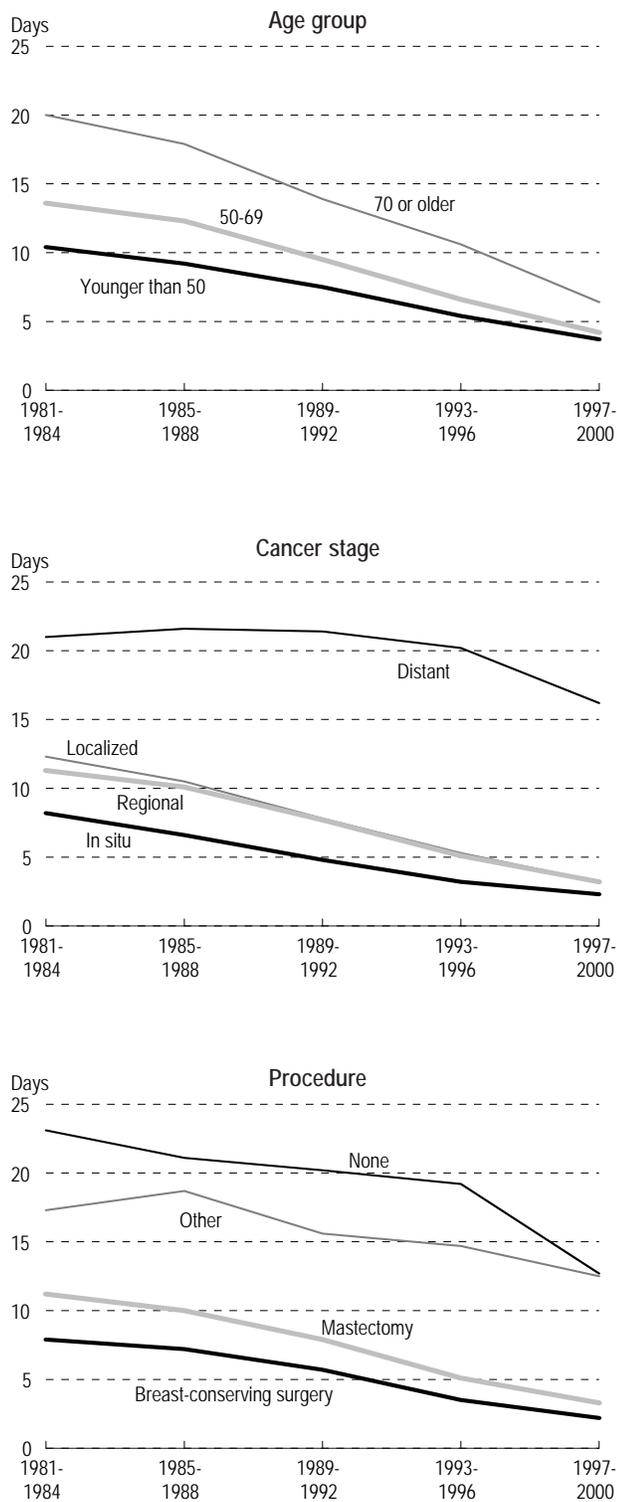
Over the two decades, patients aged 70 or older accounted for 29% of hospital admissions for breast cancer, but made up a considerably larger share—39%—of all hospital days that were attributable to the disease, reflecting the generally much longer stays for elderly women (Appendix Table A). Nonetheless, by 1997-2000, the average stay for breast cancer patients aged 70 or older was strikingly shorter than it had been in 1981-1984, dropping from 20.0 to 6.4 days (Chart 3). Younger women tended not to be hospitalized so long, but average stays for such patients also fell sharply. The average for women aged 50 to 69 fell from 13.6 to 4.2 days, and for women younger than 50, from 10.4 to 3.7 days.

Cancer stage major factor

The time that breast cancer patients spend in hospital is influenced by the stage of the disease; that is, the degree to which it has spread. Yet for all stages, the average length of stay declined.

