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The role of private care in the interval between diagnosis and treatment of breast cancer in Northern Ireland: an analysis of Registry data

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ABSTRACT

Objective: To examine the differences in the interval between diagnosis and initiation of treatment among women with breast cancer in Northern Ireland.

Design: A cross-sectional observational study.

Setting: All breast cancer care patients in the Northern Ireland Cancer Registry in 2006.

Participants: All women diagnosed and treated for breast cancer in Northern Ireland in 2006.

Main outcome measure: The number of days between diagnosis and initiation of treatment for breast cancer.

Results: The mean (median) interval between diagnosis and initiation of treatment among public patients was 19 (15) compared with 14 (12) among those whose care involved private providers. The differences between individual public providers were as marked as those between the public and private sector —the mean (median) ranging between 14 (12) and 25 (22) days. Multivariate models revealed that the differences were evident when a range of patient characteristics were controlled for including cancer stage.

Conclusions: A relatively small number of women received care privately in Northern Ireland but experienced shorter intervals between diagnosis and initiation of treatment than those who received care wholly in the public system. The variation among public providers was as great as that between the public and private providers. The impact of such differences on survival and in light of waiting time targets introduced in Northern Ireland warrants investigation.

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Strengths and limitations of this study

- The study was population rather than sample based.
- The study was able to control for a limited number of confounding variables.
- The study uses data that precedes recent initiatives aimed at addressing waiting time targets for patients with cancer in Northern Ireland.

overall management strategy,[2] an early detection and treatment have been shown in a number of studies to be significant determinants of the cost and outcome.[3–6] Previous work in the Republic of Ireland with respect to screening[7] and in the USA with respect to treatment[8–10] have demonstrated that the possession of private medical insurance contributes to variations in uptake and services provided, respectively. Similarly, a work in the USA with respect to outcomes has shown these to vary between the public and private care facilities.[11] Evidence from the USA also suggests that women in possession of private health insurance have a more favourable stage of disease at breast cancer diagnosis than non-insured women.[12] While this may be expected in healthcare systems where there exists a significant role for private finance or provision (in the USA and Ireland approximately 50% of the adult population hold private medical insurance),[13][14] in systems where private finance and/or delivery of core services are the exception rather than the norm, one might not expect policymakers to be as sanguine as to the existence of such differences or for such difference to be evident as a result. As healthcare budgets come under increasing pressure, so evidence of an apparent superiority of private medicine in contexts such as the UK may receive keen attention among policymakers

INTRODUCTION

Breast cancer incidence rates have risen in Britain over the past 40 years from 73.8/100 000 women in 1975 to 126.2/100 000 in 2010.[1] As the number of women with the disease has increased, so too has pressure on the healthcare system to develop effective strategies in respect of its management. While debate continues as to the role that should be accorded screening as part of the

Table 1 Descriptive statistics

Variable Age	Percentage of obs	N	Variable	Percentage of obs	N
40 or under	7.1	60	Stage at diagnosis:stage 1	30.4	258
41–50	20.6	175	Stage 2	43.6	370
51–55	11.4	97	Stage 3	19.6	166
56–60	13.3	113	Stage 4	6.4	54
60–65	12.3	104	Average number of symptoms		2
66–70	8.4	71	Deprivation score: most deprived (1)	19.6	166
Age71 or greater	27	228	Quintile 2	19.3	164
Trust of presentation: Breast screening unit	16.8	143	Quintile 3	18.8	159
Belfast HSCT	24.4	207	Quintile 4	22.5	191
Northern HSCT	12.8	109	Least deprived (5)	19.8	168
Private	10.5	89	Have a comorbidity	72	612
South Eastern HSCT	12	100	Source of referral—GP	74	625
Southern HSCT	11.56	102	Referral source-action cancer	2	19
Western HSCT Area of residence	11	98	Referral source—breast screening unit	17	143
Urban	64	542	Referral source—other	6.9	58

GP, general practitioner; HSCT, Health and Social Care Trust.

struggling to provide quality services in an efficient manner. While evidence that delays in initiation of treatment are material in a clinical sense are mixed[15][16] that delays may well impact on anxiety levels among patients is evident.[17] In this paper, we examine the differences in the interval between diagnosis and initiation of care in patients with breast cancer among the private and public providers in Northern Ireland. We examine the intervals between diagnosis and treatment among and between the public and private providers and discuss the implications this may have for the commissioning of services.

