BreastScreen Aotearoa Annual Report 2016

EARLY AND LOCALLY ADVANCED BREAST CANCER
PATIENTS DIAGNOSED IN NEW ZEALAND IN 2016

Prepared for Ministry of Health, New Zealand

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1 ACKNOWLEDGMENTS AND FUNDING

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This report was prepared by RACS with assistance from the University of South Australia:

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2 INTRODUCTION

The audit began in 1998 as the National Breast Cancer Audit (NBCA), collecting 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 BreastSurgANZ and in 2013 was renamed the BreastSurgANZ Quality Audit (BQA).

An extract was prepared containing New Zealand data with a diagnosis date of 2016 (if diagnosis date was not provided, first surgery date was used) from the BQA online database on 1 November 2018.

There were 14,784 cases reported to the BQA for 2016; of which, 2,888 cases were from New Zealand. Out of the 253 surgeons who contributed to the audit in 2016, 92 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 proportion of cases reported from Breast Screen Aotearoa (BSA) and other referral sources for each category were compared using a chi-square test via the statistical package Stata 15. A level of $p<0.05$ was used to indicate statistical significance. (P-value was not calculated if the number of observations per category was zero, denoted 'NC'.) Differences between groups with continuous measures were tested by independent t-test for normally distributed variables, or Wilcoxon Rank sum test for skewed data.

Results are reported to two decimal places in tables, and rounding may cause some row totals to not equal 100%.

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

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, and were less likely to be pre-menopausal when compared to non-BSA patients.
- BSA patients were more likely to have tumours that were oestrogen and progesterone positive and HER2 negative, and less likely to be triple negative tumours.
- BSA patients were more likely to have breast-conserving surgery as their first surgery, and sentinel node biopsy as their only axillary surgery.

Trends, and Australian comparison

- Since 2008, trends in tumour size, grade, first breast surgery, axillary procedures, and chemotherapy treatment appear relatively stable, however formal testing would be required to determine any significant trends, or changes in trend.

- Comparison with Australian data indicate similarities with New Zealand breast cancers for the distribution of tumour grade, hormone receptor status and axillary procedures by referral status.

- There is some evidence of a greater proportion of low grade DCIS tumours and a lower proportion of high grade DCIS tumours in New Zealand; however this would require formal testing to determine if these are statistically signficiant differences.

Distribution

- Similar numbers of breast cancer cases in New Zealand are referred as symptomatic from a general practitioner, GP (45.11%) and from BreastScreen Aotearoa (BSA) (45.24%).

- The majority of New Zealand breast cancer episodes were invasive (84.6%). There was a significantly higher proportion of ductal carcinoma in situ (DCIS) cases in the BSA referral group (24.8%) than in the non-BSA referral groups (7.6%).

- The majority of New Zealand patients were public (72.4%). 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 (75.1% and 70.3%, respectively).

- The distribution of age groups differed significantly by referral source with BSA screening proportionately higher numbers of patients aged 45–69 when compared to non-BSA sources.

3.1 Differences between BSA and non-BSA patients for invasive tumours

Characteristics

Type of invasive tumour

- There was a slightly higher proportion of ductal (NOS) and tubular invasive tumours in breast cancers referred from BSA sources compared with non-BSA sources (78.5% compared with 77.0% and 1.8% compared with 0.5%, respectively).

Tumour size

- Higher proportion of BSA patients (54.7%) had smaller (<15 mm) tumours compared to non-BSA patients (33.2%).
- Lower proportion of BSA patients (24.9%) had larger tumours (≥20 mm) compared to non-BSA patients (49.3%).

Grade

- Higher proportion of BSA patients (31.5%) had invasive Grade 1 tumours compared to non-BSA patients (19.7%).
- Lower proportion of BSA patients (21.3%) had Grade 3 tumours compared to non-BSA patients (35.6%).

Menopausal status

- Lower proportion of BSA patients (18.8%) were pre-menopausal compared to non-BSA patients (26.7%).
- Higher proportion of BSA patients (71.9%) were post-menopausal compared to non-BSA patients (67.6%).
- Higher proportion of BSA patients (9.3%) were peri-menopausal compared to non-BSA patients (5.7%).

Receptor status

- Higher proportion of BSA patients (90.2%) had oestrogen positive tumours compared to non-BSA patients (82.1%).
- Higher proportion of BSA patients (80.7%) had progesterone positive tumours compared to non-BSA patients (69.1%).
- Higher proportion of BSA patients (86.6%) had HER2 negative tumours compared to non-BSA patients (81.7%).
- Lower proportion of BSA patients (6.5%) had triple negative tumours compared to non-BSA patients (12.6%).

Treatments

Breast surgery

- The majority of BSA patients (65.4%) had a complete local excision (CLE) as their first breast surgery. The majority of non-BSA patients had a mastectomy as their first breast surgery (52.5%).

Axillary surgery

- Overall, breast cancers referred from BSA sources were more likely to have axillary surgery than breast cancers from non-BSA referred sources (97.9% and 91.7%, respectively).

- For ≤3cm tumours, a higher proportion of BSA patients (79.9%) had sentinel node biopsy (SNB) as their only axillary surgery compared with non-BSA patients (61.0%).

- For >3cm tumours, a higher proportion of BSA patients (33.0%) had SNB as their only axillary surgery compared with non-BSA patients (23.5%).

Radiotherapy treatment

- A higher proportion of BSA patients treated with breast conserving surgery (93.3%) were subsequently referred for radiotherapy compared to non-BSA patients (86.9%).

- A lower proportion of BSA patients treated with mastectomy (35.5%) were referred for radiotherapy compared to non-BSA patients (49.9%).

Chemotherapy treatment

- The proportion of patients aged 70 or under who received chemotherapy treatment was significantly lower in the BSA group (27.1%) than in the non-BSA group (46.1%). The proportion of BSA patients aged 70 or under who were not prescribed chemotherapy was higher than the equivalent non-BSA patients (62.5% and 44.0%, respectively).

Herceptin treatment

- A greater proportion of BSA-referred invasive cancers that were larger than 1cm and HER2 positive, or node positive and HER2 positive, were prescribed Herceptin and received chemotherapy (78.7%) than equivalent non-BSA referred breast cancers (65.3%).

3.2 Differences between BSA and non-BSA patients for DCIS tumours

Treatments

Breast Surgery

- A higher proportion of BSA patients (65.0%) had CLE as their first breast surgery compared to non-BSA patients (45.8%).
- The proportion of patients with mastectomy as their first surgery for DCIS tumours was significantly lower in the BSA group (26.0%) than in the non-BSA group (37.5%).
- Breast cancer cases referred from BSA sources were less likely to have further surgery after breast conserving surgery compared with non-BSA referred cases (30.6% and 46.5%, respectively).

Axillary Surgery

- A higher proportion of BSA patients with DCIS treated with mastectomy (84.8%) had SNB only compared to non-BSA patients (62.7%).

Radiotherapy

- A higher proportion of BSA patients with DCIS treated with breast conserving surgery (68.2%) were referred for radiotherapy compared with non-BSA patient (52.2%).

3.3 Key performance indicators for the management of New Zealand breast cancers during the period 2014–2016

All key performance indicators (KPIs) for all New Zealand surgeons are summarized below.