The three least severe breast cancer stages—in-situ, localized and regional—require the shortest periods of hospitalization and had the most

Chart 3
Average length of stay for breast cancer,[†] by age group, stage, procedure and period, Canada, 1981-1984 to 1997-2000



Data source: Hospital Morbidity Database, 1981/82 to 2000/01
† Primary diagnosis

substantial decreases in average stays (Chart 3). The average for in-situ breast cancer fell steadily from 8.2 to 2.3 days. The declines for localized and regional cancer were also steady, dropping from around 12 to just over 3 days.

Not surprisingly, hospitalization tends to be longer if a cancer has spread. For distant cancer, the decrease in the average length of stay was smaller and did not begin until the mid-1990s. Before that time, the average had remained more than 20 days, and by 1997-2000, had fallen relatively little to 16.2 days.

Concurrent illness lengthens stay

The time that a breast cancer patient spends in hospital can lengthen if she has other serious conditions, such as heart disease, diabetes, and liver or kidney problems.⁶ The presence of such diseases has an impact on the treatment breast cancer patients receive, the success of that treatment, and the time needed for recovery.¹⁶⁻¹⁹ In 1997-2000, breast cancer patients with no other conditions noted in their hospital record averaged 4.4 days, compared with 7.2 days for those with at least one other serious health problem. Both figures, however, were down substantially from the early 1980s, when stays had averaged 13.8 and 22.6 days, respectively.

Procedures

More complicated or extensive procedures generally require more time in hospital. Thus, a woman undergoing a mastectomy might expect to be hospitalized longer than one having breast-conserving surgery (BCS). In the early 1980s, a mastectomy meant an average of 11.2 days in hospital, and BCS, 7.9 days (Chart 3). The pace of decline in length of stay for both procedures was about the same, so that by 1997-2000, stays averaged 3.3 days for mastectomy and 2.2 days for BCS, and the relative difference between them remained almost constant.

Besides a mastectomy or BCS, breast cancer patients may be hospitalized for procedures such as blood transfusions, chemotherapy, nuclear medicine, or diagnostic radiotherapy. (Mastectomy and BCS patients may also have any of these procedures

during the surgical stay.) The average stay for the “other procedure” category decreased, but less sharply than that for mastectomy and BCS, falling from 17.3 to 12.5 days.

Another group of breast cancer patients undergo no procedure while in hospital. And although their average length of stay was almost halved from 23.1 to 12.7 days over the two decades, like the “other procedure” category, it remained high compared with stays involving mastectomy or BCS.

It is clear that the other/no procedure groups consume considerable hospital resources. In 1981-1984, the average stay for the two groups combined was 19.8 days versus 10.3 days for women who had surgery. By 1997-2000, the average stay for the other/no procedure group had fallen by only about a third to 12.6 days, whereas the average for women who had surgery was down by almost three-quarters to 2.7 days (Table 3).

Table 3
Percentage distribution of hospital admissions and days, and average length of stay for breast cancer,[†] by procedure and selected characteristics, Canada, 1981 to 2000

	Admissions		Days		Average length of stay	
	Other/ No proce- dure	Sur- gery	Other/ No proce- dure	Sur- gery	Other/ No proce- dure	Sur- gery
	%		%		Days	
Total	32.0	68.1	57.6	42.4	18.0	6.2
Period						
1981-1984	44.0	56.0	60.0	40.0	19.8	10.3
1985-1988	39.3	60.7	59.4	40.6	19.9	8.7
1989-1992	32.1	67.9	55.0	45.0	17.7	6.8
1993-1996	25.7	74.3	57.2	42.8	16.7	4.3
1997-2000	19.6	80.4	52.7	47.3	12.6	2.7
Cancer stage						
In situ	9.5	90.5	14.3	85.7	5.8	3.7
Localized	20.0	80.0	37.9	62.1	14.6	6.0
Regional	7.8	91.3	13.9	86.1	11.3	6.7
Distant	92.8	7.2	94.8	5.2	21.0	15.0
Comorbid conditions (Charlson Index)						
0	17.5	82.4	56.0	44.0	16.9	6.0
1-2	13.2	73.1	67.3	32.4	26.6	8.3
3+	53.2	46.8	72.9	27.1	26.6	12.3
Discharge status						
Alive	25.2	74.8	42.4	57.6	13.3	6.1
Dead	98.3	1.7	97.4	2.6	30.0	41.0

