BreastScreen Aotearoa Annual Report 2013

EARLY AND LOCALLY ADVANCED BREAST CANCER DIAGNOSED IN NEW ZEALAND PATIENTS IN 2013

Prepared for Ministry of Health, New Zealand

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Prepared by:

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1 Acknowledgments and Funding

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The audit is funded and directed by the Breast Surgeons of Australia and New Zealand Inc. and operated by the Royal Australasian College of Surgeons (RACS).

The report was prepared by the College:

- Ning Ma, Research Officer (data extraction, analysis and report development)
- Michelle Ogilvy, Team Leader (editorial review)
- Katherine Economides, Manager, Morbidity Audits (final review).

Clinical review was provided by Mr David Walters, Chair, BreastSurgANZ Quality Audit Steering Committee.

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2 Introduction

The National Breast Cancer Audit (NBCA) began in 1998 and collects data on the surgical care of early and locally advanced breast cancer patients in Australia and New Zealand. The audit is now funded and directed by the Breast Surgeons of Australia and New Zealand Inc. (BreastSurgANZ) and in 2013 was renamed the BreastSurgANZ Quality Audit (BQA).

An extract was prepared containing New Zealand data with a diagnosis date of 2013 from the BQA online database on 30 June 2015 and merged with a datasets from Auckland Breast Cancer Register and Christchurch Breast Cancer Register awaiting upload into the BQA (data is uploaded twice yearly).

There were 12,391 cases reported to the BQA in 2013; of which, 2,599 cases were from New Zealand. Out of the 273 surgeons who contributed to the audit in 2013, 59 were from New Zealand.

In the report, percentage case volumes for New Zealand data have been reported by referral source under the following main headings:

1. Background information
2. Invasive tumour characteristics
3. DCIS tumour characteristics
4. Breast surgery treatment
5. Axillary surgery treatment
6. Margins of excision for breast surgery
7. Radiotherapy treatment
8. Hormonal treatment
9. Chemotherapy treatment
10. Herceptin treatment

The number of cases reported from Breast Screen Aotearoa (BSA) and other referral sources for each category were compared using a proportion test via the statistical packages SPSS 20 and R 2.14.1. Independent t-test for means and chi square tests for independency are also used in the report. A statistical significance level of $p<0.05$ was used. (p value was not calculated if the number of observations of both categories were zero, denoted '-'.)

Background information, tumour characteristics and breast cancer treatments that are significantly different between "BSA" referred patients and "non-BSA" referred patients are listed in the summary section.

Definitions of the terms provided in the report are from the BreastSurgANZ Quality Audit Data Dictionary, available from www.surgeons.org/bqa.

In this report, "Unknown", "Not yet" and missing data are reported as "not known".

3 Summary

While the majority of breast cancer cases from New Zealand were referred as symptomatic from a general practitioner (50.3%), BreastScreen Aotearoa (BSA) was the second most common referral source (40.1%).

The majority of New Zealand breast cancer episodes were invasive (86.8%). There was a significantly higher proportion of ductal carcinoma in situ (DCIS) cases in the BSA referral group (21.5%) than in the non-BSA referral group (7.6%).

The majority of New Zealand patients were public (70.4%). The proportions of public and private patients were significantly different between the BSA and non-BSA groups with the BSA group having a proportionately greater number of public patients.

The mean age in the BSA group is significantly lower than the non-BSA group. All age-groups except 41–50 years differed significantly by referral source, with BSA screening proportionately higher than non-BSA sources in patients aged 51–70.

There were some significant differences between BSA and non-BSA patients for invasive and DCIS tumour characteristics and, accordingly, there were differences in some of the breast cancer treatments between BSA and non-BSA patients. These are detailed in sections 3.1 and 3.2 but can be summarised as follows: BSA patients had smaller, lower grade tumours, were less likely to present with lymphatic vascular invasion and less likely to be pre-menopausal when compared to non-BSA patients. BSA patients were more likely to have breast-conserving surgery as their first surgery, sentinel node biopsy as their only axillary surgery and, for in situ tumours, BSA patients were less likely to have further surgery after Breast Conserving Surgery (BCS).

3.1 Significant differences between BSA and non-BSA patients for invasive tumours

Characteristics

Tumour size

Mean tumour size is 16.9 mm in the BSA group, which is significantly smaller than the non-BSA group (26.6 mm).

Higher proportion of BSA patients (51.0%) had smaller (<15 mm) tumours compared to non-BSA patients (25.4%).

Lower proportion of BSA patients (30.7%) had larger tumours (≥20 mm) compared to non-BSA patients (58.2%).

Grade

Higher proportion of BSA patients (36.1%) had invasive Grade 1 tumours compared to non-BSA patients (21.0%).

Lower proportion of BSA patients (18.2%) had Grade 3 tumours compared to non-BSA patients (31.8%).

Lymphatic vascular invasion

Lower proportion of BSA patients (16.1%) had lymphatic vascular invasion compared to non-BSA patients (28.9%).

Menopausal status

Lower proportion of BSA patients (17.4%) were pre-menopausal compared with non-BSA patients (30.7%)

Higher proportion of BSA patients (71.5%) were post-menopausal compared with non-BSA patients (63.7%)

Higher proportion of BSA patients (11.1%) were peri-menopausal compared with non-BSA patients (4.6%)

Receptor status

Higher proportion of BSA patients (90.3%) had oestrogen positive tumours compared to non-BSA patients (80.0%).

Higher proportion of BSA patients (78.0%) had progesterone positive tumours compared to non-BSA patients (69.8%).

Higher proportion of BSA patients (89.1%) had HER2 negative tumours compared to non-BSA patients (80.8%).

Lower proportion of BSA patients (5.0%) had triple negative tumours compared to non-BSA patients (11.2%).

Treatments

Breast surgery
The majority of BSA patients (67.4%) had CLE as their first breast surgery. The majority of non-BSA patients had mastectomy as their first breast surgery (55.6%).

The majority of New Zealand mastectomy patients (82.7%) did not have a reconstruction. The proportion of BSA patients having a reconstruction (22.5%) was higher than non-BSA patients (15.3%).

Axillary surgery

For ≤3cm tumours, a higher proportion of BSA patients (74.8%) had SNB as their only axillary surgery compared with non-BSA patients (58.3%).

Margins

The proportion of patients with margins ≥2mm was higher for BSA patients (93.7%) than non-BSA patients (90.0%).

Proportionately, there were less BSA patients with involved margins (1.3%) when compared to non-BSA patients (3.0%).

Radiotherapy treatment after mastectomy

A lower proportion of BSA patients (31.9%) were referred for radiotherapy after mastectomy compared to non-BSA patients (41.7%).

Hormone treatment

A lower proportion of BSA patients (74.0%) with oestrogen positive tumours were referred for hormonal treatment compared to non-BSA patients (81.8%).

Chemotherapy treatment

The proportion of patients 70 years old or less referred for chemotherapy treatment was significantly lower in the BSA group (26.4%) than in the non-BSA group (52.5%).

3.2 Significant differences between BSA and non-BSA patients for DCIS tumours

Characteristics

Menopausal status
Lower proportion of BSA patients (20.5%) were pre-menopausal compared to non-BSA patients (41.7%).