KPI	Threshold for BQA (%)	Episodes meeting KPI (%)
KPI 1: Percentage of invasive cancer episodes undergoing breast conserving surgery which have been referred for radiotherapy	85	95.7
KPI 2: Percentage of invasive oestrogen positive cases referred for hormonal therapy treatment	85	83.3
KPI 3: Percentage of invasive cases undergoing axillary surgery	90	93.8
KPI 4: Percentage of in situ cases undergoing breast surgery without axillary clearance	90	98.6
KPI 5: Percentage of high risk invasive cases undergoing mastectomy and referred for radiotherapy	85	87.5
KPI 6: Percentage of high risk cases referred for chemotherapy	90	86.0

4 BACKGROUND INFORMATION

4.1 Referral source for New Zealand episodes

Referral source		Percentage (%)
BSA (n=1360)		45.2
Non-BSA (n=1644)	Symptomatic from GP (n=1356)	45.1
	Breast Screen Australia (n=4)	0.1
	Other (n=284)	9.5
Not known (n=2)		0.1
Total (N=3006)		**100**

Comments

Similar numbers of breast cancer cases in New Zealand are referred as symptomatic from a general practitioner, GP (45.1%) and from BreastScreen Aotearoa (BSA) (45.2%).

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=1360)	75.2	24.8
Non-BSA (n=1642)	92.3	7.6
p value	<0.001	

Invasive/in situ status was unknown for 2 non-BSA referred breast cancer cases

Comments

The majority of New Zealand breast cancer episodes were invasive (84.6%). There was a significantly higher proportion of ductal carcinoma in situ (DCIS) cases in the BSA referral group (24.8%) 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=1360)	24.9	75.1
Non-BSA (n=1644)	29.7	70.2
p value	< 0.005	

Comments

The majority of New Zealand patients with breast cancer were public patients (72.4%). 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 than private (75.1% and 70.3%, respectively).

Audit data used

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

Definitions

Public—a person eligible for public healthcare 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 their treatment contracted to a public hospital

Private—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 the treating medical practitioner)
- chooses to be admitted to a private hospital, although eligible for public healthcare.

4.4 Age of patients by referral source

Referral source	Median (years)	Interquartile range (years)	P value
BSA (n=1360)	58.9	51.6–64.9	<0.0001
Non-BSA (n=1644)	62.1	49.3–75.5	

Referral source	<35 years	35–39 years	40–44 years	45–49 years	50–54 years	55–59 years	60–64 years	65–69 years	70+ years
BSA (n=1360)	0 (0%)	0 (0%)	7 (0.5%)	247 (18.2%)	243 (17.9%)	260 (19.1%)	271 (19.9%)	312 (22.9%)	20 (1.5%)
Non-BSA (n=1644)	52 (3.2%)	78 (4.7%)	144 (8.8%)	159 (9.7%)	177 (10.8%)	164 (10.0%)	140 (8.5%)	124 (7.5%)	606 (36.9%)
p value					<0.001				

Comments

The age distribution and median age of those diagnosed with breast cancer differed by referral source (p<0.001). The proportion of women from BSA sources within the target screening age range (45–69 years) was more than double that of non-BSA sources (98% (n=1333) and 46% (n=764), respectively; p<0.001).

Audit data used

Information is derived from a calculation using audit questions “diagnosis date” and “date of birth”. If diagnosis date was not available, the first surgery date was used.

Definitions

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

Surgery date: The date upon which breast cancer surgery was performed.

Date of birth: Patient’s date of birth.

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 (%)	Tubular (%)	Medullary (%)	Mucinous (%)	Basal-like (%)
BSA (n=1018)	78.5	12.2	3.1	2.7	1.8	0.3	1.6	0.0
Non-BSA (n=1502)	77.0	12.1	3.6	3.9	0.5	0.2	2.6	0.1
p value				<0.05				

[1] Ductal carcinoma not otherwise specified
Tumour types were not known for 2 BSA and 13 non-BSA patients.

Comments
New Zealand invasive tumours were 'ductal carcinoma, not otherwise specified'(Ductal NOS) in 78% of cases. There was little variation in proportion of Ductal NOS and invasive lobular tumour types between the BSA and non-BSA referral sources. There was some variation in the distribution of other invasive tumour types between BSA and non-BSA referral sources which has likely contributed to the overall statistically significant difference detected.

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	Median (mm)	IQR (mm)	P value
BSA (n=1011)	13.0	9, 20	<0.001*
Non-BSA (n=1430)	21.0	14, 30	

IQR=interquartile range; *Wilcoxon rank-sum test

Referral source	<10 mm (%)	10-14 mm (%)	15-19 mm (%)	20-29 mm (%)	30-39 mm (%)	≥40 mm (%)
BSA (n=1011)	30.0	24.7	20.4	14.2	5.8	4.9
Non-BSA (n=1430)	18.0	15.2	17.6	22.5	12.1	14.7
p value			<0.001			

Tumour size was unknown for 12 BSA and 87 non-BSA patients.