Data source: Hospital Morbidity Database, 1981/82 to 2000/01

[†] Primary diagnosis

The other/no procedure patients are the most serious cases: those who have recurring cancer and are admitted for treatment of metastatic diseases, or have such severe initial disease that surgery is not appropriate. In fact, over the 20 years, the “no procedure” group accounted for 53% of admissions with the most severe comorbid conditions, 93% of admissions for which the diagnosis was distant cancer, and 98% of admissions that ended in an in-hospital death.

The proportion of breast cancer admissions that did not involve surgery fell from 44% in the earliest period to 20% in the most recent. It is likely that such patients are increasingly being cared for in chronic care or palliative care institutions, or prefer to die at home.²⁰⁻²⁴ Nonetheless, some breast cancer patients still die in hospital, typically after a long stay. In 1997-2000, the average stay for such patients was 20.6 days—about five times the overall average (Table 2). Although this was down substantially from 33.5 days in 1981-1985, the pace of decline lagged behind that for breast cancer patients in general.

Factors interrelated

The factors that can affect the length of time a breast cancer patient spends in hospital do not exist in isolation. A woman's age may be associated with the stage at which the cancer is diagnosed and with the presence of other conditions, which, in turn, influence the type of treatment she receives. For instance, the likelihood of undergoing BCS rather than a mastectomy depends on disease variables such as tumour size¹³ cancer stage,²⁵ and a variety of socio-economic and demographic factors.^{13,14,26-28} Yet even when age, geographic region, cancer stage, comorbid conditions, procedure and period are considered together, the relationship between each of these variables and length of stay persists.

The median stay for breast cancer patients over the entire 20-year period was 5 days. The odds of staying longer than 5 days were significantly high in the earlier periods, compared with 1997-2000 (Table 4). The odds of a long stay also rose with the patient's age and number of comorbid conditions. As well, compared with women who

Table 4
Adjusted odds ratios for hospital stays for breast cancer[†] longer than median,[‡] in relation to selected characteristics, Canada, 1981 to 2000

	Adjusted odds ratio	99% confidence interval
Age group		
Younger than 50 [§]	1.0	...
50-69	1.3*	1.2, 1.3
70 or older	1.9*	1.9, 2.0
Cancer stage		
In situ [§]	1.0	...
Localized/Regional	2.1*	2.0, 2.3
Distant	6.4*	6.0, 6.8
Comorbid conditions (Charlson Index)		
0 [§]	1.0	...
1-2	1.6*	1.5, 1.6
3+	1.9*	1.7, 2.2
Procedure		
Breast-conserving surgery [§]	1.0	...
Mastectomy	4.3*	4.2, 4.4
Other	1.3*	1.3, 1.4
None	1.0	1.0, 1.1
Period		
1981-1984	21.4*	20.6, 22.2
1985-1988	19.0*	18.3, 19.7
1989-1992	10.2*	9.9, 10.5
1993-1996	2.9*	2.8, 3.0
1997-2000 [§]	1.0	...
Geographic region		
Atlantic	3.3*	3.1, 3.4
Québec	3.8*	3.6, 3.9
Ontario	1.3*	1.2, 1.3
Prairies	1.5*	1.4, 1.6
British Columbia [§]	1.0	...
Discharge status		
Alive [§]	1.0	...
Dead	1.7*	1.6, 1.8

Data source: Hospital Morbidity Database, 1981/82 to 2000/01

[†] Primary diagnosis

[‡] Median length of stay = 5 days

[§] Reference group

* Significantly different from reference group ($p < 0.01$)

had in situ cancer, the odds of a long stay were high for those with local/regional, and especially, distant, cancer. The odds were high that women who had had mastectomies or “other” procedures would be hospitalized longer than the median, compared with the odds for women who had BCS. By contrast, the odds of a long stay for women who had “no procedure” were not significantly high, perhaps because of redundancy between the variables “no procedure” and “distant.”