Higher proportion of BSA patients (67.9%) were post-menopausal compared to non-BSA patients (47.0%).

Treatments

Breast Surgery
A higher proportion of BSA patients (68.8%) had CLE as their first breast surgery compared to non-BSA patients (45.9%).

The proportion of patients with mastectomy as their first surgery for DCIS tumours was significantly lower in the BSA group (25.7%) than in the non-BSA group (46.6%).

The proportion of patients treated with mastectomy after breast conserving surgery for DCIS tumours (i.e. without attempting re-excision) was significantly lower in the BSA group (8.6%) than in the non-BSA group (18.1%).

Axillary Surgery
A lower proportion of BSA patients treated with Breast Conserving Surgery (33.5%) had any axillary surgery compared to non-BSA patients (46.4%).

4 Background Information

4.1 Referral source for New Zealand episodes

Referral source		Percentage
BSA (n=1042)		40.1%
Non-BSA (n=1552)	Symptomatic from GP (N=1307)	50.3%
	Breast Screen Australia (N=5)	0.2%
	Other (N=240)	9.2%
Missing (n=5)		0.2%
Total (N=2599)		**100%**

Comments
While the majority of breast cancer cases from New Zealand were referred as symptomatic from a general practitioner, GP (50.3%), BSA was the second most common referral source (40.1%).

Audit data used
Information is derived from the audit question “referral source” which allows the options of “symptomatic (from GP)”, “Breast Screen Australia”, “Breast Screen Aotearoa” and “Other”.

Definitions
Referral source records the source from which the person was referred to the surgeon.

Symptomatic patients are referred to a breast surgeon when presenting to a GP or other physician with symptoms such as a breast lump, pain, or discharge.

Patients referred from “Other” sources may include private screening programs.

4.2 Episodes by referral source

Referral source	Invasive breast cancer	DCIS
BSA (n=1042)	78.5%	21.5%
Non-BSA (n=1552)	92.4%	7.6%
p value	< 0.001	< 0.001

Comments
The majority of New Zealand breast cancer episodes were invasive (86.8%, not tabulated). There was a significantly higher proportion of ductal carcinoma in situ (DCIS) cases in the BSA referral group (21.5%) than in the non-BSA referral group (7.6%).

Audit data used
Information is derived from the audit question “invasive/in situ cancer”.

Definitions
Invasive: cancer which has grown beyond its site of origin and invaded neighbouring tissue.

DCIS: the presence of any malignant tumour which has not yet become invasive but is confined to the layer of cells from which it arose. A form of pre-invasive cancer.

4.3 Private and public status of the episodes by referral source

Referral source	Private	Public
BSA (n=1042)	23.5%	76.5%
Non-BSA (n=1552)	33.6%	66.4%
p value	< 0.001	< 0.001

In non-BSA group, the private and public status is unknown for 2 patients.

Comments
The majority of New Zealand patients were public (70.4%, not tabulated). The proportions of public and private patients were significantly different between the BSA and non-BSA groups with the BSA group having a proportionately greater number of public patients.

Audit data used
Information is derived from the audit question "public/private" which allows the options of private and public.

Definitions
Public patient:
A person, eligible for Medicare, who, on admission to a recognised hospital or soon after:

- receives a public hospital service free of charge
- elects to be a public patient
- has treatment contracted to a private hospital.

Private patient:
A person who, on admission to a recognised hospital or soon after:

- elects to be a private patient treated by a medical practitioner of his or her choice
- elects to occupy a bed in a single room (where such an election is made, the patient is responsible for meeting certain hospital charges as well as the professional charges raised by any treating medical or dental practitioner)
- chooses to be admitted to a private hospital, when eligible for Medicare (where such a choice is made, the patient is responsible for meeting all hospital charges as well as the professional charges raised by any treating medical or dental practitioner).

4.4 Age of patients by referral source

Referral source	Mean (years)	Standard deviation (years)	p value*
BSA (n=1042)	57.6	7.4	<0.001
Non-BSA (n=1552)	60.7	15.8	

*Independent t-test, normality assumption complied (Shapiro-Wilk test) for both group.

Referral source	≤40 years	41-50 years	51-60 years	61-70 years	>70 years
BSA (n=1042)	0.2%	20.0%	41.0%	36.8%	2.0%
Non-BSA (n=1552)	9.3%	22.3%	19.2%	17.0%	32.2%
p value	<0.001	0.1443	<0.001	<0.001	<0.001

Chi-square = 579.63, p-value < 0.05

Comments
The mean age for the BSA group (57.6±7.4 years) is statistically lower than the non-BSA group (60.7±15.8 years).

The age-groups are categorised by 10-year intervals. All age-groups except 41 to 50 years differed significantly by referral source, with BSA screening proportionately higher numbers of patients aged 51 to 70 when compared with non-BSA sources, and much lower numbers of patients over 70 years. There are no dependencies supported by Chi-square test with statistical significant p value (<0.05).

Audit data used
Information is derived from a calculation using audit questions “diagnosis date” and “date of birth”.

Definitions
Diagnosis date: The date upon which the cancer diagnosis was made.

Date of birth: Patient’s date of birth.

Age (in years) is calculated by using differences between date of birth and diagnosis date.

4.5 Gender of patients by referral source

Referral source	Female	Male
BSA (n=1042)	100.00%	0.00%
Non-BSA (n=1552)	98.8%	1.2%
p value	<0.001	<0.001

Comments
Only 0.73% (not tabulated) of New Zealand patients were males and none of the male patients were referred from BSA for treatment.

Audit data used
Information is derived from the audit question "gender" which allows the options of female and male.

Definitions
Female: female patient.

Male: male patient.

5 Invasive Tumour Characteristics

5.1 Type of invasive tumour by referral source

Referral source	Ductal NOS[1]	Invasive Lobular	Other Invasive of mixed type	Other neoplasm	Unknown	Tubular	Medullary	Mucinous	Basal-like
BSA (n=816)	77.6%	12.0%	1.5%	4.0%	0.2%	2.5%	0.1%	2.1%	0.0%
Non-BSA (n=1425)	73.3%	13.5%	2.0%	5.6%	1.2%	0.7%	0.4%	3.2%	0.1%
p value	0.093	0.267	0.373	0.072	0.267	<0.001	0.757	0.119	0.562

Type of the invasive tumours were not known for 2 BSA and 9 non-BSA patients.
1: ductal carcinoma not otherwise specified.
Chi-squre = 25.30, p value = 0.003

Comments
The proportion of tubular carcinoma is significantly higher in BSA group than non-BSA group. Other proportions of invasive tumour type did not differ significantly between the BSA and non-BSA groups. There is no statistically significant dependency between type of invasive tumours and the referral source.

Audit data used
Information is derived from the audit question “invasive histological type of tumour” which allows the options of ductal carcinoma NOS, invasive lobular, tubular, medullary, mucinous, other invasive of mixed type, other neoplasm and basal-like.

Definitions
Tumour type defines the microscopic appearance of the invasive breast cancer cells in the principal tumour.

5.2 Size of invasive tumour by referral source

Referral source	Mean (mm)	Standard deviation (mm)	p value*
BSA (n=813)	16.9	12.3	<0.001
Non-BSA (n=1378)	26.6	21.0	

*Independent t-test, normality assumption complied (Shapiro-Wilk test) for both groups.

