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The characteristics, management and outcomes of older women with breast cancer in New Zealand

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ABSTRACT

The aim of this study was to understand the characteristics of older women with breast cancer and to describe the current patterns of treatment and outcomes. The study included data from the combined Auckland and Waikato breast cancer registers, which hold information for 12, 372 women diagnosed with stage I–IV breast cancer between June 2000 and May 2013. Of these women, 2671 (21.6%) were over 70 years of age. Patient characteristics, treatment type and survival were compared across four-year age groups (70–74, 75–79, 80–84, 85+) and hormone receptor status. Of the women aged over 70 years, 2485 (93.0%) had stage I–III disease. Increasing age was significantly associated with decreasing use of surgery, adjuvant radiotherapy, endocrine therapy and chemotherapy, even after adjustment for stage and level of co-morbidity. Nine hundred and one women (33.7%) had co-morbidities at the time of diagnosis. The 5-year breast cancer-specific survival rate for women aged 70–74 and that for women aged 75–79 were similar, but was worse in women aged over 80. Generally, older women are treated as per guidelines, although chemotherapy may be under-used. However, age is a significant factor influencing whether women are treated or not.

1. Introduction

Breast cancer is the second most common cancer worldwide [1], and the likelihood of being diagnosed increases with age [2]. In New Zealand (NZ), over 3000 new breast cancers were registered in 2015, with just over 800 (24.0%) of those occurring in women aged over 70 [3]. As populations age, the number of older women requiring treatment will increase [4,5].

Management of breast cancer in the elderly faces a number of issues. Historically, women over 70 have been consistently excluded from clinical trials [6–12], and with limited data demonstrating the effectiveness of standard treatments in the older population [13–15], current treatment strategies are founded on clinical evidence derived from younger women [16]. However, older women represent a different population, have a more heterogeneous level of fitness [17] and commonly present with a higher level of co-morbidity [18] and tumours that differ in their biology [19]; all factors which impact on treatment. In addition, in NZ, inclusion in a free mammographic screening programme ceases for those aged 70 years or more [20,21]. This is one reason why older women on average present with larger tumours that are at a more advanced stage [22,23]. Competing health risks contribute to considerable variation in adherence to existing treatment guidelines in older women [24], and in some cases, this results in older women not receiving treatment according to recommendations [11,25]. For all the reasons above, it has been well demonstrated that older women on average have worse outcomes from breast cancer. Therefore, specific management guidelines may be needed for the older population [26].

NZ's population is ethnically diverse, and access to breast cancer treatment varies by ethnicity [27], urban/rural status [28] and primary treatment provider (private vs. public) [29]. The NZ guidelines on the management of breast cancer do not specify age as a factor that should be included when deciding on care. We aimed to assess the impact of age on the management and outcomes for women in NZ with newly diagnosed breast cancer and what influences this might have on the need for specific guidelines for older women.

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2. Methodology

The study was a retrospective analysis of a prospectively collected cohort. Data were extracted from the combined Waikato and Auckland Breast Cancer Registers, which hold the clinical details of women diagnosed with breast cancer. The study period was from June 2000 to May 2013. Each register includes information on 1) patient characteristics: age, ethnicity, domicile and diagnosis date; 2) tumour biology: size, grade, hormone and human epidermal growth factor receptor 2 (HER2) receptor status, lymph node involvement and staging, 3) treatment: chemotherapy, endocrine therapy, radiotherapy and surgery. Outcomes included all-cause and breast cancer-specific mortality.

