

Waiting Time for Breast Cancer Treatment in Alberta

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ABSTRACT

Background: The present study had two research questions. First, what is the average waiting time between diagnosis and treatment for Alberta women with breast cancer relative to Canadian Society for Surgical Oncology (CSSO) recommendations? Second, does patient age, cancer stage, patient community size, and year of diagnosis have a significant relationship to waiting time?

Methods: The sample consisted of all Alberta women diagnosed with breast cancer between 1997 and 2000. Waiting time was defined as number of days between definitive diagnosis and treatment initiation. Multiple regression examined the relative influence of the predictor variables on waiting time.

Results: There were 6,418 cases of breast cancer between 1997 and 2000. Mean waiting time was 20.2 days (SD 21.6) and median waiting time was 17 days. Longer waiting time was significantly associated with year of diagnosis (progressively longer from 1997 to 2000), patients younger than 70, and Stage 1 cancer. Waiting time increase from 1997 to 2000 appears to be due to increased demand for services without corresponding increases in resources. Less treatment delay for women older than 70 is due to more of these women being treated the same day they received their diagnosis.

Conclusion: Only 44% of women had a waiting time of 14 days or less as recommended by the CSSO. The number of women who will have to wait longer than recommended for treatment will likely increase without a significant increase in oncological resources. The basis for differences in waiting times as a function of age needs to be further investigated to ensure equitable access to care.

Breast cancer has a significant impact on women's health. In Canada, it is the most commonly diagnosed cancer among women (excluding non-melanoma skin cancer) and the second leading cause of female cancer deaths.¹ In their lifetime, 1 in 9 Canadian women will be diagnosed with breast cancer and 1 in 26 will die from it.¹ There is currently no known primary prevention for breast cancer. As a result, early detection and treatment are the best options for improving outcomes.² Accordingly, the Canadian Society for Surgical Oncology (CSSO) has recommended that no more than two weeks transpire between diagnosis and treatment.³

Delays are related to increased patient distress.⁴⁻⁸ However, there is contradictory evidence regarding the effect that treatment delay has on survival. Some researchers have found improved survival rates with shorter delays,⁹⁻²¹ whereas others have failed to find a difference,²²⁻²⁷ and one recent study reported better survival with longer delays.²⁸ The nature of the tumour may help explain these conflicting findings. Some investigators have found that patients with fast-growing tumours are negatively impacted by delays, whereas outcome for patients with slow-growing tumours is independent of waiting time.^{17,21} Given the difficulty in determining the nature of the tumour at first contact, timely diagnosis and treatment would ensure the best chance for a positive outcome.

The actual waiting times that women experience vary according to jurisdiction and the year(s) the study was conducted. Table I summarizes waiting times found in other studies.^{6,28-35} It is difficult to make comparisons between studies because of differences in the waiting time intervals being measured. The three studies with waiting times comparable to the present study (diagnosis to treatment initiation) found intervals ranging from 10 to 24 days.³³⁻³⁵

In order to decrease waiting times, it is important to identify factors predictive of delay. Table II summarizes studies examining this issue.^{6,17,23,29,34-43} Most studies report younger age to be a risk factor for delay. The basis for this association is unclear, although some authors have speculated it is because physicians are more suspicious of breast cancer in older women

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TABLE I

Studies Investigating Median Waiting Times for Breast Cancer Treatment

Author	Year(s)	Country	n	Interval(s) Studied	Median Waiting Period
Sainsbury et al. ²⁸	1976-1995	UK	36,222	i) referral by GP to first surgical visit ii) first specialist visit to definitive treatment	i) 10 days in 1976, 12 days in 1995 ii) 7 days in 1976, 13 days in 1995
Spurgeon et al. ²⁹	1997	UK	1517	i) referral by GP to first surgical visit ii) referral by GP to definitive treatment	i) 9 days and 14 days for urgent and non-urgent cases, respectively ii) 27 days and 35 days for urgent and non-urgent cases, respectively
Robinson et al. ³⁰	1999-2000	UK	5750	i) referral by GP to first specialist visit ii) first specialist visit to treatment	i) 12 days ii) 24 days
Khawaja and Allan ³¹	2000	UK		referral by GP to first specialist visit	2 weeks and 8 weeks, for urgent and non-urgent referrals, respectively
Mackillop et al. ³²	1982-1991	Ontario, Canada	4971	definitive diagnosis to radiotherapy	61 days
Olivotto et al. ⁶	1996	Canada	13,958	i) screening examination to first GP visit ii) screening examination to diagnosis	i) 18 days ii) 26 days
Mayo et al. ³³	1992-1998	Quebec, Canada	27,515	i) first and only diagnostic test to surgical treatment ii) first diagnostic procedure to surgical treatment	i) 24 days ii) 34 days
Simunovic et al. ³⁴	2000	Ontario, Canada	440	i) referral by GP to first surgical visit ii) first surgical visit to treatment decision iii) treatment decision to initiation of treatment iv) referral by GP to initiation of treatment	i) 11 days ii) 0 days iii) 20 days iv) 37 days
Caplan et al. ³⁵	1991-1995	USA	1659	i) clinical breast exam or mammogram to diagnosis ii) diagnosis to treatment initiation iii) abnormal screening result to treatment initiation	i) 32 days ii) 10 days iii) 48 days