Referral source	<10 mm	10-14 mm	15-19 mm	20-29 mm	30-39 mm	≥40 mm
BSA (n=813)	33.1%	17.9%	18.3%	6.0%	18.9%	5.8%
Non-BSA (n=1378)	15.1%	10.3%	16.4%	14.9%	25.8%	17.5%
p value	<0.001	<0.001	0.2543	<0.001	<0.001	<0.001

Size of the invasive tumours were not known for 5 BSA and 56 non-BSA patients.
Chi-square = 198.68, p value < 0.001

Comments

The mean invasive tumour size in the BSA-referred group (16.9±12.3 mm) is significantly less than the non-BSA group (26.6±21.0 mm).

The proportion of tumours smaller than 15 mm is significantly higher in the BSA group. This trend was reversed for tumours larger than 20 mm. The percentage of patients with 15 to 19 mm invasive tumours did not differ significantly between the BSA and non-BSA groups.

Audit data used

Information is derived from the audit question “invasive tumour size in mm”.

Definitions

Tumour size refers to the maximum diameter in millimetres of the furthest points of extension of the invasive tumour cells in the principal tumour.

5.3 Histological grade of invasive tumour by referral source

Referral source	Grade 1	Grade 2	Grade 3	Unknown
BSA (n=817)	36.1%	45.0%	18.2%	0.7%
Non-BSA (n=1410)	21.0%	45.6%	31.8%	1.6%
p value	<0.001	0.749	<0.001	0.067

Histological grade of the invasive tumours were not known for 1 BSA and 24 non-BSA patients.
Chi-square = 83.13, p value < 0.05

Comments

The percentage of patients with Grade 1 tumours was significantly higher in the BSA group (36.1%) than in the non-BSA group (21.0%). The percentage of patients with Grade 3 tumours was significantly higher in the non-BSA group (31.8%) when compared to the BSA group (18.2%). Proportions of Grade 2 invasive tumours did not differ significantly between the BSA and non-BSA groups. There is no significant dependency between invasive tumour grade and referral sources.

Audit data used

Information is derived from the audit question "invasive histological grade of tumour" which allows the options of grade 1, grade 2, and grade 3.

Definitions

Histological grade is the degree of differentiation of the breast cancer, or the degree to which it resembles normal tissue as assessed by the pathologist according to Pathology Reporting Guidelines. The histological grade is calculated by adding three scores (mitosis score, nuclear score and tubular differentiation score):

Grade 1: Total score of 3–5

Grade 2: Total score of 6–7

Grade 3: Total score of 8–9

5.4 Lymphatic vascular invasion of invasive tumour by referral source

Referral source	Present	Absent	Not known
BSA (n=816)	16.1%	82.8%	1.1%
Non-BSA (n=1427)	28.9%	69.0%	2.1%
p value	<0.001	<0.001	0.082

Lymphatic vascular invasion was not known for 2 BSA and 7 non-BSA patients.

Comments
In the majority (75.5%, not tabulated) of New Zealand patients, lymphatic vascular invasion was absent. The proportion of patients with vascular lymphatic invasion was significantly lower in the BSA group (16.1%) than in the non-BSA group (28.9%).

Audit data used
Information is derived from the audit question "vascular/lymphatic invasion" which allows the options of present and absent.

Definitions
Lymphatic vascular invasion present refers to tumour cells being observed within the lumen of blood or lymphatic vessels.

5.5 Bilateral synchronous status of invasive tumour by referral source

Referral source	Bilateral synchronous
BSA (n=818)	3.3%
Non-BSA (n=1434)	3.8%
p value	0.542

There are no missing data for bilateral synchronous status reported.

Comments
Most (96.4%, not tabulated) New Zealand invasive cancers were not bilateral synchronous. Proportions of patients with bilateral synchronous cancers did not differ significantly between patients from BSA and non-BSA groups.

Audit data used
Information is derived from the audit question "bilateral synchronous" which allows the options of yes and no.

Definitions
Bilateral synchronous cancers are cancers that occur in both breasts either simultaneously or sequentially within three months.

5.6 Menopausal status for invasive tumour by referral source

Referral source	Pre	Peri	Post	Male
BSA (n=809)	17.4%	11.1%	71.5%	0.0%
Non-BSA (n=1423)	30.7%	4.6%	63.7%	1.0%
p value	<0.001	<0.001	<0.001	0.001

Menopausal status of invasion was not known for 9 BSA and 11 non-BSA patients.

Comments

More than half (66.4%, not tabulated) of New Zealand patients were post-menopausal. The proportion of pre-menopausal women was significantly lower in the BSA group (17.4%) than in the non-BSA group (30.7%). The BSA group had significantly higher proportions of post- and peri-menopausal patients.

Audit data used

Information is derived from the audit question “menopausal status” which allows the options of pre, peri, post and male.

Definitions

Pre: an individual who has not yet experienced the menopause

Post: an individual who has experienced the menopause and the occurrence of greater than one year of spontaneous amenorrhoea

Peri: an individual who is either in the period just prior to the menopause or the subsequent one year of amenorrhoea following the menopause

5.7 Hormone receptor status of invasive tumour by referral source

Referral source	ER Positive	PR Positive	ER+PR Positive
BSA (n=817)	90.3%	78.0%	77.7%
Non-BSA (n=1432)	80.0%	69.8%	69.3%
p value	<0.001	<0.001	<0.001

Hormone receptor status was not known for 1 BSA and 2 non-BSA patients.

Comments
Most (83.7%, not tabulated) New Zealand patients had oestrogen positive tumours. The majority (72.8%) of New Zealand patients had progesterone positive tumours. The majority had tumours that were both oestrogen and progesterone positive (72.4%).

The proportion of patients with either oestrogen positive or progesterone positive tumours was significantly higher in the BSA group than in non-BSA group.

Audit data used
Information is derived from the audit questions “Oestrogen receptor status” and “progesterone receptor status” which allow the options of positive, negative, ordered but not known and not done.

Definitions
The presence or absence of oestrogen receptors or progesterone receptors on the tumour cells.

5.8 HER2 Receptor status of invasive tumour by referral source

Referral source	Positive	Negative	Unknown	Not Done
BSA (n=817)	9.2%	89.1%	0.1%	1.6%
Non-BSA (n=1431)	14.5%	80.8%	0.0%	4.7%
p value	<0.001	<0.001	0.084	<0.001

HER2 status was not known for 1 patient in BSA group and 3 for non-BSA group.

Comments
Most (83.9%, not tabulated) New Zealand patients had HER2 negative invasive tumours. The percentage of patients with HER2 negative tumours was slightly higher in the BSA group (89.1%) than in non-BSA group (80.8%). This difference was significant.

Audit data used
Information is derived from the audit question “HER2 receptor status” which allows the options of positive, negative, ordered but not known and not done.