Cancer stage

Over the entire 20 years, the median length of stay was 3 days for patients with in-situ breast cancer. Their odds of being hospitalized longer than 3 days were more than 20 times greater in the early 1980s than in 1997-2000 (Table 5). For patients with localized or regional breast cancer, the overall median length of stay during the two decades was 5 days. Their odds of a stay that surpassed this median were more than 40 times greater in the early 1980s than in 1997-2000.

The reduction over time in length of stay was much less dramatic for patients with distant cancer. Over the two decades, the median length of stay for such patients was 11 days. At the beginning of

Table 5
Adjusted odds ratios for hospital stays for breast cancer[†] longer than median,[‡] by cancer stage, in relation to selected characteristics, Canada, 1981 to 2000

	Cancer stage		
	In situ	Localized/Regional	Distant
Period			
1981-1984	23.4*	44.0*	1.8*
1985-1988	17.3*	36.1*	1.7*
1989-1992	11.3*	16.7*	1.5*
1993-1996	3.2*	3.9*	1.3*
1997-2000 [§]	1.0	1.0	1.0
Age group			
Younger than 50 [§]	1.0	1.0	1.0
50-69	1.0	1.3*	1.4*
70 or older	1.3*	1.9*	2.1*
Comorbid conditions (Charlson Index)			
0 [§]	1.0	1.0	1.0
1-2	1.4*	1.6*	1.2*
3+	1.8*	2.7*	0.7*
Procedure			
Breast-conserving surgery [§]	1.0	1.0	1.0
Mastectomy	7.2*	4.7*	0.9
Other	0.9	0.9	1.7*
None	1.8*	1.3*	0.8
Discharge status			
Alive [§]	1.0	1.0	1.0
Dead	5.2*	2.8*	1.7*
Median length of stay (days)	3	5	11

Data source: Hospital Morbidity Database, 1981/82 to 2000/01

Note: Logistic regression models are adjusted for all variables shown and for region of residence.

[†] Primary diagnosis

[‡] Length of stay dichotomized at median

[§] Reference group

* Significantly different from reference group ($p < 0.01$)

the period, their odds of being hospitalized longer than this median were just under two times their odds at the end of the period. This illustrates that even in an era of steep reductions in length of stay, patients with distant cancer continue to be hospitalized for a relatively long time.

When the data are stratified by time period and patients' age, again, distant cancer stands out: the odds that these patients would have a relatively long hospital stay actually rose over time, regardless of their age (Table 6). For instance, in 1981-1988, the median length of stay for breast cancer patients aged 70 or older was 10 days. Those with distant cancer

had about three times the odds of a hospital stay that exceeded this median, compared with those in the same age group who had in-situ cancer. By 1997-2000, the median stay for elderly women with breast cancer was 3 days; the odds that those with distant cancer would remain in hospital longer than this median were almost nine times the odds for their contemporaries with in-situ tumours.

Impact of shorter stays

The steady reductions in hospital stays over the past two decades may raise concern about the effects of "early" discharge on breast cancer patients.

Definitions

For this analysis, breast cancer is classified in accordance with the *International Classification of Diseases, Ninth Revision (ICD-9)*.³ Diagnostic codes recorded on discharge summaries were used to identify breast cancer admissions and classify them by *cancer stage*: in-situ, localized, regional and distant. In-situ carcinoma of the breast (ICD-9 code 233.0), which means cancer in place, is an early cancer that has not spread beyond its point of origin. Localized breast cancer (174.0 to 174.9) has spread into the breast; regional (174.0 to 174.9 plus 196.0 to 196.9), into the breast and also the lymph nodes. Distant cancer (174.0 to 174.9 plus 197 to 199.0) is primary malignant breast cancer with metastases beyond the lymph nodes or any other secondary or unspecified neoplasms.