Only women who were 70 years or older with newly diagnosed, invasive (stage I–IV) breast cancer were included in this study (N = 2,671). Women were split into four-year age groups (70–74, 75–79, 80–84 and 85+) for analysis. Firstly we established the characteristics of older women with breast cancer including demographics (age, ethnicity, region, urban/rural status); their tumour characteristics (stage, grade, size, hormone receptor and HER2 status); and factors associated with their management (mode of detection, public or private care and the presence of co-morbidities). Co-morbidity information was obtained from the National Minimum Dataset (NMDS) and patients were characterised as either having zero co-morbidities (C0), one co-morbidity (C1) or two or more co-morbidities (2+) using the C3 co-morbidity index [29,30].We then linked these variables to patient treatment, including surgery in women with localised disease (breast conserving surgery (BCS), mastectomy or no surgery), endocrine therapy in those who were oestrogen (ER) and/or progesterone (PR) positive; radiotherapy in those who received BCS and finally the use of chemotherapy and HER2 targeted therapies. A forward stepwise logistic regression model was carried out on these four treatment groups to see if age affects patient management (alpha level < 0.05). Finally, we assessed mortality by age group and by hormone receptor subtype. Hormone receptor subtype was categorised as Group 1 (ER+, PR+, HER2-), Group 2 (ER+, PR-, HER2-; ER-, PR+, HER2-), Group 3, (ER+, PR+, HER2+; ER+, PR-, HER2+; ER-, PR+, HER2+), Group 4 (ER-, PR-, HER2+) and Group 5 (Triple negative; ER-, PR-, HER2-) [31]. Patients were linked via the National Health Index (NHI) number with the National Mortality Collection to obtain mortality information. Kaplan-Meier survival was used to examine breast cancer-specific survival and all-cause survival.

Data were analysed using IBM SPSS Statistics 23 (New York, United States). If a patient had missing data they were recorded as 'unknown' and included in analyses (unless where specified). Ethical approval for the study was granted through the Northern A Health and Disability Ethics Committee, reference: 12/NTA/42/AM01.

3. Results

3.1. Patient and tumour characteristics

There were 12, 372 invasive breast cancers registered in the Auckland and Waikato regions between 2000 and 2013, of which, 2671 (21.6%) were diagnosed in women over 70 years of age. The majority of women were NZ European (2276, 85.2%) (see Table 1), with a mean age of 78.8 years (range 70–104 years). Fifteen percent were detected through mammographic screening. Most women had zero co-morbidities (1427, 53.4%), but 33.7% (901) presented with a high level of co-morbidity (i.e., 2+ co-morbid conditions) at time of diagnosis. The majority of women (2, 485, 93.0%) had localised (stage I–III) cancer, and 186 (7.0%) women had stage IV cancer. Five hundred and seventy-eight women (21.6%) had a tumour grading of 3, and 225 women (8.4%) had a tumour size over 50 mm (i.e., T3 disease).

The proportion of older women with their hormone receptor subtype is presented in Table 2. Of the total cohort, 910 women (34.1%) did not have complete information on their receptor status and so were not categorised. ER positive cases are found in Groups 1–3, while Group 5 (usually designated triple negative), are the most likely to receive chemotherapy. Hormone receptor status was more likely to be ER positive (2109, 79.0%) and PR positive (1653, 61.9%). Women in Groups 1–3 were more likely to receive endocrine therapy; 750 (70.3%) in Group 1, 195 (67.7%) in Group 2 and 87 (79.1%) in Group 3.

3.2. Surgery

Of the 2485 (93.0%) women with stage I–III cancer, 2131 (85.8%) received surgery. Of these, 1264 (59.3%) had a mastectomy and 867 (40.7%) had breast conserving surgery (BCS). With the exception of those aged 80–84, women with stage I cancer were more likely to have BCS, whereas women with stage II–III cancer were more likely to have mastectomy, irrespective of age. In a stepwise logistic regression, a number of factors were associated with the probability of having surgery. The likelihood of receiving surgery decreased with increasing age. Māori patients were significantly less likely to receive surgical treatment, even after adjustment for the presence of co-morbidities. Women with more advanced stage disease were less likely to be treated surgically, as were women with subtype Group 5 cancer.