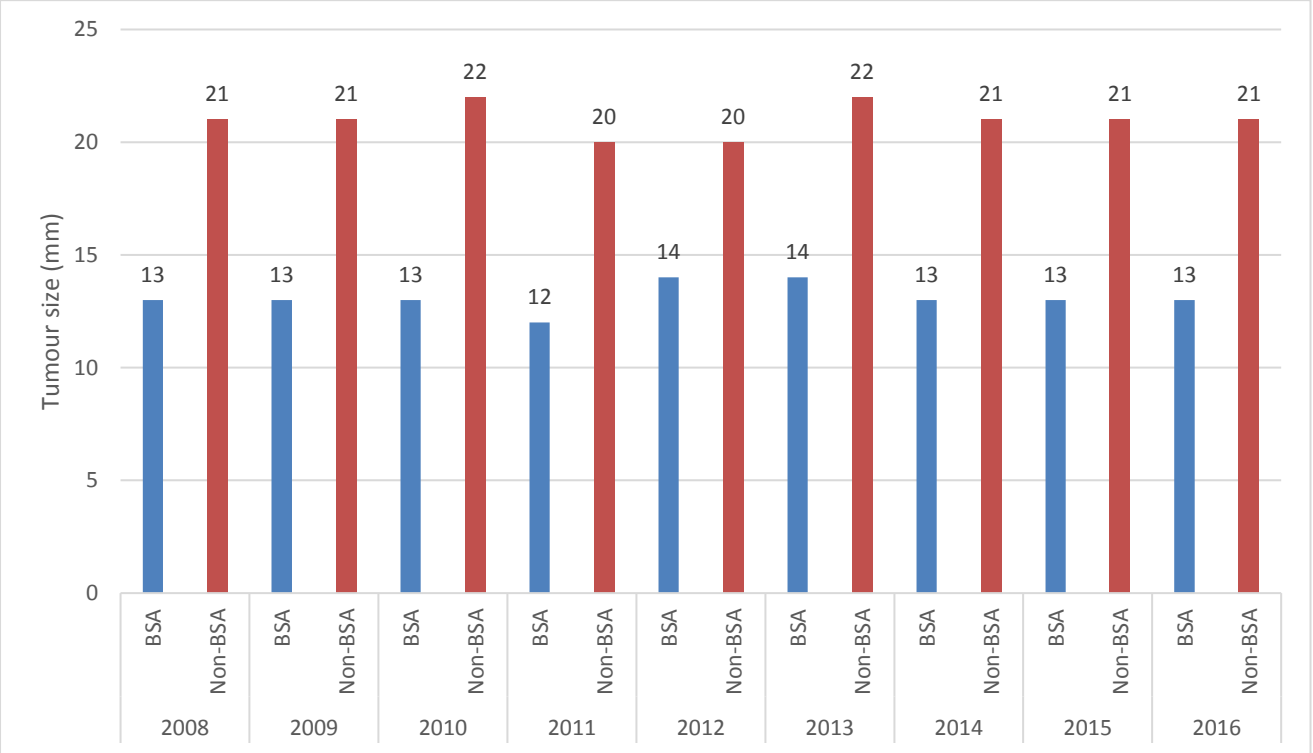

Figure 1 Median invasive tumours size by year and referral source

Comments

The distribution of invasive tumour size differed between BSA and non-BSA referral sources (p<0.001). The percentage of breast cancers less than 15 mm was greater in those referred from BSA (54.7%) compared with those referred from non-BSA resources (33.2%). The percentage of breast cancers equal to or larger than 20 mm was greater in those referred from non-BSA sources (49.3%) than in those referred from BSA (24.9%). The median tumour size for BSA and non-BSA referred invasive breast cancers has remained relatively stable over time (Figure 1).

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	Australia			New Zealand		
	Grade 1 (%)	Grade 2 (%)	Grade 3 (%)	Grade 1 (%)	Grade 2 (%)	Grade 3 (%)
BreastScreen	27.4	49.7	22.9	31.5	47.3	21.3
Non-BreastScreen	14.8	46.2	39.0	19.7	44.7	35.6
p value		<0.001			<0.001	

Histological grade of invasive tumours was not known for 16 BSA and 47 non-BSA patients

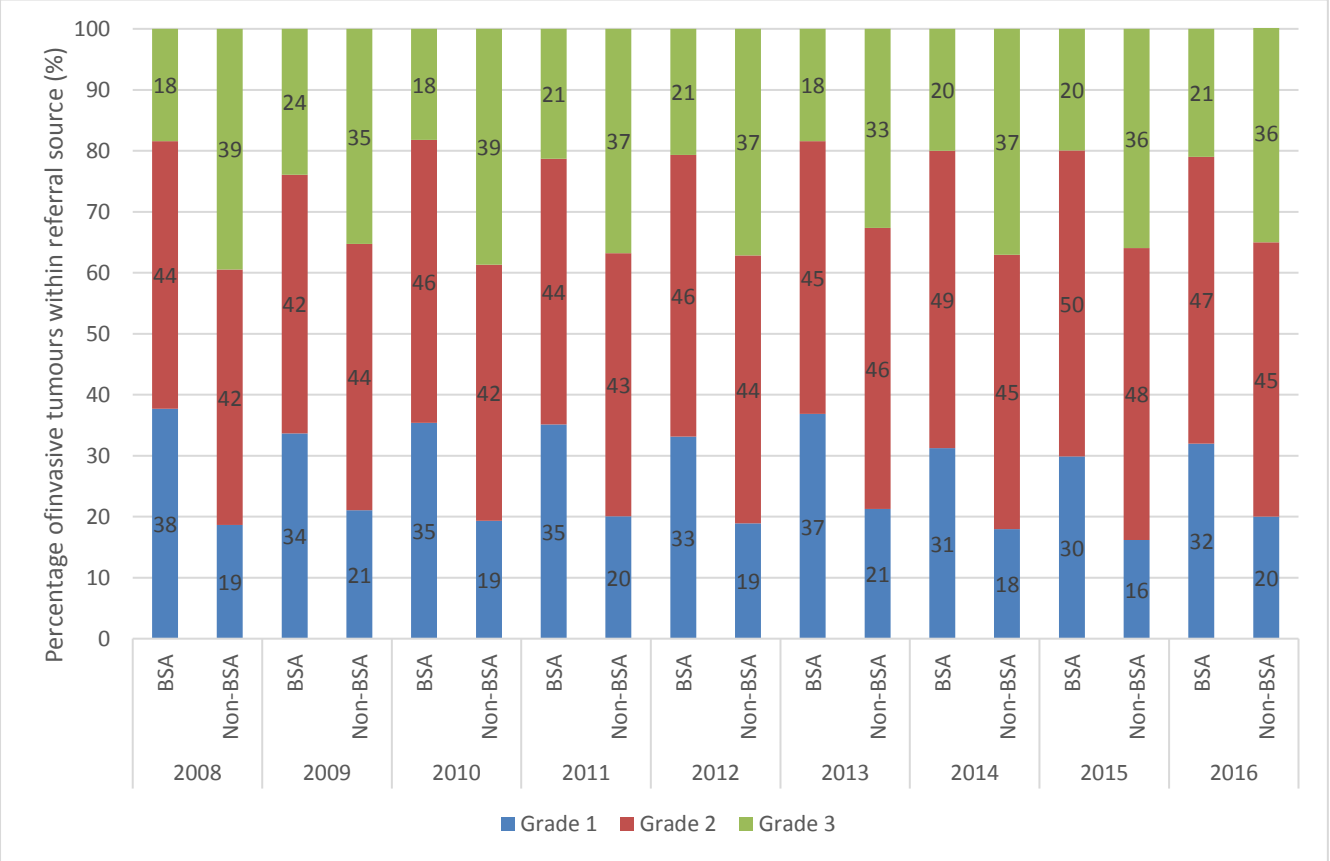

Figure 2 Grade of NZ invasive tumours by referral source and year of diagnosis

Comments

The distribution of histological grade of invasive breast tumours in New Zealand differed significantly according to the referral source (p<0.001). Over time, there has been little variation in the distribution of tumour grade between referral sources (Figure 2).

For New Zealand breast cancers, the percentage of Grade 1 invasive tumours was higher in those referred from BSA (31.5%) compared with those referred from non-BSA sources (19.7%). In contrast, the percentage of Grade 3 tumours was higher in those breast cancers referred from non-BSA sources (35.6%) compared with those referred from BSA (21.3%).

A greater percentage of New Zealand invasive breast cancers were Grade 1 compared to Australian Grade 1 invasive breast cancer (24.5% and 19.3%, respectively). Similar percentages of Grade 2 cancers were seen in 2016 between the two countries (45.7% and 47.4% for New Zealand and Australia respectively, and a slightly greater percentage of invasive breast cancers were Grade 3 in Australian compared to New Zealand (33.3% and 29.7%, respectively) (data not shown).

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 Menopausal status for invasive tumour by referral source

Referral source	Pre (%)	Peri (%)	Post (%)
All women (n=2523)	23.5	7.2	69.3
BSA (n=1020)	18.8	9.3	71.9
Non-BSA (n=1503)	26.7	5.7	67.6
p value		<0.001	

Comments

More than half (69.3%) of New Zealand female patients were post-menopausal. There were fewer pre-menopausal women in the BSA group (18.8%) than in the non-BSA group (26.7%). The BSA group had greater proportions of peri- and post-menopausal patients than those women referred from non-BSA sources (9.3% versus 5.7% and 71.9% versus 67.6%, respectively).