Diagnoses were obtained from the first five diagnostic fields on the patient's chart. The primary diagnosis appears in the first field. Only cases with breast cancer recorded as the primary diagnosis were included in this analysis. If there was more than one breast cancer diagnosis, the most severe was used to determine stage.

The two in-hospital procedures most frequently performed for breast cancer are breast-conserving surgery (BCS), also known as lumpectomy or wide local excision,²⁹ and mastectomy. BCS is removal of the tumour along with an area of normal tissue; for a mastectomy, most of the breast tissue is removed.²⁹ Breast surgeries were coded in accordance with the *Canadian Classification of Diagnostic and Therapeutic Procedures (CCP)*.³⁰ Mastectomies were identified as CCP codes 97.12 to 97, and BCS as codes 97.11 and 97.25 to 97.28. Various other types of breast tissue removal and axillary node excision were identified as codes 52.13 and 52.43.

For this study, all *procedures* from the first six recorded procedure fields were checked. If both mastectomy and BCS were listed as

having been performed during a single admission, the most severe (mastectomy) was selected for determining length of stay. This was the case for about 3% of admissions. "Other procedures" refers to non-operative procedures such as blood transfusions, chemotherapy, nuclear medicine, and diagnostic radiotherapy. The "no procedure" category pertains to hospitalizations for which breast cancer was the primary diagnosis, but no procedures were performed.

Length of stay was defined as the number of days in hospital from the admission date (set at 0) to the discharge date. Since a small proportion of hospital stays were very long, sometimes several years, length of stay was capped at 365 days. The calculation of total days in hospital also included this truncation.

Comorbid conditions are measured with the Charlson Index, which categorizes ICD diagnostic codes according to severity and assigns a value.⁶ Metastatic tumours are considered distant cancer, and are not included among the comorbidities.

For most provinces, *age* was calculated by subtracting date of birth from admission date. (Québec and Manitoba submit a reporting date.) Three age groups were defined for analysis: younger than 50, 50 to 69, and 70 or older.

Discharge status refers to whether the patient died in hospital.

Province of residence was used to allocate patients to provinces. Because of small populations in some provinces, the provinces were grouped into five regions for multivariate analysis: Atlantic (Newfoundland and Labrador, Prince Edward Island, Nova Scotia, and New Brunswick); Québec; Ontario; Prairies (Manitoba, Saskatchewan and Alberta); and British Columbia. The territories are included in the national data, but no data are presented at the territorial level.

Table 6

Adjusted odds ratios for hospital stays for breast cancer[†] longer than median,[‡] by age group and period, in relation to selected characteristics, Canada, 1981-1988 to 1997-2000

	Total	Age group								
		Younger than 50			50-69			70 or older		
		1981-1988	1989-1996	1997-2000	1981-1984	1989-1998	1997-2000	1981-1988	1989-1996	1997-2000
Cancer stage										
In situ [§]	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Localized/Regional	2.1*	2.1*	1.9*	1.5*	2.3*	2.4*	1.8*	1.9*	2.3*	2.1*
Distant	6.4*	5.5*	4.6*	7.2*	5.2*	8.1*	10.2*	3.4*	5.9*	8.7*
Comorbid conditions (Charlson Index)										
0 [§]	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
1-2	1.5*	1.6*	1.2	1.4*	1.7*	1.5*	1.5*	1.6*	1.6*	1.5*
3+	1.9	1.2	2.0	1.5	1.9*	1.6*	1.8*	2.0*	2.0*	1.8*
Procedure										
Breast-conserving surgery [§]	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Mastectomy	4.3*	5.3*	3.0*	3.2*	4.7*	3.2*	3.2*	3.7*	3.6*	3.2*
Other	1.3*	1.1	1.2*	1.6*	1.8*	1.4*	1.4*	3.3*	2.5*	3.3*
None	1.0	0.7	1.0	1.2	1.1	1.3*	1.3*	2.5*	2.4*	3.1*
Discharge status										
Alive [§]	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Dead	1.7*	1.8*	1.3*	1.4	1.6*	1.5*	1.7*	1.8*	1.6*	1.7*
Median length of stay (days)	5	7	4	2	8	5	2	10	6	3