3.3. Chemotherapy

Very few women were treated with chemotherapy. Of those who were stage I–III, only 101 (4.1%) were treated with chemotherapy. Again age was a significant factor, with older women being less likely to receive treatment. Waikato women were twice as likely to be treated with chemotherapy than older women in Auckland. Of those with metastatic breast cancer, only 7 (3.8%) had chemotherapy and all of them were in the Waikato. One hundred and eighty-four women (6.9%) were found to be HER2 positive, but only 24 (13.0%) of these women received Trastuzumab.

3.4. Radiotherapy

Of the 872 women in total who were treated with BCS, 637 (73.1%) received radiotherapy. Age was a significant factor again in the use of radiotherapy, as was the presence of multiple co-morbidities. After adjusting for age and co-morbidities, no difference in the use of radiotherapy was found in Māori, but Pacific women were less likely to be treated. The main influence on whether these women were treated was whether they were treated publicly or privately or whether they were in Waikato.

3.5. Endocrine therapy

Analysing use of endocrine therapy by subtype, 1,465 women (54.8%) were categorised as Group 1–3. Of these, 1032 (70.4%) received endocrine therapy. Women were significantly less likely to receive endocrine therapy as age increased. Older Māori women were more likely to receive endocrine therapy, as were women in the Waikato, and those receiving treatment in the public sector (see Table 3).

3.6. Survival

Five year survival across age groups was analysed using the Kaplan-Meier method (Fig. 1). There was a significant difference in breast cancer-specific and all-cause survival across age groups, with 80–84 and 85+ year olds having worse breast cancer specific and all-cause survival than women aged 70–74 and 75–79. Five-year breast cancer-specific survival was worst for 85+ year olds (76.0%), followed by 80–84 year olds (80.1%), 75–79 year olds (84.8%) and was best for 70–74 year olds (86.1%). Similar proportions of women aged 70–79 died from breast cancer and from other causes. For women 80 and over,

Table 1
Patient and tumour characteristics by age group (N = 2671).