Audit data used

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

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

5.5 Hormone receptor status of invasive tumour by referral source

New Zealand referral source	ER Positive (%)	PR Positive (%)	ER+PR Positive (%)
BSA (n=1009)	90.2	80.7	80.3
Non-BSA (n=1494)	82.1	69.1	67.9
p value[1]	<0.0001	<0.0001	<0.0001

ER: oestrogen receptor. PR: progesterone receptor.
[1] Two sample test of proportions comparing the proportion of each referral source within the hormone receptor positive group.
Note that the table displays percentage of receptor positive breast cancers within each referral source.

Australian referral source	ER Positive (%)	PR Positive (%)	ER+PR Positive (%)
BreastScreen Australia (n=3535)	90.5	81.5	81.1
Non-BreastScreen Australia (n=6561)	81.8	71.5	70.9
p value[1]	<0.0001	<0.0001	<0.0001

ER: oestrogen receptor. PR: progesterone receptor.
[1] Two sample test of proportions comparing the proportion of each referral source within the hormone receptor positive group.
Note that the table displays percentage of receptor positive breast cancers within each referral source.

Invasive tumour size (mm) by receptor status (Mean +/- Standard Deviation)

New Zealand referral source	ER Positive	PR Positive	ER+PR Positive
BSA	15.8 ± 11.8	16.0 ± 12.0	16.1 ± 12.0
Non-BSA	24.4 ± 21.5	24.7 ± 22.5	24.6 ± 22.2

Australian referral source	ER Positive	PR Positive	ER+PR Positive
BreastScreen Australia	18.9 ± 18.1	12.1 ± 6.3	17.6 ± 15.0
Non- BreastScreen Australia	26.0 ± 20.2	23.0 ± 17.4	24.6 ± 19.9

ER – oestrogen receptor, PR – progesterone receptor

Comments

Most (85.4%) New Zealand patients had oestrogen positive tumours and 73.8% had progesterone positive tumours. The majority of New Zealand patients had tumours that were both oestrogen and progesterone positive (72.9%).

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

Comparisons with breast cancers diagnosed in Australia indicate similar patterns of oestrogen and progesterone receptor status by referral source. Non-screening referral sources have similar average invasive tumour size in Australia and New Zealand, however there are potentially some differences in tumour size by receptor status between the two countries for screen-referred breast cancers.

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.

5.6 HER2 Receptor status of invasive tumour by referral source

New Zealand referral source	Positive (%)	Negative (%)
BSA (n=1003)	13.4	86.6
Non-BSA (n=1450)	18.3	81.7
p value	0.001	

HER2 status was not known for 20 BSA and 67 non-BSA patients.

Australian referral source	Positive (%)	Negative (%)
BreastScreen Australia (n=3490)	9.3	90.7
Non-BreastScreen Australia (n=6481)	12.8	87.2
p value	<0.001	

HER2 status was not known for 62 BSA and 164 non-BSA patients.

Comments

Most (83.7%) New Zealand invasive breast cancers were HER2 negative tumours. The percentage of patients with HER2 negative tumours was slightly higher in the BSA group (86.6%) than in non-BSA group (81.7%). This difference was significant (p=0.001).

Comparison across countries indicate that there is a slightly greater proportion of HER2 negative tumours in Australia than New Zealand (88.4% and 83.7%, respectively).

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

5.7 Triple negative invasive tumours by referral source

Referral source	Triple negative cancer (%)
BSA (n=972)	6.5
Non-BSA (n=1369)	12.6
p value	<0.001

Triple negative refers to tumours oestrogen receptor, progesterone receptor and HER2 negative.

Comments

Only 10.1% 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 (6.5%) than in the non-BSA group (12.6%).

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	Median (mm)	IQR (mm)	P value
BSA (n=336)	16.0	9, 32.5	0.884*
Non-BSA (n=121)	17.0	8, 40	

IQR=interquartile range; * Wilcoxon rank sum test

Referral source	<10 mm (%)	10-14 mm (%)	15-19 mm (%)	20-29 mm (%)	30-39 mm (%)	≥40 mm (%)
BSA (n=336)	27.4	15.5	10.1	15.5	11.0	20.5
Non-BSA (n=121)	26.5	15.7	9.9	14.1	7.4	26.5
p value			0.748			

DCIS tumour size was not known for 1 BSA patient, 4 non-BSA patients

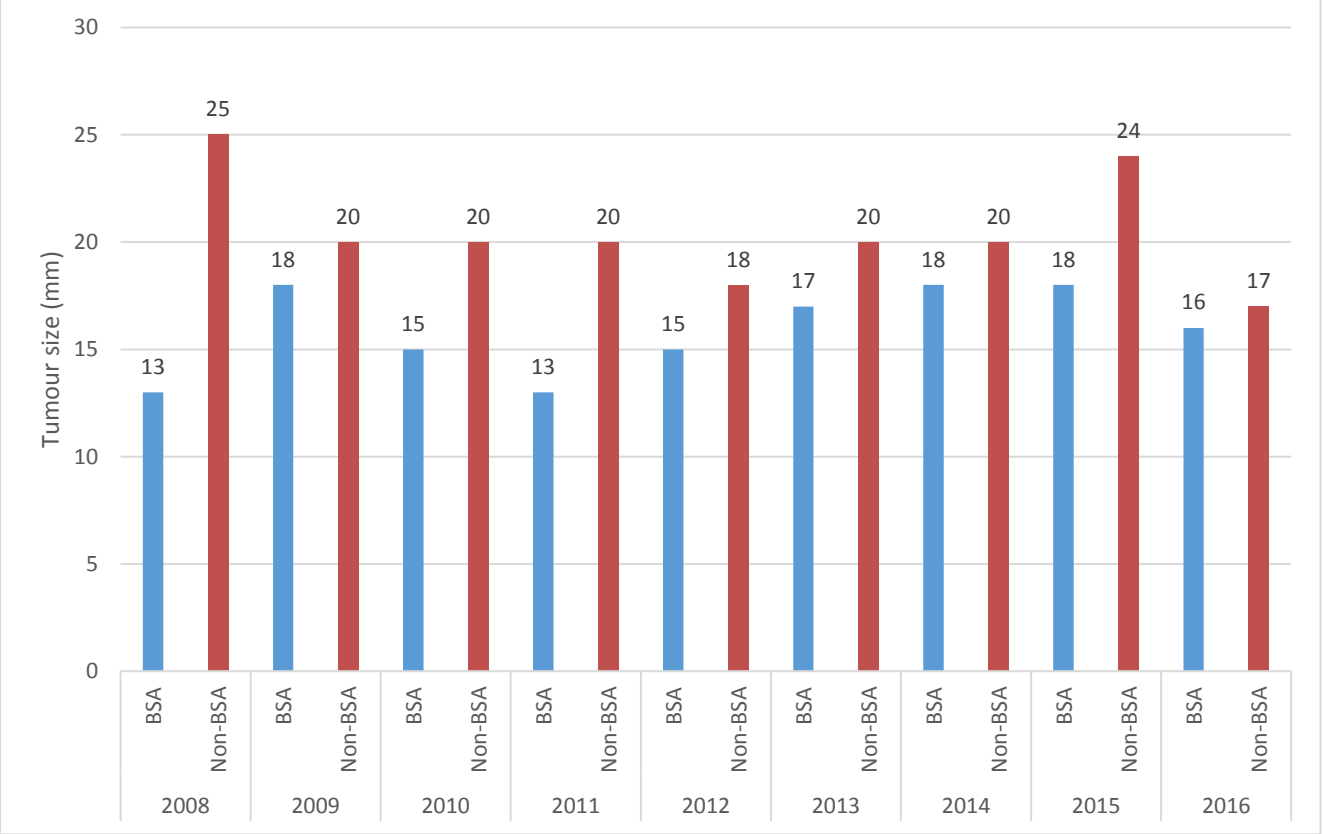

Figure 3 Median insitu tumour size by year and referral status

Comments

The percentage of patients with smaller in situ tumours (<20mm) was marginally higher for the BSA group than the non-BSA group (53.0% and 52.1%, respectively; p=0.863). The percentage of patients with larger in situ tumours (≥40mm) was higher in the non-BSA group than the BSA group (26.5% and 20.5%, respectively; p=0.179).