Definitions
HER2: Human Epidermal growth factor Receptor 2

Positive: Biopsy revealed abnormally high levels of the HER2 gene or protein

Negative: Biopsy revealed a normal level of the HER2 gene or protein

5.9 Triple negative invasive tumours by referral source

Referral source	Triple negative cancer
BSA (n=817)	5.0%
Non-BSA (n=1432)	11.2%
p value	<0.001

Triple negative refers to tumours oestrogen receptor, progesterone receptor and HER2 negative.
This status was unknown for 1 patient in BSA and 2 patients in non-BSA group.

Comments

Only 8.79% (not tabulated) of New Zealand patients were oestrogen receptor, progesterone receptor and HER2 negative (triple negative). The proportion of triple negative patients was lower in the BSA group (5.0%) than in the Non-BSA group (11.2%).

Audit data used

Information is derived from the audit questions “Oestrogen receptor status”, “progesterone receptor status” and “HER2 receptor status” which allow the options of positive, negative, ordered but not known and not done.

6 DCIS Tumour Characteristics

6.1 Size of DCIS tumours by referral source

Referral source	Mean (mm)	Standard deviation (mm)	p value*
BSA (n=221)	28.1	26.7	0.319
Non-BSA (n=115)	25.2	24.5	

*Independent t-test, normality assumption complied (Shapiro-Wilk test) for both group.

Referral source	<10 mm	10-14 mm	15-19 mm	20-29 mm	30-39 mm	≥40 mm
BSA (n=221)	34.7%	8.4%	11.1%	16.0%	8.9%	20.9%
Non-BSA (n=115)	26.6%	9.5%	8.6%	21.6%	12.1%	21.6%
p value	0.134	0.728	0.472	0.201	0.352	0.881

Tumour size of DCIS was unknown for 3 patient in BSA and 3 patients in non-BSA group.
Chi-square = 4.18, p value = 0.524

Comments
The mean of DCIS tumour size in BSA group (28.1±26.7 mm) is not significantly different than non-BSA group (25.2±24.5 mm). There are no significant differences in tumour size between BSA and non-BSA groups. However, Chi-square showed that the referral source is dependent from tumour size groups ($p>0.05$).

Audit data used
Information is derived from the audit question “DCIS tumour size in mm”.

Definitions
Tumour size refers to the maximum diameter in millimetres of the furthest points of extension of the DCIS tumour cells in the principal tumour.

6.2 Histological grade of DCIS tumour by referral source

Referral source	Low	Intermediate	High	Unknown
BSA (n=222)	18.0%	29.3%	50.9%	1.8%
Non-BSA (n=116)	11.2%	39.5%	46.7%	2.6%
p value	0.103	0.536	0.453	0.624

The DCIS tumour grade is unknown for 2 patients in BSA group and 2 patients in non-BSA group
Chi-square equal to 23.19, p-value <0.05

Comments
Proportions of each histological grade of DCIS tumours did not differ significantly between BSA and non-BSA groups.

Audit data used
Information is derived from the audit question "DCIS histological grade of tumour" which allows the following options: low, medium and high.

Definitions
The degree of differentiation of the breast cancer or the degree to which it resembles normal tissue as assessed by the pathologist.

Low: well differentiated

Intermediate: moderately differentiated

High: poorly differentiated

6.3 Necrosis of DCIS tumour by referral status

Referral source	Absent	Present	Not applicable
BSA (n=216)	32.9%	61.1%	6.0%
Non-BSA (n=114)	28.1%	64.9%	7.0%
p value	0.373	0.496	0.726

The presence of necrosis in DCIS tumour is unknown for 8 patients in BSA group and 4 patients in non-BSA group

Comments
The majority (62.4%, not tabulated) of New Zealand patients with DCIS tumours had necrosis. Proportions of DCIS tumours with necrosis did not differ significantly between BSA and non-BSA groups.

Audit data used
Information is derived from the audit question "necrosis of tumour" which allows the options of present and absent.

Definitions
Two categories of necrosis are recognised with DCIS: focal necrosis with no central necrosis and central necrosis in ducts.

Present: Central necrosis is identified in ducts (this has previously been described as "comedo" type necrosis).

Absent: Necrosis is not present or minimal. No central duct necrosis is present, but focal necrosis and isolated apoptotic cells may be present.

6.4 Bilateral synchronous status of DCIS tumours by referral source

Referral source	Bilateral synchronous
BSA (n=223)	6.3%
Non-BSA (n=118)	2.5%
p value	0.126

The bilateral synchronous status in DCIS tumour is not known for 1 patient in BSA group.

Comments

DCIS tumours in most New Zealand patients (95.0%, not tabulated) were not bilateral synchronous. Proportionately, the incidence of patients with bilateral synchronous DCIS tumours was higher in the BSA group (6.3%) than in non-BSA group (2.5%), but this difference was not significant.

Audit data used

Information is derived from the audit question “bilateral synchronous” which allows the option of yes and no.

Definitions

Bilateral synchronous cancers are cancers that occur in both breasts either simultaneously or sequentially within three months.

6.5 Menopausal status for DCIS tumours by referral source

Referral source	Pre	Peri	Post	Male
BSA (n=215)	20.5%	11.6%	67.9%	0.0%
Non-BSA (n=115)	41.7%	9.6%	47.0%	1.7%
p value	<0.001	0.575	<0.001	0.055

The menopausal status in DCIS tumour is unknown for 9 patients in BSA group and 3 patients in non-BSA group

Comments

Almost two thirds of New Zealand DCIS patients (60.6%, not tabulated) were post-menopausal. The proportion of post-menopausal DCIS patients (67.9%) was significantly higher for BSA-screened patients than for non-BSA (47.0%).

Audit data used

Information is derived from the audit question “menopausal status” where the options are: pre, peri, post and male.

Definitions

Pre: an individual who has not yet experienced the menopause

Post: an individual who has experienced the menopause and the occurrence of greater than one year of spontaneous amenorrhoea

Peri: an individual who is either in the period just prior to the menopause or the subsequent one year of amenorrhoea following the menopause

7 Breast Surgery Treatment

7.1 First breast surgery performed for invasive cancer by referral source

Referral source	None	Open Biopsy	CLE	Mastectomy	Other
BSA (n=817)	0.4%	2.6%	67.4%	28.6%	1.0%
Non-BSA (n=1433)	5.0%	2.4%	36.6%	55.6%	0.4%
p value	<0.001	0.772	<0.001	<0.001	0.080

Surgery status in invasive tumour is unknown for 1 patient in BSA group and 1 patient in non-BSA group

Comments
The proportion of complete local excision in BSA group (67.4%) is significantly higher than such (36.6%) in non-BSA group. On the contrary, the proportion of mastectomy in BSA group (28.6%) is significantly lower than such in non-BSA group (55.6%). Other procedures showed no statistical difference in proportion between BSA and non-BSA groups.

7.2 Further breast surgery after breast conserving surgery for invasive cancer by referral source

Referral source	Mastectomy only	Mastectomy + re-excision	Re-excision only	Other surgery	Any further surgery	No further breast surgery
BSA (n=572)	2.3%	3.5%	5.3%	1.2%	**12.3%**	**87.7%**
Non-BSA (n=563)	9.6%	1.3%	3.8%	1.9%	**16.6%**	**83.4%**
p value	<0.001	0.015	0.227	0.373	**0.039**	**0.039**

Comments
The majority of New Zealand patients (85.6%, not tabulated) treated with breast conserving surgery (BCS) for invasive cancer had no further surgery. The proportion of patients receiving further surgeries in the BSA group (12.3%) is statistically different than such for non-BSA group (16.6%).