	Age group	70–74	%	75–79	%	80–84	%	85+	%	Totals	%
Age	n	832	31.1	726	27.2	547	20.5	566	21.2	2671	100.0
Screen detected	Yes	234	28.1	115	15.8	29	5.3	25	4.4	403	15.1
	No	598	71.9	611	84.2	518	94.7	541	95.6	2268	84.9
Public/Private	Private	256	30.8	198	27.3	112	20.5	91	16.1	657	24.6
	Public	576	69.2	528	72.7	435	79.5	475	83.9	2014	75.4
Urban/Rural	Rural	197	23.7	167	23.0	138	25.2	109	19.3	611	22.9
	Urban	627	75.4	551	75.9	403	73.7	450	79.5	2031	76.0
	Unknown	8	1.0	8	1.1	6	1.1	7	1.2	29	1.1
Ethnicity	NZ European	664	79.8	596	82.1	490	89.6	526	92.9	2276	85.2
	NZ Māori	55	6.6	46	6.3	14	2.6	10	1.8	125	4.7
	Pacific	45	5.4	25	3.4	19	3.5	9	1.6	98	3.7
	Other	55	6.6	46	6.3	22	4.0	18	3.2	141	5.3
	Unknown	13	1.6	13	1.8	2	0.4	3	0.5	31	1.2
Register	Auckland	624	75.0	525	72.3	385	70.4	435	76.9	1969	73.7
	Waikato	208	25.0	201	27.7	162	29.6	131	23.1	702	26.3
Surgery	Mastectomy	407	48.9	381	52.5	288	52.7	223	39.4	1299	48.6
	BCS	368	44.2	258	35.5	131	23.9	115	20.3	872	32.6
	None	57	6.9	87	12.0	127	23.2	229	40.5	500	18.7
	No RT	396	47.6	405	55.8	392	71.7	492	86.9	1685	63.1
	RT post-BCS	312	37.5	203	28.0	84	15.4	38	6.7	637	23.8
Radiotherapy	RT post-Mast	110	13.2	108	14.9	58	10.6	28	4.9	304	11.4
	RT pre-Mast	4	0.5	2	0.3	2	0.4	2	0.4	10	0.4
	RT No Surgery	10	1.2	8	1.1	11	2.0	6	1.1	35	1.3
Treatment	Endocrine	495	59.5	451	62.1	340	62.2	353	62.4	1639	61.4
	Chemotherapy	78	9.4	28	3.9	2	0.4	0	0.0	108	4.0
	Trastuzumab	18	2.2	9	1.2	0	0.0	0	0.0	27	1.0
	No treatment	28	3.4	35	4.8	38	6.9	58	10.2	159	6.0
ER	Negative	161	19.4	106	14.6	75	13.7	71	12.5	413	15.5
	Positive	661	79.4	594	81.8	431	78.8	423	74.7	2109	79.0
	Unknown	10	1.2	26	3.6	41	7.5	72	12.7	149	5.6
PR	Negative	298	35.8	221	30.4	166	30.3	171	30.2	856	32.0
	Positive	520	62.5	476	65.6	337	61.6	320	56.5	1653	61.9
	Unknown	14	1.7	29	4.0	44	8.0	75	13.3	162	6.1
HER 2	Negative	541	65.0	454	62.5	309	56.5	286	50.5	1654	61.9
	Positive	64	7.7	54	7.4	38	6.9	28	4.9	184	6.9
	Not done	227	27.3	218	30.0	200	36.6	252	44.5	897	33.6
	Unknown	45	5.4	70	9.6	88	16.1	166	29.3	369	13.8
	0 ~ 10	112	13.5	58	8.0	30	5.5	16	2.8	216	8.1
Tumour Size	10 ~ 20	274	32.9	181	24.9	110	20.1	97	17.1	662	24.8
	20 ~ 30	204	24.5	215	29.6	138	25.2	130	23.0	687	25.7
	30 ~ 50	138	16.6	143	19.7	122	22.3	109	19.3	512	19.2
	50+	59	7.1	59	8.1	59	10.8	48	8.5	225	8.4
	1	189	22.7	165	22.7	104	19.0	110	19.4	568	21.3
Grade	2	406	48.8	344	47.4	234	42.8	214	37.8	1198	44.9
	3	198	23.8	157	21.6	122	22.3	101	17.8	578	21.6
	Unknown	39	4.7	60	8.3	87	15.9	141	24.9	327	12.2
C3 score	0	543	65.3	410	56.5	257	47.0	217	38.3	1427	53.4
	1	105	12.6	95	13.1	73	13.3	70	12.4	343	12.8
	2+	184	22.1	221	30.4	217	39.7	279	49.3	901	33.7
Stage	I	356	42.8	246	33.9	156	28.5	161	28.4	919	34.4
	II	325	39.1	325	44.8	262	47.9	289	51.1	1201	45.0
	III	100	12.0	102	14.0	87	15.9	76	13.4	365	13.7
	IV	51	6.1	53	7.3	42	7.7	40	7.1	186	7.0

death from other causes was the much greater risk. There was also a significant difference in breast cancer-specific survival across hormone receptor subtype (Fig. 2), with survival being worst for Group 4 (61.0%) HER2 over-expression, and best for Group 1 (89.6%).

4. Discussion

The present study describes the characteristics, treatment and outcomes of women aged 70 years or older with breast cancer across two regions in NZ. Age was a significant factor in all treatment variables. After adjustment for key variables we noted that older women received less surgery, less chemotherapy and less radiotherapy as age increased. Breast cancer-specific survival was impacted by age and subtype, with worse 5-year survival for women aged over 85 and those women with ER and PR negative and HER2 positive cancer (Group 4).