Data source: Hospital Morbidity Database, 1981/82 to 2000/01

Note: Logistic regression models are adjusted for all variables shown and for region of residence.

[†] Primary diagnosis

[‡] Length of stay dichotomized at median

[§] Reference group

* $p < 0.01$

However, other research has generally not found shorter stays to be associated with less favourable outcomes. In 1989, a comparison of three groups of mastectomy patients with different lengths of stay found no differences in surgical complications.³¹ Subsequent studies in the 1990s showed no increase in the rate of complications or long-term sequelae.³²⁻³⁴ As well, according to a report from the Organisation for Economic Co-operation and Development, breast cancer treatment patterns and outcomes for Canada compare favourably with those of other OECD countries.³⁵

One indication of a potentially negative outcome is the proportion of women who are readmitted to hospital shortly after undergoing a procedure for breast cancer. National data that make it possible to track individual patients are available only from 1994. As well, based on the limited information on patients' records, it is not possible to determine if these readmissions resulted from complications or

if further treatment had been planned. Nonetheless, relatively few BCS and mastectomy patients were rehospitalized for cancer-related reasons in the two months following discharge. In 1994, 13.2% of women who had BCS were readmitted within 60 days; in 2000, the figure was 11.1% (Table 7). The proportion of mastectomy patients rehospitalized within 60 days was 4.7% in 1994 and 3.9% in 2000.

It is possible that the sharp reduction in length of stay for breast cancer could affect patient satisfaction. However, patients often prefer short stays.³⁴ The physical and psychological benefits of a relatively brief hospitalization tend to outweigh the minor inconvenience to the patients and their families.³⁶ Even in the case of terminal illness, research suggests that patients prefer to die at home.²⁰

Of course, the ultimate measure of success in treating breast cancer is survival. Population-based survival estimates are useful "average" outcome

Table 7
Percentage of BCS and mastectomy patients rehospitalized within 60 days, Canada, 1994 and 2000

	Total patients	Procedure on readmission within 60 days									
		Total readmissions		Breast-conserving surgery		Mastectomy		Lymph node excision		Aftercare	
		Number	% of total patients	Number	% of total patients	Number	% of total patients	Number	% of total patients	Number	% of total patients
Total											
1994	12,877	1,194	9.3	169	1.3	485	3.8	146	1.1	394	3.1
2000	13,830	1,050	7.6	103	0.7	440	3.2	91	0.7	416	3.0
Breast-conserving surgery (BCS)											
1994	6,961	918	13.2	166	2.4	447	6.4	136	2.0	169	2.4
2000	7,079	784	11.1	98	1.4	411	5.8	75	1.1	200	2.8
Mastectomy											
1994	5,916	276	4.7	3	0.1	38	0.6	10	0.2	225	3.8
2000	6,785	266	3.9	5	0.1	29	0.4	16	0.2	216	3.2

Data source: Health Person-Oriented Information Database, 1994/95 and 2000/01

indicators of the effectiveness of cancer diagnosis and treatment. A recent study that compared five-year survival ratios for breast cancers diagnosed in 1985-1987 with those diagnosed in 1992-1994 found that survival increased for all age groups in all provinces.³⁷ And reflecting those increases in relative survival, breast cancer mortality rates have fallen: from 30.1 deaths per 100,000 women in 1981 to 25.0 per 100,000 in 2001.³⁸

Concluding remarks

In Canada, as in other OECD countries,³⁶ the length of time that breast cancer patients spend in hospital has declined sharply since the early 1980s. The average fell from more than 14 days in 1981-1984 to less than 5 days in 1997-2000. Moreover, regardless of the patient's age, province of residence, stage of the cancer, comorbid conditions, and procedures that were (or were not) performed, average length of stay dropped. Substantial decreases occurred for in-situ, localized and regional disease, and smaller decreases, for the more complex cases—notably distant cancer.