The proportion of patients undergoing mastectomy (no re-excision) after BCS for invasive cancer differed significantly for the BSA group (2.3%) when compared to the non-BSA group (9.6%).

7.3 Reconstruction after mastectomy for invasive cancer by referral source

Referral source	Reconstruction
BSA (n=315)	22.5%
Non-BSA (n=868)	15.3%
p value	0.003

Comments
The majority of New Zealand mastectomy patients (82.7%) with invasive tumours had no reconstruction. The proportion of patients with reconstruction surgery after mastectomy for invasive tumours differed significantly between BSA and non-BSA groups.

Audit data used
Information is derived from the audit question "surgical procedures" which allows the following options: no surgery, ABBI, open biopsy, CLE, re-excision, total mastectomy, reconstruction and other.

Definitions

Open biopsy:	surgical procedure in which a sample of breast tissue for histological examination is obtained in a conventional surgical procedure, using an open excision
CLE:	the complete excision of an entire tumour mass
ABBI:	the process whereby an Advanced Breast Biopsy Instrumentation System (or similar) technique is used to excise non-palpable breast lesions
Total mastectomy:	the surgical removal of the breast
Re-excision:	a secondary surgical procedure conducted to obtain a rim of normal breast tissue around the periphery of the previously removed primary tumour
Reconstruction:	the use of a prosthesis or tissue from other parts of the body to re-build a breast
Other:	other surgery

7.4 First breast surgery performed for DCIS by referral source

Referral source	None	Open Biopsy	CLE	Mastectomy	Other
BSA (n=223)	0.4%	4.2%	68.8%	25.7%	0.9%
Not BSA (n=117)	0.9%	6.0%	45.9%	46.6%	0.6%
p value	0.562	0.459	<0.001	<0.001	0.764

Surgery status in DCIS is unknown for 1 patient in BSA group and 1 patient in non-BSA group

Comments
Over two thirds of New Zealand patients (65.8%, not tabulated) had breast conserving surgery (open biopsy or CLE) as their first surgery for DCIS cancers. The proportion of patients who had complete local excision for DCIS tumours was significantly higher in the BSA group (68.8%) than in the non-BSA group (45.9%). The percentage of patients with mastectomy as their first surgery for DCIS tumours was significantly lower in the BSA group (25.7%) than in the non-BSA group (46.6%).

7.5 Further surgery after breast conserving surgery for DCIS by referral source

Referral source	Mastectomy only	Mastectomy + re-excision	Re-excision only	Other	Any further surgery	No further breast surgery
BSA (n=163)	8.6%	3.6%	24.5%	2.6%	**39.3%**	**60.7%**
Non-BSA (n=61)	18.1%	0.0%	13.1%	11.4%	**42.6%**	**57.4%**
p value	0.044	0.134	0.064	0.007	**0.653**	**0.653**

Comments
Almost two thirds (59.8%) of New Zealand patients who had breast conserving surgery for DCIS received no further surgical treatment. None of the proportions regarding to further surgeries were statistically different between BSA and non-BSA groups.

7.6 Reconstruction performed after mastectomy for DCIS by referral source

Referral source	Reconstruction
BSA (n=93)	42.3%
Non-BSA (n=70)	38.5%
p value	0.624

Comments
Over half (59.5%) of New Zealand DCIS patients treated with mastectomy had no reconstruction. There was no significant difference between BSA and non-BSA patients.

Audit data used
Information is derived from the audit question “surgical procedures” which allows the following options: no surgery, ABBI, open biopsy, CLE, re-excision, total mastectomy, reconstruction and other.

Definitions

Open biopsy:	surgical procedure in which a sample of breast tissue for histological examination is obtained in a conventional surgical procedure, using an open excision
CLE:	the complete excision of an entire tumour mass
ABBI:	the process whereby an Advanced Breast Biopsy Instrumentation System (or similar) technique is used to excise non-palpable breast lesions
Total mastectomy:	the surgical removal of the breast
Re-excision:	a secondary surgical procedure conducted to obtain a rim of normal breast tissue around the periphery of the previously removed primary tumour
Reconstruction:	the use of a prosthesis or tissue from other parts of the body to re-build a breast
Other:	other surgery

8 Axillary surgery treatment

8.1 Axillary procedures for invasive cancer by referral source

Referral source	SNB only	Level 1	Level 2	Level 3	Any axillary surgery	No axillary surgery
BSA (n=818)	70.2%	2.8%	19.3%	3.8%	**96.1%**	**3.9%**
Non-BSA (n=1434)	45.9%	2.4%	34.2%	7.9%	**90.4%**	**9.6%**
p value	<0.001	0.562	<0.001	0.001	**<0.001**	**<0.001**

Most of the patients (92.4%, not tabulated) have received axillary surgeries for their invasive cancer in New Zealand. The proportion of axillary surgeries performed is significantly different in the BSA group (96.1%) than in the non-BSA group (90.4%). The proportion of SNB only cases were significantly higher (70.2%) in the BSA group (70.2%) than such in non-BSA group (45.9%).

8.2 Axillary procedures for ≤3cm invasive cancer by referral source

Referral source	SNB only	Level 1	Level 2	Level 3	Any axillary surgery	No axillary surgery
BSA (n=737)	74.8%	2.7%	15.7%	3.3%	**96.5%**	**3.5%**
Non-BSA (n=1041)	58.3%	2.7%	27.6%	5.4%	**94.0%**	**6.0%**
p value	<0.001	1.000	<0.001	0.036	**<0.001**	**<0.001**

Axillary procedures in invasive tumour size less than 3cm is unknown for 2 patients in BSA group and 18 patients in non-BSA group

Very similar trends were observed in axillary procedures performed on greater than 3 cm tumours, compared with general axillary procedures above.

8.3 Axillary procedures for >3cm invasive cancer by referral source

Referral source	SNB only	Level 1	Level 2	Level 3	Any axillary surgery	No axillary surgery
BSA (n=76)	28.9%	3.9%	55.4%	9.2%	**97.4%**	**2.6%**
Non-BSA (n=364)	17.9%	2.2%	55.7%	15.4%	**91.2%**	**8.8%**
p value	0.029	0.390	0.936	0.162	**0.066**	**0.066**

Axillary procedures in invasive tumour size greater than 3cm is unknown for 3 patients in BSA group and 11 patients in non-BSA group

Comments
The majority of breast cancer patients with tumours larger than 3 cm in New Zealand received axillary procedures (92.2%, not tabulated). However, the proportion difference between BSA (97.4%) and non-BSA (91.2%) groups were not significantly different.

Audit data used
Information on axillary procedure is from the audit question "axillary surgery" which allows the following options: sentinel node biopsy; level 1 sampling, level 2, level 3 and no axillary surgery.

Definitions

Sentinel node biopsy:	Identification and excision of the sentinel lymph node (the first node(s) draining the primary tumour in the regional lymphatic basin).
Axillary surgery:	Surgical excision of the axillary contents (fat and lymph nodes).
Level 1:	Excision of a single, low axillary node or the excision of the axillary contents up to the inferior border of the pectoralis minor muscle, includes sampling.
Level 2:	Excision of the axillary contents up to the superior border of the pectoralis minor muscle.
Level 3:	Excision of the axillary contents up to the apex of the axilla.