Several studies have suggested that elderly women are less likely to receive surgery according to guidelines, and that age is a factor [5,6,13,16–18,23,32–35]. We found in our cohort, even after adjustment for co-morbidities, older women were less likely to receive surgery. Three hundred and fifty-four women (14.2%) with stage I–III cancer did not receive surgical treatment. The majority of these women had multiple co-morbidities and so had valid contraindications to surgery. However, age on its own is not listed as a factor for surgical consideration in the NZ guidelines. Of concern is that older women of NZ Māori ethnicity were less likely to receive surgery. In addition, women with stage III compared with stage I disease seem to be less likely to be treated surgically and are more likely to be treated with endocrine therapy.

In terms of non-surgical intervention, age was again the most significant factor determining whether older women received treatment. Only 101 women (4.1%) with stage I–III cancer, and 7 women (3.8%) with metastatic disease received chemotherapy. Elderly women in the

Table 2
Patient and tumour characteristics by hormone receptor subtype (N = 1761). Women with unknown hormone receptor status (n = 910) were not included in this analysis.

		Group 1		Group 2		Group 3		Group 4		Group 5		Total	
		ER/PR+, HER2-		ER+, PR-, HER2- ER-, PR+, HER2-		ER/PR+, HER2+ ER+, PR-, HER2+ ER-, PR+, HER2+		ER/PR-, HER2+		ER/PR-, HER2-			
		n = 1067		n = 288		n = 110		n = 72		n = 224		N = 1761	
		n	%	n	%	n	%	n	%	n	%	N	%
Age	70–74	345	32.3	97	33.7	37	33.6	27	37.5	95	42.4	601	34.1
	75–79	320	30.0	76	26.4	32	29.1	21	29.2	58	25.9	507	28.8
	80–84	203	19.0	60	20.8	27	24.5	11	15.3	42	18.8	343	19.5
	85+	199	18.7	55	19.1	14	12.7	13	18.1	29	12.9	310	17.6
Surgery	BCS	422	39.6	96	33.3	28	25.5	20	27.8	59	26.3	625	35.5
	Mast	497	46.6	150	52.1	68	61.8	45	62.5	151	67.4	911	51.7
	No surgery	148	13.9	42	14.6	14	12.7	7	9.7	14	6.3	225	12.8
Chemotherapy	Yes	12	1.1	9	3.1	10	9.1	13	18.1	50	22.3	94	5.3
	No	1055	98.9	279	96.9	100	90.9	59	81.9	174	77.7	1667	94.7
Radiotherapy	Yes	431	40.4	113	39.2	37	33.6	29	40.3	107	47.8	717	40.7
	No	636	59.6	175	60.8	73	66.4	43	59.7	117	52.2	1044	59.3
Endocrine	Yes	750	70.3	195	67.7	87	79.1	6	8.3	17	7.6	1055	59.9
	No	317	29.7	93	32.3	23	20.9	66	91.7	207	92.4	706	40.1
Trastuzumab	Yes	0	0.0	0	0.0	9	8.2	15	20.8	1	0.4	25	1.4
	No	1067	100.0	288	100.0	101	91.8	57	79.2	223	99.6	1736	98.6
Ethnicity	NZ European	898	84.2	250	86.8	97	88.2	55	76.4	193	86.2	1493	84.8
	NZ Māori	65	6.1	13	4.5	4	3.6	1	1.4	7	3.1	90	5.1
	Pacific	33	3.1	5	1.7	4	3.6	10	13.9	9	4.0	61	3.5
	Other	59	5.5	13	4.5	5	4.5	5	6.9	13	5.8	95	5.4
	Unknown	12	1.1	7	2.4	0	0.0	1	1.4	2	0.9	22	1.2
Stage	I	406	38.1	101	35.1	29	26.4	15	20.8	56	25.0	607	34.5
	II	464	43.5	129	44.8	51	46.4	33	45.8	106	47.3	783	44.5
	III	138	12.9	34	11.8	22	20.0	13	18.1	46	20.5	253	14.4
	IV	59	5.5	24	8.3	8	7.3	11	15.3	16	7.1	118	6.7
Grade	1	299	28.0	54	18.8	8	7.3	1	1.4	3	1.3	365	20.7
	2	581	54.5	149	51.7	52	47.3	11	15.3	57	25.4	850	48.3
	3	123	11.5	64	22.2	43	39.1	59	81.9	153	68.3	442	25.1
Tumour size	Unknown	102	9.6	34	11.8	13	11.8	5	6.9	13	5.8	167	9.5
	0 ~ 10	95	8.9	24	8.3	4	3.6	6	8.3	15	6.7	144	8.2
	10 ~ 20	296	27.7	71	24.7	25	22.7	13	18.1	45	20.1	450	25.6
	20 ~ 30	282	26.4	70	24.3	34	30.9	21	29.2	70	31.3	477	27.1
	30 ~ 50	212	19.9	57	19.8	25	22.7	18	25.0	55	24.6	367	20.8
	50+	80	7.5	32	11.1	9	8.2	9	12.5	26	11.6	156	8.9