METHODS

Data for all women diagnosed with breast cancer in Northern Ireland in 2006 were obtained from the Northern Ireland Cancer Registry (NICR). The Registry is a state-funded body that registers all cancer diagnoses in Northern Ireland and contains a range of data on the patient, their diagnosis and treatment. A total of 951 women were recorded by the registry as being diagnosed with breast cancer in 2006. Data on 848[i] women in the NICR were extracted for analysis. Data included the details on the care provider (healthcare and social care Trust) in which the woman was treated and whether the woman

had a record of being diagnosed or treated at any stage of the care pathway privately. In addition, data on the cancer stage (I–IV), the woman's age at diagnosis, the socio-economic deprivation score for the area in which she resided, whether she resided in a rural or urban area, whether or not she experienced comorbid conditions and the number of symptoms experienced. Data on the source of the referral and the Trust where the woman presented were also extracted. The complete details of all variables are presented in online supplementary appendix 1. The interval used here is the duration time between diagnosis of breast cancer and the initiation of any treatment, that is, pre-treatment in terms of the Aarhus Statement.[18]

A Cox's proportional hazards regression model[19] was used to examine whether women who were seen at any stage of their cancer journey privately had a different interval between diagnosis and initiation of treatment when other variables were controlled, than women who were dealt with entirely within the publicly funded system. Duration was measured in days. Women whose treatment was initiated on the same day as diagnosis were treated as having an interval between treatment and diagnosis of 1. The secondary analyses examined the variation among the public providers using a Cox regression model.[19] The proportional hazards assumption for the Cox regression model is tested using Schoenfeld residuals.[20]

[i]Fifty-one were dropped from the analysis as there was a negative value for the number of days between the date of diagnosis and the beginning of treatment. Two outliers were excluded from the analysis as their treatments were significantly delayed due to other life-limiting diseases. One related to a private patient with a duration of 561 days, and another of a public patient with a duration of 223 days. An additional 50 women were excluded as the stage at diagnosis was unknown and inclusion in the models violated the proportional hazards assumptions for the Cox proportional hazards regression model.

RESULTS

In table 1, descriptive statistics on a range of variables for women included in the Cox proportional hazards regression model are presented.

A total of 759 women were seen solely in public hospitals and 89 at some stage in private hospitals. The mean duration between diagnosis and initiation of treatment

Table 2 Duration between diagnosis of breast cancer and beginning of treatment

Number of days between diagnosis and treatment of breast cancer	Public patients (N=759)	Private patients (N=89)
Treatment initiated on the same day	4%	5%
Treatment initiated between 1 and 10 days after diagnosis	27%	41%
Treatment initiated between 11 and 15 days after diagnosis	23%	20.5%
Treatment initiated between 16 and 25 days after diagnosis	23.4%	20.5%
Treatment initiated between 26and 75 days after diagnosis	22%	13%
Treatment initiated between 76 and 121 days after diagnosis	0.6%	0%
Average time between diagnosis and initiation of treatment	19 days	14 days
Median time between diagnosis and initiation of treatment	15 days	12 days
10th centile	5 days	3 days
25th centile	9 days	6.5 days
50th centile	15 days	12 days
75th centile	24 days	18 days
90th centile	36 days	28 days
95th centile	48 days	33 days

for women seen at some stage in private hospitals was 14 days and that for those seen solely in publicly funded hospitals is 19 days. The difference in the interval between diagnosis and initiation of treatment was statistically significant before other variables were controlled for, $p<0.01$. The differences in the percentages of private versus public patients in terms of the intervals between diagnosis and initiation of treatment are reported in table 2 at various durations.

Table 3 shows each of the number of women in the dataset by trust in which they lived and the trust in which they presented, for example, 179 women diagnosed with breast cancer in 2006 resided in the Belfast Trust area but 237 women presented through the Belfast Trust. As illustrated the Trust with the highest number opting for private healthcare is the South Eastern Health and Social Care Trust (HSCT) with the lowest number coming from the Western Trust.

Figure 1 illustrates the variation in interval for both groups of patients. The y-axis represents the number of days between diagnosis and treatment; the whiskers plot the CI.

The results from Cox's proportional hazards regression model in which we focus on the distinction between public and private controlling for a range of variables—including age, stage, source of referral, comorbid status and deprivation score—are presented in table 4. Coefficients in the table may be interpreted as follows: if the coefficient is greater than 1, treatment is likely to be initiated sooner after diagnosis; if the coefficient is less than 1, the interval between diagnosis and initiation of treatment is likely to be longer. As can be seen, controlling for confounding variables, women diagnosed or treated at any stage privately are likely to have a shorter interval between diagnosis and initiation of treatment than those whose diagnosis and treatment are wholly within the public system. The p value for the Schoenfeld residual test is presented at the end of table 3.[19] Obtaining a p value greater than 0.05 indicates that the proportional hazards assumption for the Cox regression model is not violated.