Median tumour sizes appear to have stabilised over time in both BSA and non-BSA referred in situ tumours (Figure 3) and differences between the two referral sources have become smaller.

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	Australia			New Zealand		
	Low (%)	Intermediate (%)	High (%)	Low (%)	Intermediate (%)	High (%)
BreastScreen	11.2	31.1	57.7	10.9	38.1	51.1
Non-BreastScreen	13.1	35.5	51.4	19.1	32.2	48.7
p value		<0.043			0.068	

DCIS histological grade was not known for 6 BSA breast cancers, 10 non-BSA breast cancers.

Figure 4 New Zealand insitu tumour grade by referral source and year

Comments

The greater percentage of New Zealand DCIS were high grade (50.5%) followed by intermediate and low grades (36.6% and 13.0%, respectively).

Comparison of histological grade by New Zealand referral source indicated no statistically significant difference between BSA and non-BSA referral sources (p=0.068) although high grade tumours were more common. A similar pattern of grade distribution was seen with Australian DCIS, although with more high grade tumours. The distribution of grade by Australian referral source, where greater numbers of DCIS occur, was statistically significant (p=0.043).

Within each referral source, intermediate in situ tumours are marginally more common in New Zealand compared to Australia (36.6% and 32.9%, respectively), and high grade tumours are less common in New Zealand compared to Australia (50.5% and 55.2%, respectively).

The distribution of tumour grade has remained relatively stable for New Zealand in situ tumours over time (Figure 4).

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

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=1009)	0.9	1.8	65.4	31.6	0.3
Not BSA (n=1473)	5.8	1.3	39.8	52.5	0.6
p value			<0.001		

CLE = complete local excision

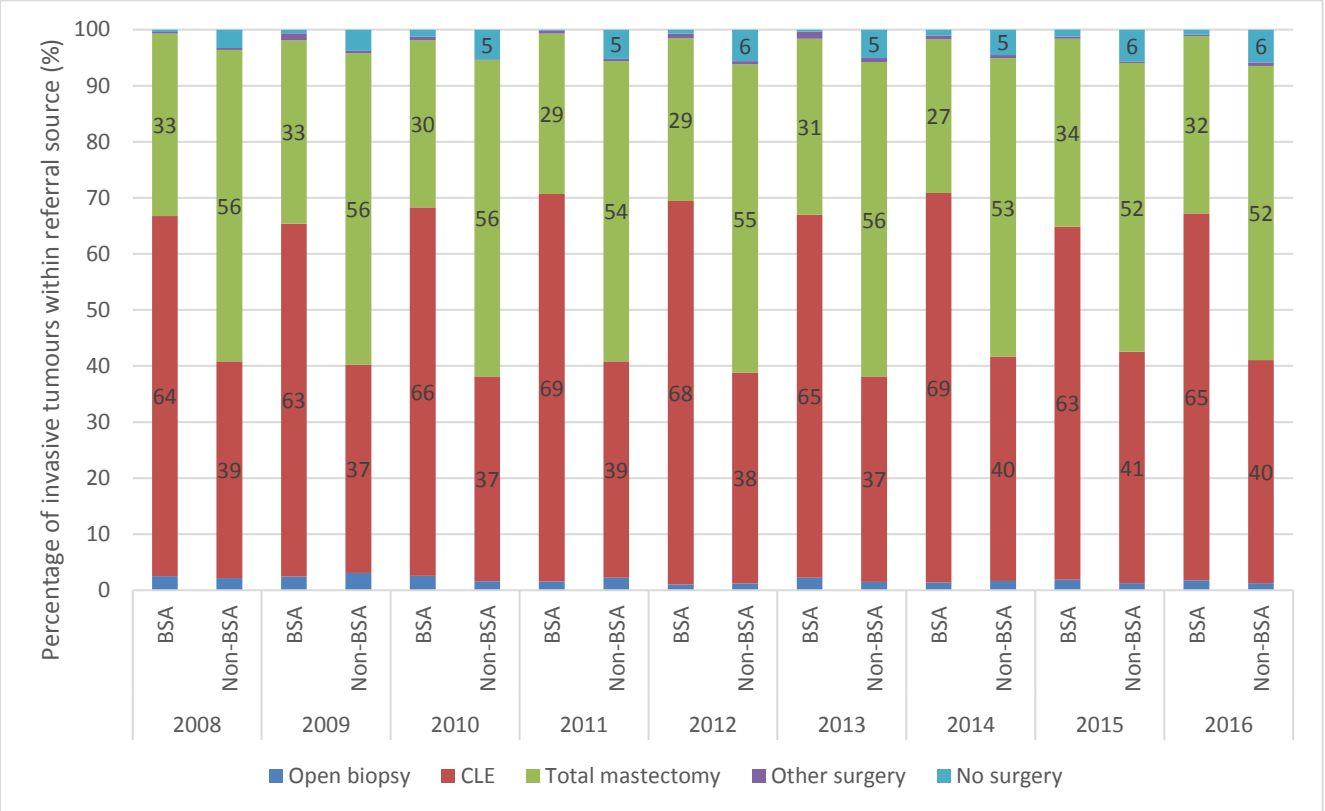

Figure 5 First surgery by referral source and year; CLE = complete local excision
Note: Data labels have not been applied for surgeries comprising less than 5% of all first surgeries in invasive breast cancer

Comments

There was a significant difference in the distribution of first breast surgery for invasive breast cancer by referral source (p<0.001). BSA patients were more likely to undergo complete local excision (65.4%) than mastectomy (31.6%) as their first surgery. The reverse was true for non-BSA patients (39.8% and 52.5%, respectively).

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 (%)	Any further surgery (%)	No further breast surgery (%)
BSA (n=678)	4.7	0.7	8.1	**13.9**	**86.1**
Non-BSA (n=605)	7.9	2.2	6.3	**16.9**	**83.1**
p value				**0.302**	

Comments
The majority of New Zealand patients (84.7%) treated with breast conserving surgery (BCS) for invasive cancer had no further surgery. The proportion of patients undergoing mastectomy after BCS for invasive cancer was lower for the BSA group (4.7%) when compared to the non-BSA group (7.9%).