current cohort were significantly less likely to receive chemotherapy as age and level of co-morbidity increased, which is in accordance with other research [4,11,12,16,23,35–39]. A number of valid reasons do preclude the provision of chemotherapy in older women; chemotherapy use typically decreases with increasing level of co-morbidity [38,40], physicians may prefer not to administer it due to toxicity [9,11,14] and the potential impact on fitness [10,18,41]. Women themselves may decline treatment knowing that there are serious toxicities and adverse effects on quality of life [42], and there may also be a level of cognitive impairment associated with chemotherapy use [43]. Approximately 20% of women who had triple-ve disease or HER2 over expressing tumours did receive chemotherapy. Interestingly, women in the current cohort were twice as likely to be treated with chemotherapy in Waikato, suggesting physician preference could be a significant driver. It was also interesting to note that no women over the age of 80 years were treated with Trastuzumab, yet over 600 women aged over 80 years were tested for HER2 expression (see Table 1). While we have shown that HER2 status is a prognostic indicator, HER2 testing is expensive (NZD$196 in the Waikato) [44] and it could be argued that women over 80 should not be tested. On the other hand, knowledge of HER2 status may sway borderline cases in favour of undergoing surgery, and for hormone responsive women with HER2 positive cancers, may also strengthen the indication to give endocrine treatment.

Endocrine therapy was the most administered non-surgical treatment. Generally, a high proportion of elderly women usually receive endocrine therapy [4,6,16,18,23,26], reflecting the higher proportion of ER and PR receptor positive cancers common in the older population [4,14,18,19,23,36,37]. Endocrine therapy is also a less toxic treatment than chemotherapy, and so is a good option for patients who may be very old or frail and therefore not eligible for surgery [13,26]. In the current cohort, Māori were more likely to be treated with endocrine therapy, but less likely to have surgery. Recent data has reported lower rates of BCS and surgical reconstruction for Māori compared to NZ European [45]. In addition, existing inequities around access to care and treatment for Māori are well documented [22,27,31,45] and so may have contributed to the lower rate of surgery.

Six hundred and thirty-seven women (73.1%) received BCS followed by adjuvant radiotherapy. However, radiotherapy use declined with increasing age and level of co-morbidity. Declining rates of radiotherapy with advancing age have also been reported in a variety of countries [4,11,16,23,35–37]. Lower use of radiotherapy in the elderly is in part due to the reduction in absolute benefit shown in older women [9,11], with competing risks for death. Risk of local recurrence generally tends to decrease with age, and this has to be weighed against the

Table 3
Multivariate analysis for factors associated with treatment.