The decline in length of stay cannot be attributed to any single cause. Length of stay results from an interplay of a number of factors, among them, a trend toward less extensive operations,³⁹⁻⁴¹ particularly a shift away from radical mastectomies toward BCS.⁴² Another change is the use of adjuvant

therapy for cases with axillary lymph node involvement (that is, the cancer cells have spread outside the breast to lymph nodes in the underarm area).⁴²

This analysis of hospital data was able to examine variables such as the patients' age, disease severity, and comorbid conditions. Characteristics such as socio-economic status, which are also important, could not be included because they are not compiled in the Hospital Morbidity Database.

No attempt is made here to identify an "ideal" length of stay for breast cancer patients. However, according to a number of indicators, shorter hospital stays did not compromise outcomes. The decline has not meant higher readmission rates, reduced survival or higher mortality rates. In fact, breast cancer mortality rates have dropped, survival ratios have increased, and readmission rates are low and stable.

Nonetheless, substantial numbers of breast cancer patients still have very long hospital stays, notably those with distant cancer. This may be an area of hospital use amenable to further reductions in length of stay. It is possible that many of these patients could be treated in more suitable chronic care or palliative care institutions, or even sent home, if appropriate facilities and home care were available. ●

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Appendix

Table A
Hospital admissions, length of stay per visit, and hospital days
for breast cancer, by selected characteristics, Canada, 1981
to 2000

	Admissions	Days	Length of stay [†]	
			Average	Median
Total 1981-2000 (number)	388,146	3,865,730	Days	
	%	%		
	100.0	100.0	10.0	5
Age				
Younger than 50	24.1	17.3	7.1	5
50-69	47.2	43.8	9.3	5
70 or older	28.7	38.9	13.5	6
Cancer stage				
In situ	3.5	1.3	3.9	3
Localized	59.2	45.6	7.7	5
Regional	17.6	12.5	7.1	5
Distant	19.7	40.5	20.5	11
Comorbid conditions (Charlson Index)				
0	91.4	86.3	9.4	5
1-2	7.8	12.0	15.4	7
3+	0.8	1.6	20.2	9
Procedure				
Breast-conserving surgery	30.2	14.2	4.7	3
Mastectomy	37.9	28.2	7.4	6
Other	17.4	28.4	16.3	8
None	14.6	29.3	20.0	8
Period				
1981-1984	18.2	26.0	14.5	9
1985-1988	20.2	26.0	13.1	8
1989-1992	21.5	22.3	10.3	6
1993-1996	20.1	15.1	7.5	4
1997-2000	20.0	9.4	4.7	2
Province				
Newfoundland	1.5	1.4	9.7	7
Prince Edward Island	0.6	3.0	10.8	7
Nova Scotia	3.5	0.6	10.2	7
New Brunswick	2.7	3.3	9.5	6
Québec	26.9	34.5	12.8	7
Ontario	37.0	32.3	9.0	5
Manitoba	3.9	4.3	10.8	6
Saskatchewan	4.0	4.1	10.3	6
Alberta	7.5	6.3	8.3	4
British Columbia	12.4	9.2	7.4	4
Discharge status				
Alive	90.9	72.3	7.9	5
Dead	9.1	27.7	30.3	14

Data source: Hospital Morbidity Database, 1981/82 to 2000/01

Note: Because of rounding, detail may not add to totals.

† Length of stay truncated at 365 days