Examining the variations in the interval between diagnosis and initiation of treatment among providers reveals that, on an average, the interval was 15 days for Belfast HSCT (n=207), 18 days for the Northern HSCT (n=109), 14 days for private hospitals (n=89) or the South-Eastern HSCT n=(100), 25 days for the Southern HSCT (n=102), 19 days for the Western HSCT (n=98) and 24 days for the breast screening programme (n=143). This indicates wide variations among publicly funded care providers. In table 5, results of a Cox regression that controls for individual trusts are reported, as well as confounding variables are presented. As can be seen while the coefficient on private hospitals remains

Table 3 Trust of residence and trust of presentation

Trust of residence	Trust of presentation							
	Belfast	BSU	Northern	Private	South-Eastern	Southern	Western	Total
Belfast	108	20	0	16	35	0	0	179
Northern	53	36	123	28	5	4	4	253
South Eastern	57	26	1	30	76	0	0	190
Southern	18	37	2	17	3	113	2	192
Western	1	29	0	5	0	1	99	135
Total	237	148	126	96	119	118	105	949*

*Trust of presentation was not recorded for two women in the sample, they are not included in table 3.
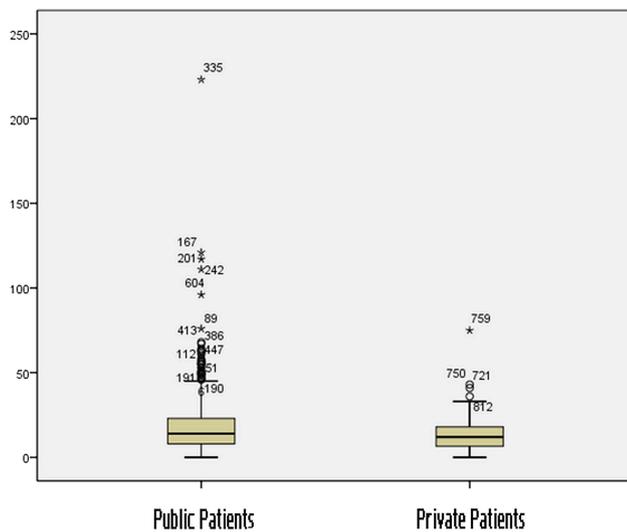BSU, breast screening unit.

Figure 1 Duration times for private and public patients between diagnosis and treatment of breast cancer, all stages.

significant, so too is that on several of the publicly funded care providers.

DISCUSSION

In the interests of brevity, we focus our discussion on the impact of public versus private care on the interval between diagnosis and initiation of treatment as well as among the public sector providers. The differences are

Table 4 Cox's proportional hazards regression model output

Variable N=845†	HR
Urban/rural	1.045 (0.075)
Age 41–50	1.062 (0.16)
Age 51–55	0.894 (0.148)
Age 56–60	1.181 (0.19)
Age 60–65	1.033 (0.169)
Age 66–70	1.126 (0.211)
Age 71 or greater	1.154 (0.17)
Have a comorbidity	0.996 (0.005)
Stage 2	1.04 (0.082)
Stage 3	1.025 (0.108)
Stage 4	0.956 (0.152)
Number of symptoms	0.982 (0.019)
Quintile 2	0.878 (0.093)
Quintile 3	0.873 (0.097)
Quintile 4	0.839 (0.09)
Least deprived	1.116 (0.123)
Breast screening unit	0.647*** (0.066)
Action cancer	1.158 (0.217)
Other	0.889 (0.151)
Individuals seen privately at some stage along the treatment pathway	1.358** (0.178)
Schoenfeld residual test p value	<0.05

Numbers in parentheses are SEs.
*, 90% significance level; **, 95% significance level;
***, 99% significance level.
†Source of referral is unknown for three observations which are excluded from the model displayed in table 4.

Table 5 Cox's proportional hazards regression model output—trust of presentation

Variable (N=848)	HR
Urban/rural	1.125 (0.082)
Age 41–50	1.079 (0.164)
Age 51–55	0.92 (0.149)
Age 56–60	1.21 (0.195)
Age 60–65	1.024 (0.172)
Age 66–70	1.167 (0.222)
Age 71 or greater	1.128 (0.169)
Have a comorbidity	0.995 (0.005)
Stage 2	1.017 (0.08)
Stage 3	0.972 (0.109)
Stage 4	0.909 (0.147)
Number of symptoms	0.988 (0.019)
Quintile 2	0.885 (0.093)
Quintile 3	0.849 (0.095)
Quintile 4	0.8** (0.088)
Least deprived	0.96 (0.108)
Belfast HSCT	0.962 (0.15)
Northern HSCT	0.732* (0.119)
Breast screening unit	0.475*** (0.074)
South-Eastern HSCT	0.957 (0.156)
Southern HSCT	0.464*** (0.076)
Western HSCT	0.68** (0.113)
Schoenfeld residual test p value	<0.05