* Bolded are waiting time definitions comparable to the present study.

and refer them to a specialist more quickly.²⁸ Most studies have also found that the absence of a breast lump is related to longer delay.^{35-37,39} The reason for this may be that physicians are more likely to attribute a lump to possible cancer compared to other breast symptoms. Similarly, there is consistent evidence that women with malignant breast disease experience less delay before treatment than women with benign conditions.^{6,42,43} All studies in Table II have found significant regional variation in waiting times.^{6,29,32,35,37} This is not surprising considering the uneven distribution of resources across jurisdictions and the centralization of specialty services. There is modest evidence that Caucasian women experience less delay.^{23,35,37} Finally, there is conflicting evidence concerning whether family history of breast cancer is related to waiting time.^{38,40}

The present study had two research questions:

1. What was the average waiting time between diagnosis and treatment for female breast cancer patients in Alberta from 1997-2000 relative to the CSSO 14-day recommendation? Our hypothesis was that the average waiting time exceeded the recommended waiting time.
2. Do the factors of patient age, size of community the patient comes from, cancer stage, and year of diagnosis have a relationship to waiting time in Alberta?

TABLE II

Factors Related to Longer Waiting Times for Breast Cancer Treatment After Diagnosis

Predictive Factor	Supporting Studies	Refuting Studies
Younger age	Afzelius et al. ¹⁷ (n=7609) Burgess et al. ³⁶ (n=185) Caplan et al. ³⁷ (n=1659) Caplan et al. ³⁵ (n=996) Finley & Francis ³⁸ (n=454) Sainsbury et al. ²⁸ (n=18,846)	Adam et al. ⁴⁰ (n=162) Dennis et al. ²³ (n=237)
Absence of a breast lump	Burgess et al. ³⁶ (n=185) Caplan et al. ³⁷ (n=1659) Caplan et al. ³⁵ (n=996) Nichols et al. ³⁹ (n=582)	Adam et al. ⁴⁰ (n=162) MacArthur & Smith ⁴¹ (n=145)
Malignant versus benign diagnosis	Bywaters ⁴² (n=180) Greer ⁴³ (n=157) Olivotto et al. ⁶ (n=13,958)	
Region	Caplan et al. ³⁷ (n=1659) Caplan et al. ³⁵ (n=996) Mackillop et al. ³² (n=18,077) Olivotto et al. ⁶ (n=13,958) Spurgeon et al. ²⁹ (n=1517)	
Non-White ethnic origin	Caplan et al. ³⁷ (n=1659) Dennis et al. ²³ (n=237)	Caplan et al. ³⁵ (n=996)
No family history of breast disease	Finley & Francis ³⁸ (n=454)	Adam et al. ⁴⁰ (n=162)

Our hypothesis was that all of these factors were significantly related to waiting time.

METHODS

Female breast cancer data for 1997-2000 was obtained from the Alberta Cancer Registry. The registry is a computerized database of all new primary cancer cases. Quality assurance investigations by the North American Association of Central Cancer Registries have indicated that the

registry has collected at least 95% of all cancer cases in the province.⁴⁴

Waiting time was calculated as the continuous number of days between cancer diagnosis and treatment. If the patient had more than one diagnostic test, the last diagnostic test date was used. The available variables included: age at diagnosis; community size the patient lived in (<10,000; 10,000-100,000; >100,000); year the diagnosis was made (1997, 1998, 1999, 2000); and stage of breast cancer (Stage 1, 2, 3, or 4). Stage was determined by tumour size, involve-

TABLE III

Mean and Median Waiting Time From Diagnosis to Treatment Initiation for Breast Cancer Patients in Alberta for the Years 1997-2000

		N	Median Time	Mean Time	% Waiting >14 days
Year of study	1997	1521	14	17.9	49.7
	1998	1447	16	18.2	51.8
	1999	1651	18	20.9	58.3
	2000	1619	20	23.6	63.9
Age	<31	33	16	22.3	54.5
	31-40	468	15	18.4	50.2
	41-50	1306	17	20.9	58.5
	51-60	1460	19	21.5	62.1
	61-70	1273	19	20.8	59.0
	71-80	1143	16	19.2	52.7
	81-90	501	6	17.6	41.7
	>90	52	0	18.6	34.6
Stage	1	2333	20	22.1	62.6
	2	2158	15	17.5	50.8
	3	377	14	18.2	49.9
	4	201	14	18.5	47.5
Patient community size	Unknown	1169	18	22.4	56.7
	<10,000	2510	18	20.4	56.9
	10,000-100,000	609	17	19.5	55.2
	>100,000	3119	17	20.1	55.8