Treatment	Factors	Odds Ratio	(95% C.I.)
Surgery	Age	0.85	(0.83–0.87)***
	Public vs private	0.33	(0.21–0.52)***
	Stage 2 vs 1	0.52	(0.37–0.71)***
	Stage 3 vs 1	0.40	(0.26–0.61)***
	C3 score: 1 vs 0	0.71	(0.45–1.11)
	C3 score: 2+ vs 0	0.36	(0.27–0.48)***
	Subtype Grp 2 vs Grp 1	1.19	(0.71–1.98)
	Subtype Grp 3 vs Grp 1	1.48	(0.67–3.29)
	Subtype Grp 4 vs Grp 1	4.41	(1.00–19.51)
	Subtype Grp 5 vs Grp 1	6.49	(2.26–18.62)***
	Māori vs others	0.48	(0.26–0.87)*
	Pacific vs others	0.61	(0.31–1.19)
Chemotherapy	Age	0.79	(0.75–0.84)***
	Grade 2 vs 1	14.46	(1.96–106.84)*
	Grade 3 vs 1	102.99	(14.16–749.09)***
	Waikato vs Auckland	2.17	(1.37–3.43)**
	C3 score: 1 vs 0	1.20	(0.66–2.20)
	C3 score: 2+ vs 0	0.46	(0.25–0.85)*
Radiotherapy	Age	0.86	(0.83–0.88)***
	C3 score: 1 vs 0	1.00	(0.60–1.66)
	C3 score: 2+ vs 0	0.44	(0.31–0.64)***
	Waikato vs. Auckland	9.85	(2.29–42.26)**
	Public vs. Private	0.14	(0.03–0.76)*
	Māori vs others	0.93	(0.38–2.30)
	Pacific vs others	0.22	(0.07–0.67)*
Endocrine therapy	Age	0.96	(0.93–0.98)***
	Grade 2 vs 1	2.53	(1.86–3.44)***
	Grade 3 vs 1	3.24	(1.99–5.27)***
	Stage 2 vs 1	3.70	(2.73–5.01)***
	Stage 3 vs 1	8.06	(4.34–14.97)***
	Waikato vs Auckland	3.75	(2.58–5.46)***
	Public vs private	1.55	(1.15–2.10)**
	Māori vs others	2.71	(1.10–6.69)*
	Pacific vs others	1.82	(0.65–5.12)

* < 0.05, ** < 0.01, *** < 0.001.

negative effects on quality of life [46] and difficulties in accessing care that may influence treatment decisions [16]. As with chemotherapy, older women were more likely to receive radiotherapy in Waikato and women treated in the private sector were also more likely to receive radiotherapy.

Breast screening improves early diagnosis and survival [22] but ceases at age 69 for women in NZ. NZ is considering widening the age for mammographic screening from 45 to 74 years. It is interesting to note that 254 women (28.1%) aged 70–74 had been screened, suggesting that widening the age criteria may not have quite as large an impact as expected in reducing breast cancer specific mortality. Our findings with regards to mortality show that breast cancer survival for women 70–79 years is good, but decreases in women 80+ where treatment is more likely to not be offered. As with younger women, hormone receptor status also has a more profound influence on prognosis than age (Fig. 2). Overall, all-cause mortality is naturally age-related but 10-year survival in those aged 70–79 is over 50% and in 80–84 year old women with breast cancer 10-year survival is still over 20%.

The strengths of this study include the relatively large sample, derived from generally complete datasets from the Waikato and Auckland Breast Cancer Registers. Despite the quality of information contained in these databases, there was still some missing data, such as biomarker status, tumour size and grade that might influence the findings.

This study has shown that although age is not listed as a factor that should influence management of women with breast cancer in the NZ guidelines, in fact, increasing age is a significant variable in treatment decisions when managing women over the age of 70 years. This is true after adjustment for the presence of co-morbidities, stage and endocrine status, which are recognised factors influencing treatment decisions. While most women received surgery and when indicated, endocrine therapy, chemotherapy was generally little used, although usage varied depending on the centre involved. International differences in the use of chemotherapy [16,32,37] may suggest there is an argument to review when chemotherapy can be used in older age groups.

Contributors

Tania Blackmore wrote the article under the guidance of Ross Lawrenson.