7.3 Reconstruction after mastectomy for invasive cancer by referral source

Referral source	Reconstruction (%)	No reconstruction (%)
BSA (n=387)	17.8	82.2
Non-BSA (n=892)	17.0	83.0
p value	0.732	

Comments
The majority of New Zealand mastectomy patients (82.7%) with invasive tumours had no reconstruction. The distribution of patients receiving reconstruction surgery after mastectomy for invasive tumours did not differ significantly according to BSA and non-BSA referral sources.

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=334)	0.3	7.5	65.0	26.1	1.2
Non-BSA (n=120)	2.5	13.3	45.8	37.5	0.8
p value			0.001		

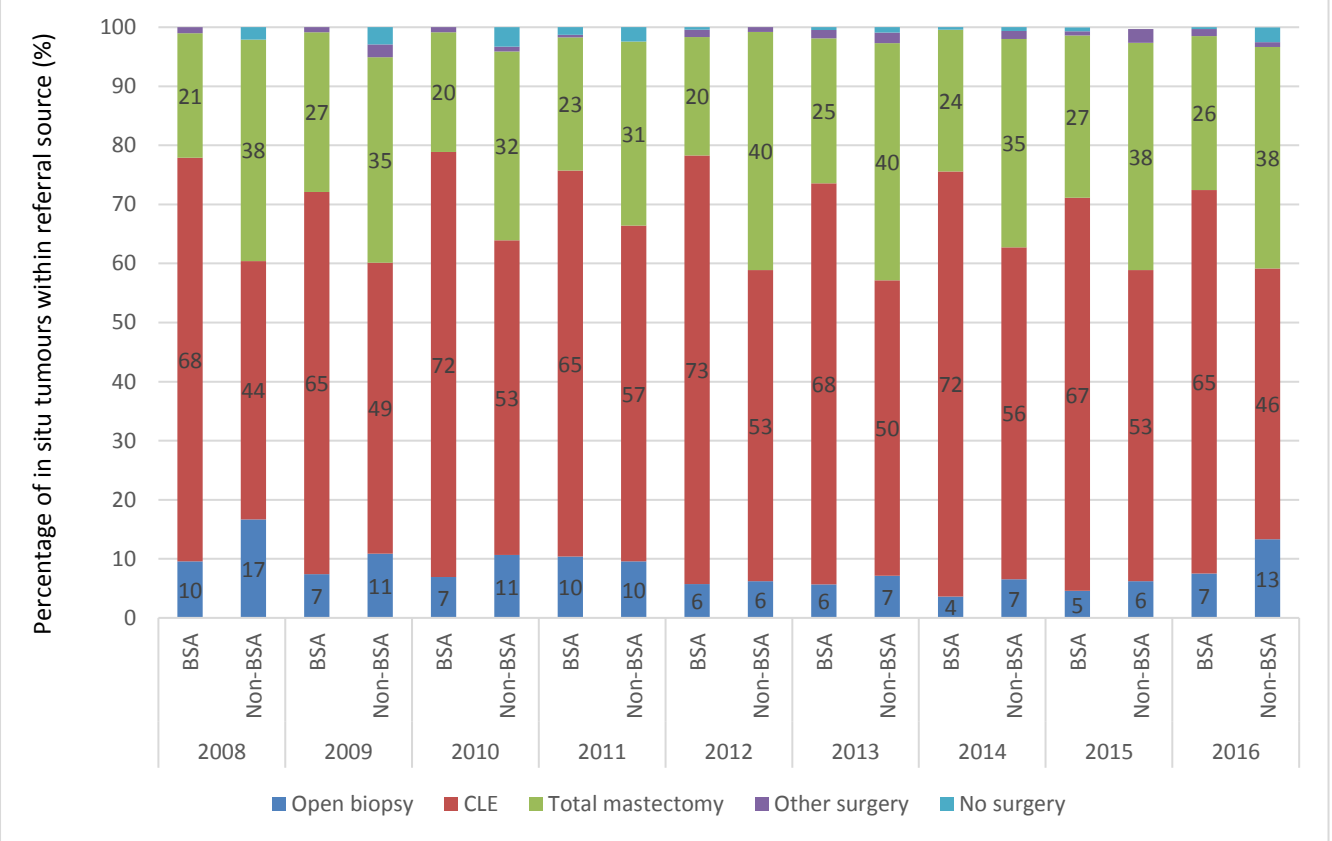

Figure 6 First surgery for DCIS by referral source and year
Note: Data labels have not been applied for surgeries comprising less than 3% of all first surgeries in insitu breast cancer

Comments

The distribution of first breast surgery differed according to the referral source (p=0.001). Over two-thirds of New Zealand patients (68.9%) had breast conserving surgery (open biopsy or CLE) as their first surgery for DCIS. The percentage of patients who had breast conserving surgery for DCIS was higher in the BSA group (72.5%) than in the non-BSA group (59.2%). The percentage of patients with mastectomy as their first surgery for DCIS tumours was lower in the BSA group (26.1%) than in the non-BSA group (37.5%).

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

Referral source	Mastectomy Only (%)	Mastectomy + re-excision (%)	Re-excision only (%)	Any further surgery (%)	No further breast surgery (%)
BSA (n=242)	9.5	2.5	15.7	**27.7**	**72.3**
Non-BSA (n=71)	16.9	7.0	14.1	**38.0**	**62.0**
p value				**0.013**	

Comments

Approximately two-thirds (65.8%) of New Zealand patients who had breast conserving surgery for DCIS received no further surgical treatment. There was an association between referral source and the likelihood of further breast surgery following breast conserving surgery (p = 0.013).

The proportion of patients treated with mastectomy after breast conserving surgery for DCIS was lower in the BSA group (12.0%) than in the non-BSA group (23.9%).

7.6 Reconstruction performed after mastectomy for DCIS by referral source

Referral source	Reconstruction (%)	No reconstruction (%)
BSA (n=119)	38.7	61.3
Non-BSA (n=72)	37.5	62.5
p value	0.873	

Comments

Almost two thirds (61.8%) 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 Only (%)	Level 2 only (%)	Level 3 only (%)	SNB & any axillary surgery (%)	Any axillary surgery (%)	No axillary surgery (%)
BSA (n=1034)	75.3	2.4	8.8	1.6	9.5	**97.7**	**2.3**
Non-BSA (n=1541)	51.1	3.1	20.2	6.2	10.7	**91.2**	**8.8**
p value						**<0.001**	

Australian referral source	SNB Only (%)	Level 1 Only (%)	Level 2 only (%)	Level 3 only (%)	SNB & any axillary surgery (%)	Any axillary surgery (%)	No axillary surgery (%)
BreastScreen Australia (n=3599)	81.3	1.4	5.0	2.2	7.5	**97.4**	**2.6**
Non-BreastScreen Australia (n=6775)	61.3	3.2	12.2	6.0	11.5	**94.1**	**5.9**
p value						**<0.001**	