TABLE IV

Standard Multiple Regression of Variables Related to Waiting Time

	Regression Coefficients (B)	Standardized Regression Coefficients (β)	Squared Semi-Partial Correlations (sr_i^2)
Age	-.155	-.158	.023*
Stage	-.171	-.127	.014*
Year	.060	.103	.011*
Stage Missing	-.148	-.089	.006*
Patient Community Size	.001	.014	.000

$R^2 = .047^{***}$

* $p < 0.001$

Note: Standardized regression coefficients (β) show the importance of the variable relative to both the dependent variable and the other independent variables (i.e., for every 1 SD increase in Age there is a .158 SD decrease in Waiting Time). Squared semi-partial correlations (sr_i^2) show the unique contribution of the variable, or how much R^2 is reduced if the variable is removed.

ment of lymph nodes and whether the cancer had metastasized (TNM staging).

Standard multiple regression using SPSS Regression (11.0) investigated the relationship between waiting time and the independent variables of age, stage, patient community size, and year.

RESULTS

There were 6,418 cases of female breast cancer recorded in the registry over the four-year period. However, 180 cases did not have a recorded waiting time and were eliminated, leaving 6,238 cases. A total of 1,169 patients did not have cancer stage recorded. An independent t-test indicated those without a stage recorded were significantly younger than those having a recorded stage ($t=19.9$, $p<0.001$). Because of the possibility that a missing stage value could indicate uncertainty (and thus, related to waiting time), a new variable was created: stage present or missing. Cases without a stage recorded were then retained in the

analysis by imputing stage using SPSS Linear Trend at Point.

Mean age of the patients was 60.5 years ($SD=14.4$). Thirty-seven percent had Stage 1 cancer, 34% had Stage 2, 6% had Stage 3, 3% had Stage 4, and in 20% of cases stage was unknown. Fifty percent of patients resided in a large urban centre (>100,000), 10% came from communities of between 10,000-100,000 people, and 40% from communities smaller than 10,000.

Mean waiting time between diagnosis and treatment was 20.2 days ($SD=21.6$), median waiting time was 17 days, and modal waiting time was 0 days (27% of women began treatment the same day). Only 43.8% of patients were treated within 14 days after diagnosis, as recommended by the Canadian Society for Surgical Oncology.

Table III presents median and mean waiting times as a function of each of the independent variables. Median waiting time increased 2 days each year from 1997

to 2000. There also appear to be notable differences in waiting times as a function of age and stage.

The data were evaluated for normality, linearity, homoscedasticity, univariate and multivariate outliers, and multicollinearity prior to multiple regression analysis. There were no multivariate outliers. Waiting time was severely skewed due to the large number of people who received immediate treatment after diagnosis. Logarithmic transformation improved the normality of this variable. The variables of stage and age were nonlinear. A Kruskal-Wallis test with Dunn post hoc comparisons found that the only significant waiting time difference between stages was between Stage 1 and all other stages ($H = 82.1$, $p<0.001$). Therefore, linearity of stage was improved by recoding it into Stage 1 versus Stages 2-4. The same statistical procedure found no significant difference in waiting times for age groups below 70, but significant differences for the older age groups ($H = 88.0$, $p<0.001$). Therefore, linearity of age was improved by recoding it into age groups: <70; 71-80; 81-90; and >90.

Table IV displays results of the multiple regression analysis. Reported are the unstandardized regression coefficients (B), the standardized regression coefficients (β), the semi-partial correlations (sr_i^2), and adjusted R^2 . The multiple regression coefficient (R) was significantly different from zero, $F = 61.8$, $p<0.001$. Four of the five variables contributed significantly to prediction of waiting time: age ($sr_i^2 = 0.023$), stage ($sr_i^2 = 0.014$), stage missing ($sr_i^2 = 0.006$), and year ($sr_i^2 = 0.011$). Altogether, 4.7% of the variability in waiting time was predicted by knowing the scores on these four variables.

DISCUSSION

Only 43.8% of Alberta women receive treatment in the 14-day time period recommended by the Canadian Society for Surgical Oncology. The median waiting time of 17 days between diagnosis and breast cancer treatment found in this study is shorter than the 24 days reported in Quebec³³ (between first and only diagnostic test to surgical treatment), and the 20 days reported in Ontario³⁴ (between treatment decision to initiation of treatment). However, it is longer than the 10 days

observed in the United States³⁵ (between diagnosis and treatment initiation).