8.4 Axillary procedures for DCIS treated with breast conserving surgery only by referral source

Referral source	SNB only	Level 1	Level 2	Level 3	Any axillary surgery	No axillary surgery
BSA (n=185)	32.4%	0.0%	1.1%	0.0%	**33.5%**	**66.5%**
Non-BSA (n=84)	44.0%	0.0%	2.4%	0.0%	**46.4%**	**53.6%**
p value	0.066	-	0.418	-	**0.043**	**0.043**

Comments
More than half (62.4%, not tabulated) of New Zealand patients with DCIS treated by BCS did not have axillary surgery, as expected from the guidelines, where BSA group is just significantly less (33.5%) than non-BSA group (46.4%). No patients have received Level 1 and 3 axillary surgeries and no significant differences were observed in all subgroups of axillary surgeries.

8.5 Axillary procedures for DCIS treated with mastectomy by referral source

Referral source	SNB only	Level 1	Level 2	Level 3	Any axillary surgery	No axillary surgery
BSA (n=90)	82.3%	0.0%	2.2%	1.1%	**85.6%**	**14.4%**
Non-BSA (n=69)	72.4%	2.9%	7.2%	0.1%	**82.6%**	**17.4%**
p value	0.144	0.103	0.126	0.441	**0.603**	**0.603**

Comments

Most of New Zealand patients with DCIS treated by mastectomy did have axillary surgery (84.3%, not tabulated). The proportions of axillary surgery performed did not differ significantly between the BSA group and non-BSA group.

Audit data used

Information on axillary procedure is from the audit question "axillary surgery" which allows the following options: sentinel node biopsy; level 1 sampling, level 2, level 3 and no axillary surgery.

Definitions

Sentinel node biopsy:	Identification and excision of the sentinel lymph node (the first node(s) draining the primary tumour in the regional lymphatic basin).
Axillary surgery:	Surgical excision of the axillary contents (fat and lymph nodes).
Level 1:	Excision of a single, low axillary node or the excision of the axillary contents up to the inferior border of the pectoralis minor muscle, includes sampling.
Level 2:	Excision of the axillary contents up to the superior border of the pectoralis minor muscle.
Level 3:	Excision of the axillary contents up to the apex of the axilla.

9 Margins of excision for breast surgery

9.1 Margins of excision for invasive cancer by referral source

Referral source	Involved margin	1mm margin	≥2mm margin	Clear but unspecified margin
BSA (n=697)	1.3%	2.7%	93.7%	2.3%
Non-BSA (n=1029)	3.0%	4.4%	90.0%	2.6%
p value	0.021	0.067	0.007	0.697

Margin size was unknown for 121 patients in BSA group and 405 patients in non-BSA group
Chi-square = 9.297, p value = 0.054

Comments
Most (91.5%) New Zealand patients had margins of at least 2 mm after surgery for invasive cancer, where the proportion in the BSA group (93.7%) is significantly greater than the non-BSA group (90.0%). There was also a significant difference between the proportion of patients with an involved margin in the BSA and the non-BSA group.

9.2 Margins of excision for DCIS cancer by referral source

Referral source	Involved margin	1mm margin	≥2mm margin	Clear but unspecified margin
BSA (n=185)	5.4%	8.6%	84.9%	1.1%
Non-BSA (n=89)	2.2%	9.0%	86.5%	2.3%
p value	0.226	0.912	0.726	0.441

Margin size was unknown for 39 patients in BSA group and 29 patients in non-BSA group
Chi-square = 1.1819, p value = 0.611

Comments
Most New Zealand patients had margins of at least 2mm after surgery for DCIS (85.4%, not tabulated). No significant differences were observed in any of the margin groups between BSA and non-BSA patients.

Audit data used
Information on margin size is derived from the audit question “distance (in mm) to closest circumferential margin” and “distance (in mm) to closest vertical margin”. Margin is measured in whole numbers; an entry of 0 is an involved margin; margins between 0.1 and 0.9 must be rounded up to 1mm. For cases where the pathologist has indicated a “clear margin” without specifying a specific value, a code of “99” can be used in the system. This is interpreted as “clear but unspecified margin”.

10 Radiotherapy treatment

10.1 Radiotherapy for invasive cancer by referral source

Referral source	Referred for radiotherapy
BSA (n=808)	70.3%
Non-BSA (n=1417)	55.3%
p value	<0.001

Referral of radiotherapy was unknown for 10 patients in BSA group and 17 patients in non-BSA group

Comments
The proportion of New Zealand patients referred for radiotherapy treatment for invasive cancers was slightly higher for BSA (70.3%) patients when compared to non-BSA patients (55.3%). This difference was significant.

10.2 Radiotherapy for invasive cancer treated with breast conserving surgery by referral source

Referral source	Referred for radiotherapy
BSA (n=501)	97.8%
Non-BSA (n=484)	96.1%
p value	0.109

Please note that patients who had mastectomy or other breast surgery after breast conserving surgery were not included in this group.
Referral of radiotherapy was unknown for 3 patients in BSA group and 16 patients in non-BSA group

Comments
The percentage of patients referred for radiotherapy treatment after breast conserving surgery for invasive cancer was not significantly different in the BSA group (97.8%) compared to the non-BSA group (96.1%).

10.3 Radiotherapy for invasive cancer treated with mastectomy by referral source

Referral source	Referred for radiotherapy
BSA (n=302)	31.9%
Non-BSA (n=878)	41.7%
p value	0.002

Radiotherapy status was not known for 2 BSA patients and 39 for non-BSA patients.

Comments
The percentage of patients referred for radiotherapy treatment after mastectomy for invasive cancer was significantly lower in the BSA group (31.9%) compared to the non-BSA group (41.7%).

10.4 Radiotherapy for high risk invasive cancer treated with mastectomy by referral source

Referral source	Referred for radiotherapy
BSA (n=42)	90.5%
Non-BSA (n=228)	83.3%
p value	0.238

"High risk" is defined as invasive tumours ≥50mm OR invasive tumours with ≥4 positive lymph nodes

Comments
The proportion of high risk patients referred for radiotherapy did not differ significantly between the two groups.

10.5 Radiotherapy for DCIS treated with breast conserving surgery by referral source

Referral source	Referred for radiotherapy
BSA (n=181)	48.6%
Non-BSA (n=82)	36.6%
p value	0.070

Radiotherapy status was not known for 22 BSA patients and 6 for non-BSA patients.
Please note that the DCIS patients who had mastectomy after breast conserving surgery were excluded in this group.

Comments
Less than half (44.9%, not tabulated) of New Zealand DCIS patients treated with breast conserving surgery were referred for radiotherapy. There is no statistically significant difference between BSA and non-BSA groups regarding radiotherapy being referred after breast conserving surgery.

10.6 Radiotherapy for DCIS treated with mastectomy by referral source

Referral source	Referred for radiotherapy
BSA (n=85)	5.9%
Non-BSA (n=67)	6.0%
p value	0.976

Radiotherapy status was not known for 4 BSA patients and 2 for non-BSA patients.