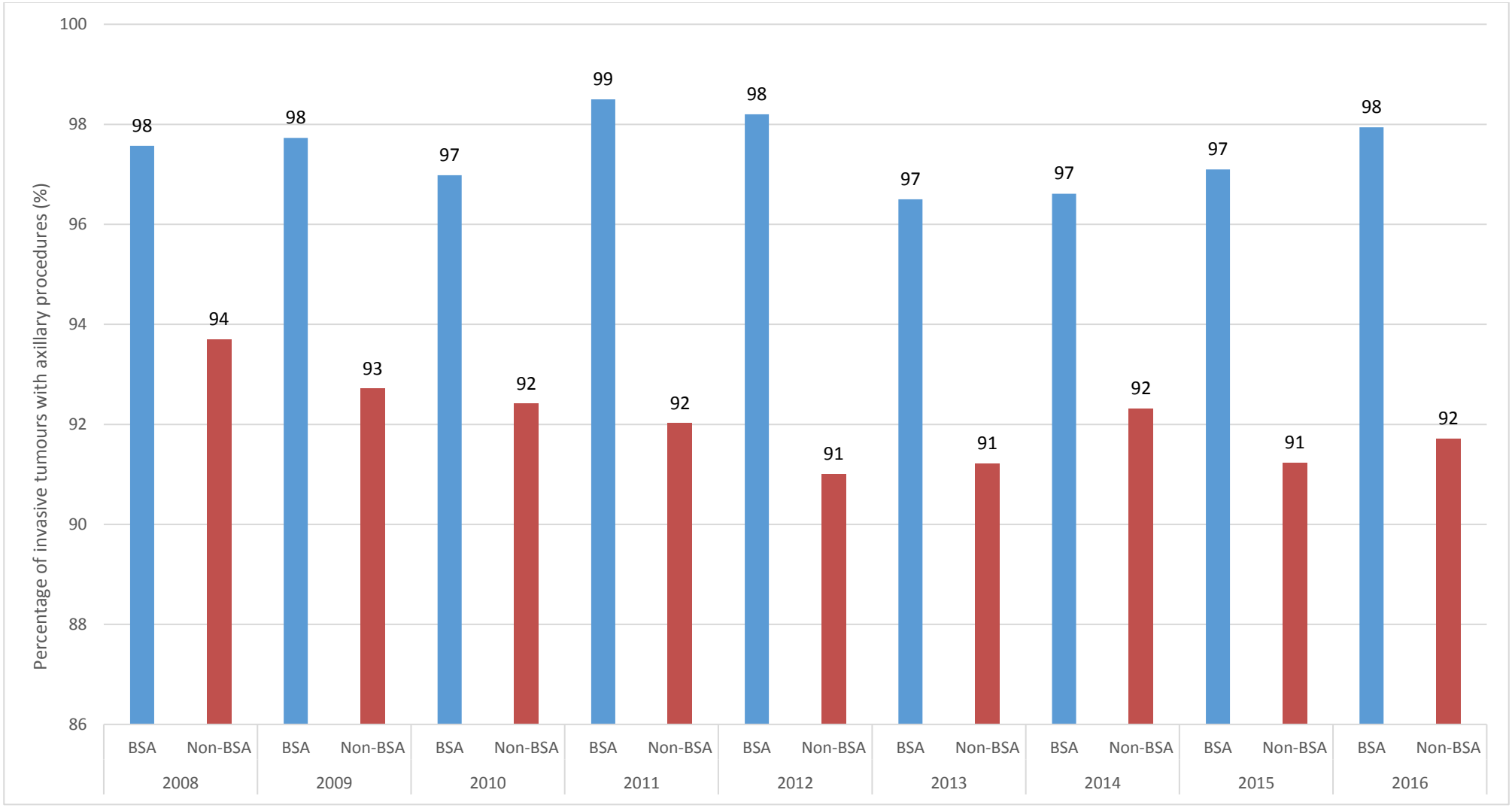

Figure 7 Axillary procedures in invasive tumours by referral source and year in New Zealand

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

New Zealand referral source	SNB Only (%)	Level 1 Only (%)	Level 2 only (%)	Level 3 only (%)	SNB & any axillary surgery (%)	Any axillary surgery (%)	No axillary surgery (%)
BSA (n=925)	79.9	2.5	6.6	1.0	8.5	**98.6**	**1.4**
Non-BSA (n=1109)	61.0	3.6	16.1	5.5	9.8	**96.2**	**3.8**
p value						**<0.001**	

Australian referral source	SNB Only (%)	Level 1 Only (%)	Level 2 only (%)	Level 3 only (%)	SNB & any axillary surgery (%)	Any axillary surgery (%)	No axillary surgery (%)
BreastScreen Australia (n=3212)	85.1	1.1	3.9	1.4	5.8	**97.3**	**2.7**
Non-BreastScreen Australia (n=5034)	69.9	2.5	9.4	3.5	9.1	**94.4**	**5.6**
p value						**<0.001**	

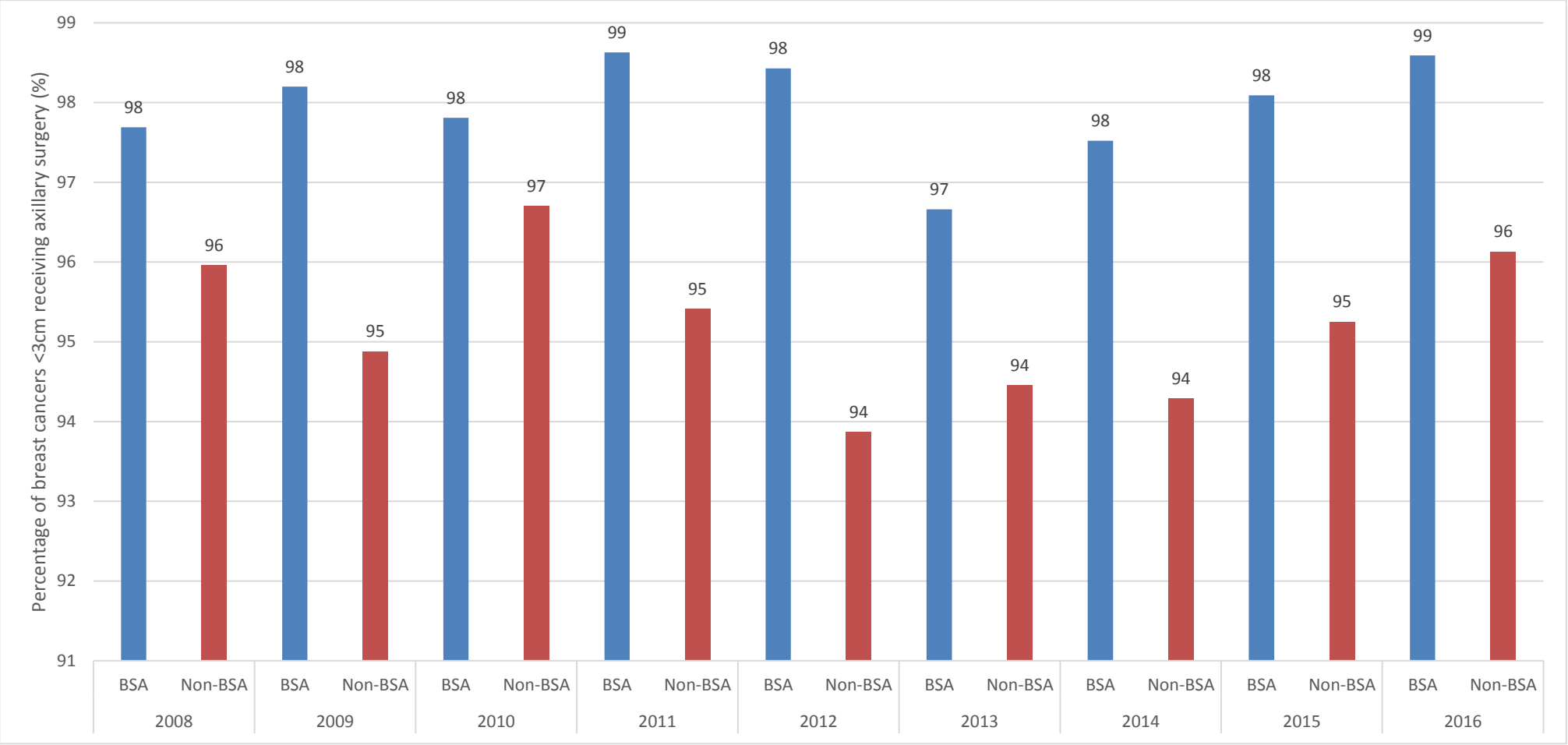

Figure 8 Axillary procedures in invasive tumours ≤ 3cm by referral source and year in New Zealand