Numbers in parentheses are SEs.
*, 90% significance level; **, 95% significance level;
***, 99% significance level.
HSCT, Health and Social Care Trust.

evident between patients whose entire care was within the public sector and those who were seen at some point in the private sector. That private medicine (funding or provision) should impact on care in a mixed healthcare system is unsurprising. Self-interest would suggest the reason individuals hold private medical insurance is because of the superior service—including the speed with which individual's treatment might be initiated[21]—it affords and private providers operate because there exists an effective demand for the services they provide. As noted, the previous studies in the area of breast cancer have demonstrated the existence of difference whether in service uptake, provision or outcome[7 10 11] in such systems. That differences in terms of the speed with which care is initiated appear to exist between the public and private sectors in a country whose publicly funded healthcare system extols equality of access based on need, and not the ability to pay is not perhaps what one might expect. With specific regard to the interval between diagnosis and initiation of treatment, general concerns have indeed been explicitly referenced by the Department of Health.[17] Crucially though these have focused on variations per se and not on variations between public and private providers. This study has clearly demonstrated that such concerns (at least in 2006) were justified in the Northern Ireland. Importantly, even though there were differences between the private and public providers (when confounding

variables are controlled for), the dichotomy between the public and private provision is false in the sense that best practice among public providers was on a par with that in the private sector. Poor performance among some public providers was not evident among all of them. It is unclear whether the difference between the best and worst performing providers in terms of the interval in the initiation of treatment was material with respect to the outcome, though others have found delays may be a source of anxiety to some patients[18 22] and as noted with respect to survival.[16] In their investigation into the effect of waiting times between localised breast cancer diagnosis and treatment, Redaniel et al[15] found that the duration times have a very little impact on survival. However, as highlighted by Paul et al,[22] longer interval times can have negative psychological impacts on patients with cancer. This also raises the question of the effect of longer duration times on non-localised breast cancer. Our results show that there is no stage differential in the interval between diagnosis and initiation of treatment.

The cost and outcomes do not form part of the analysis undertaken and no inference with respect to these is made. The difference in the speed with which the system responds may nevertheless be taken as a valid indicator of quality. What might constitute an appropriate policy response to such delays, this study suggests, will depend on the particular circumstances that explain poor performance in the case of individual providers. These may relate to the staffing issues unique to the period studied, other capacity issues or broader managerial deficiencies. That the issue is public sector provision per se though is clearly not the case. As public expectations rise and healthcare budgets come under increasing pressure, debate as to how best to deliver care in breast cancer and other services will intensify. Privatisation will inevitably be mooted by some as a solution. These results, however, indicate that with respect to breast cancer services, there is no reason to believe it offers a superior service to that which can be delivered by the public sector.

Since 2006, waiting time targets for patients with cancer have been introduced in Northern Ireland. Whether this has impacted on the speed with which treatment is initiated (ie, delay in receiving treatment after a positive diagnosis) or differences among and between public and private providers in this regard require further examination. What, if any, impact such delays or failure to reach targets may have had on survival and cost of care are also areas that seem worthy of further examination.

Data sharing statement The Cancer Registry maintains details of all incident cases of cancer in Northern Ireland. Details of the data and arrangements for access can be obtained from the Northern Ireland Cancer Registry.

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APPENDIX

The variables presented in this study are based on data from the National Cancer Registry
Northern Ireland from 2006. The data for approx 900 women from 2006 are analysed in this
study.

Variable	Definition
Age	Age at which the woman was diagnosed
Individual treated privately	If the patient was treated in a private hospital at any stage along the diagnostic or treatment pathway
Deprivation Score	The deprivation score for the area in which the woman resided ranging from 1 the most deprived to 5 the least deprived
Source of Referral	Source of referral, including Action Cancer, GP referral, Breast Cancer Screening Unit, or other source if the woman presented outside these 3, such as cancer found during investigations or treatment for comorbidity or the patient referred herself to Accident and Emergency directly
Stage at diagnosis	The stage of the breast cancer at diagnosis, I-IV or unknown
Urban/Rural	If the woman lives in an urban or rural area
Trust of Presentation	Trust in which the woman is diagnosed, Belfast Health and Social Care Trust (HSCT), Breast Screening Programme, Northern HSCT, private hospital, South-Eastern HSCT or the Western HSCT
Have a Comorbidity	If the woman has a comorbidity or not
Number of diagnostic tests carried out	Number of diagnostic tests carried out during the diagnostic phase of care
Number of symptoms	Number of symptoms experienced by the woman