Comments
Only a small proportion (5.9%, not tabulated) of New Zealand DCIS patients treated with mastectomy were referred for radiotherapy. There is no statistically significant difference between BSA and non-BSA groups regarding radiotherapy referred after mastectomy.

Audit data used
Information on patients undergoing radiotherapy is derived from the audit question "did you prescribe or refer for any of the following adjuvant therapies?" where one of the options is radiotherapy. The options were: yes, no, not yet, referred but not used, not known.

Definitions
Radiotherapy is the use of radiation, usually X-rays or gamma rays, to kill tumour cells.

11 Hormonal treatment

11.1 Hormonal treatment type by menopausal status: oestrogen positive invasive tumours

Any Menopausal State

Referral source	SERMs only	SERMs & Ovarian ablation	SERMs & Aromatase inhibitors	Ovarian ablation only	Ovarian ablation & Aromatase inhibitors	Aromatase inhibitors only	All three hormone treatments	Any hormone treatment	No hormone treatment
BSA (n=724)	35.4%	0.3%	3.9%	0.1%	0.0%	34.3%	0.0%	**74.0%**	**26.0%**
Non-BSA (n=1117)	43.0%	0.1%	5.9%	0.3%	0.0%	32.4%	0.1%	**81.8%**	**18.2%**
p value	0. 001	0.332	0.057	0.373	-	0.373	-	**<0.001**	**<0.001**

Hormone treatment status of invasive tumour where oestrogen receptor was positive was not known for 6 BSA and 26 non-BSA patients.

Comments

A very large percentage (78.7%, not tabulated) of New Zealand patients with oestrogen positive tumours had hormonal treatment. Proportions of patients with oestrogen positive tumours who had hormone therapy are significantly lower in BSA (74.0%) than non-BSA groups (81.8%).

Pre Menopause

Referral source	SERMs only	SERMs & Ovarian ablation	SERMs & Aromatase inhibitors	Ovarian ablation only	Ovarian ablation & Aromatase inhibitors	Aromatase inhibitors only	All three hormone treatments	Any hormone treatment	No hormone treatment
BSA (n=128)	71.0%	1.6%	1.6%	0.0%	0.0%	1.6%	0.0%	**75.8%**	**24.2%**
Non-BSA (n=320)	81.9%	0.3%	2.2%	0.9%	0.0%	3.1%	0.0%	**88.4%**	**11.6%**
p value	0.011	0.129	0.682	-	-	0.373	-	**<0.001**	**<0.001**

Peri Menopause

Referral source	SERMs only	SERMs & Ovarian ablation	SERMs & Aromatase inhibitors	Ovarian ablation only	Ovarian ablation & Aromatase inhibitors	Aromatase inhibitors only	All three hormone treatments	Any hormone treatment	No hormone treatment
BSA (n=83)	55.4%	0.0%	3.6%	1.2%	0.0%	16.9%	0.0%	**77.1%**	**22.9%**
Non-BSA (n=51)	58.8%	0.0%	9.8%	0.0%	0.0%	9.8%	0.0%	**78.4%**	**21.6%**
p value	0.697	-	0.1415	-	-	0.254	-	**0.857**	**0.857**

Post Menopause

Referral source	SERMs only	SERMs & Ovarian ablation	SERMs & Aromatase inhibitors	Ovarian ablation only	Ovarian ablation & Aromatase inhibitors	Aromatase inhibitors only	All three hormone treatments	Any hormone treatment	No hormone treatment
BSA (n=505)	23.4%	0.0%	4.6%	0.0%	0.00%	45.9%	0.0%	**73.9%**	**26.1%**
Non-BSA (n=726)	24.0%	0.0%	7.6%	0.0%	0.1%	47.7%	0.1%	**79.5%**	**20.5%**
p value	0.810	-	0.034	-	-	0.509	-	**0.021**	**0.021**

Male

Referral source	SERMs only	SERMs & Ovarian ablation	SERMs & Aromatase inhibitors	Ovarian ablation only	Ovarian ablation & Aromatase inhibitors	Aromatase inhibitors only	All three hormone treatments	Any hormone treatment	No hormone treatment
BSA (n=0)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	**0.0%**	**0.0%**
Non-BSA (n=14)	71.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	**71.4%**	**28.6%**
p value	-	-	-	-	-	-	-	**-**	**-**

11.2 Hormonal treatment type by menopausal status: oestrogen negative invasive tumours

Any Menopausal State

Referral source	SERMs only	SERMs & Ovarian ablation	SERMs & Aromatase inhibitors	Ovarian ablation only	Ovarian ablation & Aromatase inhibitors	Aromatase inhibitors only	All three hormone treatments	Any hormone treatment	No hormone treatment
BSA (n=71)	2.8%	0.0%	0.0%	0.0%	0.0%	4.2%	0.0%	**7.0%**	**93.0%**
Non-BSA (n=248)	3.2%	0.0%	1.7%	0.4%	0.0%	2.0%	0.0%	**7.3%**	**92.7%**
p value	0.749	-	-	-	-	0.110	-	**0.873**	**0.873**

Hormone treatment status of invasive tumour where oestrogen receptor was negative was not known for 8 BSA and 32 non-BSA patients.

Comments

A small percentage (7.23%, not tabulated) of New Zealand patients with oestrogen negative tumours had hormonal treatment. Proportions of patients with oestrogen negative tumours who had hormone therapy did not differ significantly different between BSA and non-BSA groups.

Pre Menopause

Referral source	SERMs only	SERMs & Ovarian ablation	SERMs & Aromatase inhibitors	Ovarian ablation only	Ovarian ablation & Aromatase inhibitors	Aromatase inhibitors only	All three hormone treatments	Any hormone treatment	No hormone treatment
BSA (n=12)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	**0.0%**	**100.0%**
Non-BSA (n=93)	5.4%	0.0%	1.1%	0.0%	0.0%	0.0%	0.0%	**6.5%**	**93.5%**
p value	-	-	-	-	-	-	-	-	-

Peri Menopause

Referral source	SERMs only	SERMs & Ovarian ablation	SERMs & Aromatase inhibitors	Ovarian ablation only	Ovarian ablation & Aromatase inhibitors	Aromatase inhibitors only	All three hormone treatments	Any hormone treatment	No hormone treatment
BSA (n=6)	16.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	**16.7%**	**83.3%**
Non-BSA (n=10)	20.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	**20.0%**	**80.0%**
p value	0.873	-	-	-	-	-	-	**0.873**	**0.873**

Post Menopause

Referral source	SERMs only	SERMs & Ovarian ablation	SERMs & Aromatase inhibitors	Ovarian ablation only	Ovarian ablation & Aromatase inhibitors	Aromatase inhibitors only	All three hormone treatments	Any hormone treatment	No hormone treatment
BSA (n=52)	1.9%	0.0%	0.0%	0.0%	0.0%	5.8%	0.0%	**7.7%**	**92.3%**
Non-BSA (n=142)	0.7%	0.0%	2.1%	0.7%	0.0%	3.5%	0.0%	**7.0%**	**93.0%**
p value	0.174	-	-	-	-	0.478	-	**0.865**	**0.865**

There are no data for hormone treatment in males with oestrogen negative receptor invasive tumours.