Data analysis was conducted by Tania Blackmore and Chunhuan Lao.

All authors contributed to the study design, and edited and reviewed the article.

Conflict of interest

The authors declare they have no conflict of interest.

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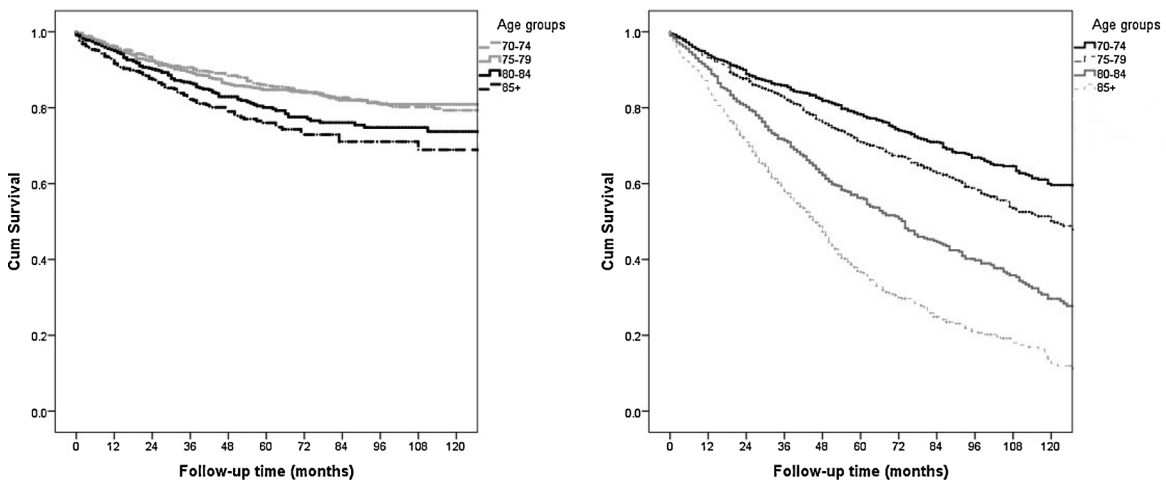

Fig. 1. Kaplan-Meier analysis comparing breast cancer-specific survival (left) and all-cause survival (right) across age groups over 70.

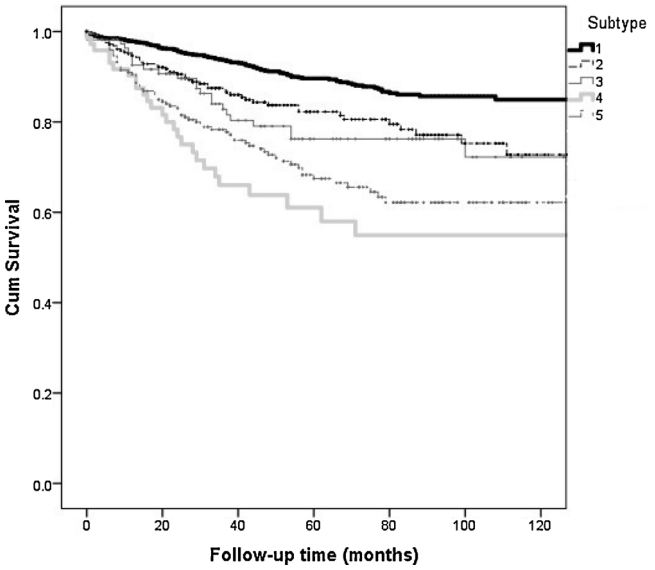

Fig. 2. Kaplan-Meier analysis comparing breast cancer-specific mortality across subtype.

Ethical approval

Ethical approval for the study was granted through the Northern A Health and Disability Ethics Committee, reference: 12/NTA/42/AM01.

Provenance and peer review

This article has undergone peer review.

Research data (data sharing and collaboration)

There are no linked research data sets for this paper. The data that have been used are confidential.

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