Waiting time is also increasing. In this study, median waiting time for breast cancer treatment increased from 14 days in 1997 to 20 days in 2000. This appears to be due to increased demand for services with no matching increase in resources. Because of an increasing and aging population, the number of new cases of cancer in Alberta in 2000 was 12% higher than in 1997 (9,795 to 11,001) (6% increase in breast cancer cases).⁴⁵ There has been a corresponding 14% increase in the number of surgeries from 1997/98 to 2000/01.⁴⁶ By comparison, in this same time frame, there was only a 3% increase in the number of surgeons in Alberta (from 136 to 140)⁴⁷ and a 1% increase in the number of acute care surgical beds (from 6,305 to 6,365).⁴⁶

Younger age is the variable most consistently associated with delays in the literature.^{17,28,35-38} This variable was also significantly related to waiting time in the present study, but only for patients older than 70. The primary reason for this is that older patients are more likely to be treated on the same day as their diagnosis (48% of 81-90 year olds treated same day and 57% of >90 year olds compared to 27% for the entire sample). There is insufficient information in the Alberta cancer registry to determine why this is. However, one possibility is that women older than 70 may be more likely to already be in hospital (or readily transferable from long-term care) when they receive a breast cancer diagnosis. Another consideration is that because of cosmetic considerations, younger women may take longer to decide between a lumpectomy or mastectomy after a cancer diagnosis. A final contributing factor is that older women are more likely to have an open biopsy under general anesthetic to assess the cancer, which would conveniently allow for immediate surgical treatment if cancer is confirmed.

Women diagnosed with Stage 1 disease and women with no recorded stage waited significantly longer for treatment than women with Stage 2, 3 or 4 breast cancer. One plausible interpretation is that the treatment decision for women with either Stage 1 or unknown stage is more difficult and more open to a range of viable options, leading to a delay while the

patient and the physician agree upon the surgical intervention. Furthermore, surgeons likely identify patients with more advanced disease as urgent, thereby treating them sooner than patients with less advanced disease. This is consistent with the study in Great Britain that found waiting times for urgent cancer cases were significantly less than non-urgent cases.²⁹

Size of the community the patient came from was not significantly related to waiting time. This is different from what has been found in some other studies,^{6,29,32,35,37} and does not preclude the possibility of regional variations in waiting time as a function of other factors (e.g., Regional Health Authority, physician density, etc.).

LIMITATIONS

This study only indicates that the time between diagnosis and treatment is increasing, and not whether the time between first physician visit to treatment is increasing. It would be valuable to study the entire system interval as well as subintervals to determine if there are other trends of increase. It must also be noted that the amount of variance accounted for by the four significant predictor variables is small, both individually and collectively. Some of this is an artifact of their nonlinearity and the non-normality of the dependent variable. However, there is also considerable variability in waiting time as a function of these predictor variables and, hence, their predictive power is not particularly strong. A final limitation is that there are other potential patient variables (ethnicity, family history of breast disease) and system variables (e.g., surgeon protocol) that may be related to waiting time that were unavailable for this study.

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RÉSUMÉ

Contexte : L'étude s'articule autour de deux questions de recherche, la première étant le délai d'attente moyen entre le diagnostic et le traitement chez les Albertaines ayant le cancer du sein par rapport aux recommandations de la Société canadienne pour l'oncologie chirurgicale, et la seconde, l'influence éventuelle de l'âge, de la progression du cancer, de la taille de la communauté de la patiente et de l'année du diagnostic sur le délai d'attente.

Méthode : L'échantillon se composait de toutes les Albertaines ayant reçu un diagnostic de cancer du sein entre 1997 et 2000. Le délai d'attente a été défini comme le nombre de jours entre l'évaluation définitive et le début du traitement. Par analyse de régression multiple, nous avons examiné l'influence relative des prédicteurs du délai d'attente.

Résultats : Il y a eu 6 418 cas de cancer du sein entre 1997 et 2000. Le délai d'attente moyen entre le diagnostic et le traitement était de 20,2 jours (écart-type de 21,6), et le délai d'attente médian, de 17 jours. Une attente prolongée était associée de façon significative à l'année du diagnostic (le délai s'est allongé progressivement entre 1997 et 2000), aux patientes de moins de 70 ans, et au premier stade du cancer. L'augmentation du délai d'attente entre 1997 et 2000 semble s'expliquer par la demande accrue de services sans augmentation correspondante des ressources. Le traitement plus rapide des femmes de plus de 70 ans s'explique par le fait que davantage de ces femmes ont été traitées le jour même de leur diagnostic.

Conclusion : Seulement 44 % des femmes ont attendu 14 jours ou moins comme le recommande la Société canadienne pour l'oncologie chirurgicale. Ces délais d'attente élevés continueront sans doute à augmenter sans hausse significative des ressources en oncologie. Pour assurer un accès équitable aux soins, il faudrait étudier plus avant la raison des écarts dus à l'âge dans les délais d'attente.

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