Audit data used

Information for oestrogen receptor positive status is derived from the audit questions relating to “receptor status” where information is recorded for oestrogen and progesterone status, as well as HER2, with options of positive, negative, ordered but not known and not done.

Information for number of patients prescribed and/or referred for hormonal therapy is derived from the question “did you prescribe or refer for any of the following

adjuvant therapies?" The following options apply: yes, no, not yet and referred but not used.

Definitions

Oestrogen Receptors are prognostic indicators. They are an intracellular receptor protein that binds oestrogens and anti-oestrogens, mediating their effects by binding to DNA and altering the expression of specific genes.

Hormonal treatment includes SERMs, aromatase inhibitors and ovarian ablation.

SERMs refers to the use of Selective Oestrogen Receptor Modulators to inhibit the growth of hormone responsive cancer cells after primary treatment, either by surgery or radiotherapy or a combination of these, to eradicate micro metastatic cancer.

Ovarian ablation refers to the use of surgery, radiation or drug treatment to cease hormone production by the ovaries, after primary treatment either by surgery or radiotherapy or a combination of these (usually within six weeks), to eradicate micro metastatic cancer.

Aromatase inhibitors refer to the class of drugs which lower the level of oestrogen in the tumour. They are primarily used in post-menopausal patients.

12 Chemotherapy treatment

12.1 Chemotherapy treatment for invasive cancer in patients ≤ 70 years old by referral source

Referral source	Chemotherapy prescribed	No chemotherapy perscribed	Referred but not used
BSA (n=778)	26.4%	62.8%	10.8%
Non-BSA (n=948)	52.5%	39.1%	8.4%
p value	<0.001	<0.001	0.077

Chemotherapy status was not known for 16 BSA and 11 non-BSA patients.

Comments:
Among 70 years and younger patients, chemotherapy was prescribed significantly more in non-BSA patients (52.5%) than BSA patients (26.4%).

Referral source	Positive receptor in oestrogen or progesterone		
	Chemotherapy prescribed	Chemotherapy not prescribed	Referred but not used
BSA (n=714)	22.4%	66.4%	11.2%
Non-BSA (n=736)	45.8%	45.7%	8.5%
p value	< 0.001	< 0.001	0.097

"Oestrogen or Progesterone" refers to the receptor status of the case. Cases included as "positive" are positive for either oestrogen or progesterone receptors.
Hormone receptor status was not known for 8 BSA and 26 non-BSA patients.

Comments
Where 70 years or younger patients had positive oestrogen or progesterone receptors, chemotherapy was prescribed significantly more in non-BSA patients (45.8%) than BSA patients (22.4%).

Referral source	Negative receptors for both oestrogen and progesterone		
	Chemotherapy prescribed	Chemotherapy not prescribed	Referred but not used
BSA (n=66)	71.2%	21.2%	7.6%
Non-BSA (n=181)	82.3%	9.4%	8.3%
p value	0.056	0.013	0.857

"Oestrogen or Progesterone" refers to the receptor status of the case. Cases included as "negative" are negative on both oestrogen and progesterone receptors.
Hormone receptor status was not known for 6 BSA and 16 non-BSA patients.

Comments
Where 70 years or younger patients had negative oestrogen and progesterone receptors, chemotherapy was prescribed borderline significantly more in non-BSA patients (82.3%) than BSA patients (71.2%).

12.2 Chemotherapy treatment for invasive cancer for patients >70 years old by referral source

Referral source	Chemotherapy prescribed	No chemotherapy perscribed	Referred but not used
BSA (n=19)	21.1%	73.7%	5.2%
Non-BSA (n=466)	5.4%	86.1%	8.5%
p value	<0.001	<0.001	0.077

Chemotherapy status was not known for 5 BSA and 9 non-BSA patients.

Comments:
Among 70 years or older patients, chemotherapy was prescribed significantly more in BSA patients (21.1%) than non-BSA patients (5.4%).

Referral source	Positive receptor in oestrogen or progesterone		
	Chemotherapy prescribed	Chemotherapy not prescribed	Referred but not used
BSA (n=16)	18.8%	81.2%	0.0%
Non-BSA (n=401)	4.2%	88.1%	7.7%
p value	0.007	0.418	0.250

"Oestrogen or Progesterone" refers to the receptor status of the case. Cases included as "positive" are positive for either oestrogen or progesterone receptors.
Chemotherapy status was not known for 2 BSA and 11 non-BSA patients.

Comments
Where 70 years or older patients had positive oestrogen or progesterone receptors, chemotherapy was prescribed significantly more in BSA patients (18.8%) than non-BSA patients (4.2%).

Referral source	Negative receptor in both oestrogen and progesterone		
	Chemotherapy prescribed	Chemotherapy not prescribed	Referred but not used
BSA (n=3)	33.4%	33.3%	33.3%
Non-BSA (n=57)	14.0%	70.2%	15.8%
p value	0.363	0.180	0.430

"Oestrogen or Progesterone" refers to the receptor status of the case. Cases included as "negative" are negative on both oestrogen and progesterone receptors.
Chemotherapy status was not known for 3 BSA and 6 non-BSA patients.

Comments
Where 70 years or older patients had negative oestrogen and progesterone receptors, the proportion of chemotherapy prescription was not significantly different between the BSA and non-BSA groups.

Audit data used
Information on chemotherapy was derived from the audit question "did you prescribe or refer for any of the following adjuvant therapies?" where one choice is chemotherapy. The following options apply: yes, no, not yet, referred but not used.

Definitions
Chemotherapy is the use of cytotoxic drugs that aim to kill, prevent or slow the growth rate of cancer cells.

13 Herceptin treatment

13.1 Herceptin treatment for >1cm HER2 positive OR node positive HER2 positive invasive cancer by referral source

Referral Source	Herceptin prescribed			Herceptin not prescribed			Herceptin referred but not used
	Chemo-Yes	Chemo-No	Chemo-Unknown	Chemo-Yes	Chemo-No	Chemo-Unknown	Chemo-Unknown
BSA (n=54)	79.5%	1.9%	0.0%	0.0%	11.1%	1.9%	5.6%
Non-BSA (n=170)	65.8%	6.5%	0.6%	5.9%	11.2%	4.7%	5.3%
p value	0.057	0.194	0.569	0.067	0.984	0.363	0.928

Herceptin treatment was unknown for 3 BSA patients and 6 non-BSA patients with >1cm HER2 (+) or node (+) HER2 positive tumours.

Comments
The majority (75.0%, not tabulated) of New Zealand patients with HER2 positive tumours over 1 cm or with HER2 positive tumours and positive nodes received Herceptin treatment with or without chemotherapy. Proportions of Herceptin treatment did not differ significantly between BSA and non-BSA groups whether they had chemotherapy or not.

Audit data used
Information on chemotherapy and Herceptin was derived from the audit question "did you prescribe or refer for any of the following adjuvant therapies?" where one choice is Herceptin or other immunotherapy and another is chemotherapy. The following options apply: yes, no, not yet, referred but not used.

Definitions
Herceptin is a drug aimed at women who show HER2 gene amplification and/or protein over expression.