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

Referral source	SNB Only (%)	Level 1 Only (%)	Level 2 only (%)	Level 3 only (%)	SNB & any axillary surgery (%)	Any axillary surgery (%)	No axillary surgery (%)
BSA (n=96)	33.0	2.0	29.0	8.0	19.0	**91.7**	**8.3**
Non-BSA (n=398)	23.5	1.7	31.5	8.1	13.2	**79.2**	**20.9**
p value						**0.005**	

Comments on sections 8.1 to 8.3

For smaller invasive tumours, there was a statistically significant difference in the distribution of axillary surgery by referral source (p<0.001) with a greater proportion of BSA-referred tumours undergoing axillary surgery than non-BSA referred tumours (98.6% and 96.2%, respectively). Patterns of axillary surgery in smaller tumours were similar to larger tumours in that a greater proportion of BSA referred tumours received SNB only compared with non-BSA referred tumours (79.9% and 61.0%, respectively).

For >3cm tumours, breast cancer cases referred from BSA sources were more likely to have any axillary surgery compared with non-BSA referral sources (91.7% and 79.2%, respectively; p=0.005). A higher proportion (33.0%) of BSA patients had SNB as their only axillary surgery compared with non-BSA patients (23.5%).

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 Only (%)	Level 2 Only (%)	Level 3 only (%)	SNB & any axillary surgery (%)	Any axillary surgery (%)	No axillary surgery (%)
BSA (n=168)	14.3	0.0	0.0	0.0	0.0	**14.3**	**85.7**
Non-BSA (n=38)	15.8	0.0	0.0	0.0	0.0	**15.8**	**84.2**
p value						**0.812**	

Comments

The majority (85.4%) of New Zealand patients with DCIS treated by BCS did not have axillary surgery, as expected from the guidelines. There was no statistically significant difference in the distribution of axillary surgery according to referral sources (p=0.812).

8.5 Axillary procedures for DCIS treated with mastectomy by referral source

Referral source	SNB Only (%)	Level 1 Only (%)	Level 2 only (%)	Level 3 only (%)	SNB & any axillary surgery (%)	Any axillary surgery (%)	No axillary surgery (%)
BSA (n=118)	84.8	0.0	0.0	0.9	0.0	**85.6**	**14.4**
Non-BSA (n=67)	62.7	1.5	3.0	1.5	4.5	**73.1**	**26.9**
p value						**0.038**	

Comments

The majority (81.1%) of New Zealand patients with DCIS treated by mastectomy also had axillary surgery. The proportions of axillary surgery performed did differ significantly between the BSA and non-BSA referral sources (84.8% and 62.7%, respectively). The majority of axillary procedures in DCIS treated by mastectomy was SNB only, with 84.8% and 62.7% of BSA and non-BSA referred cases respectively.

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=918)	1.4	3.5	91.9	3.2
Non-BSA (n=1256)	2.6	3.6	89.6	4.3
p value		0.143		

Margin size was not known for 105 BSA and 261 non-BSA patients.

Comments

There was no statistically significant difference in the distribution of margins in invasive cancer according to these categories of margin (p=0.143). Most (91.9%) of BSA referred patients had margins of at least 2mm after surgery for invasive cancer. There were fewer patients from BSA referral sources with involved margins (1.4%) compared to non-BSA referral sources (2.6%).

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=299)	2.3	9.4	81.3	7.0
Non-BSA (n=114)	5.3	3.5	82.5	8.8
p value		0.100		

Margin size was not known for 38 BSA and 11 non-BSA patients for DCIS cases.

Comments

BSA referred DCIS was less likely to have involved margins than non-BSA referred cases (2.3% and 5.3%, respectively). There was no significant difference in the distribution of margins according to these categories (p = 0.100).

Audit data used

Information on margin size is derived from the audit question “distance (in mm) to closest circumferential 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 treated with breast conserving surgery by referral source

Referral source	Referred for radiotherapy (%)
BSA (n=684)	93.3
Non-BSA (n=610)	86.9
p value	<0.001

Radiotherapy was not known for 1 BSA and 2 non-BSA patients. Please note that the patients who had mastectomy or other breast surgery after breast conserving surgery were not included in this group.

Comments

The proportion of New Zealand patients referred for radiotherapy treatment for invasive cancers was higher for BSA (93.3%) patients when compared to non-BSA patients (86.9%). This difference was statistically significant (p<0.001). The percentage of patients that were referred for radiotherapy but did not receive it were 6.3% and 7.5% for the BSA and non-BSA referral sources, respectively (data not shown).

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.

10.2 Radiotherapy for invasive cancer treated with mastectomy by referral source

Referral source	Referred for radiotherapy (%)
BSA (n=372)	35.5
Non-BSA (n=865)	49.9
p value	<0.001

Radiotherapy status was not known for 1 BSA patient and 2 non-BSA patients.

Comments

The percentage of patients referred for radiotherapy treatment after mastectomy for invasive cancer was significantly lower in the BSA group (35.5%) than in the non-BSA group (49.9%).

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

Referral source	Referred for radiotherapy (%)
BSA (n=7)	100.0
Non-BSA (n=52)	90.4
p value	0.391

Comments
Proportions of patients referred for radiotherapy treatment after mastectomy for high-risk invasive cancer did not differ significantly between BSA and non-BSA groups.

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.
High risk is defined as either an invasive tumour size of at least 50mm or at least 4 positive lymph nodes.

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

Referral source	Referred for radiotherapy (%)
BSA (n=242)	68.2
Non-BSA (n=67)	52.2
p value	0.016

Please note that the DCIS patients who had mastectomy after breast conserving surgery were excluded.

Comments
The majority (64.7%) of New Zealand DCIS patients treated with breast conserving surgery were referred for radiotherapy. Referral for radiotherapy treatment after breast conserving surgery for DCIS was significantly higher in cases from BSA referred sources than non-BSA sources (68.2% and 52.2%, respectively; p=0.016).

10.5 Radiotherapy for DCIS cancer treated with mastectomy by referral source

Referral source	Referred for radiotherapy (%)
BSA (n=118)	4.2
Non-BSA (n=66)	9.1
p value	0.183

Comments

Only a small percentage (6.0%) of New Zealand DCIS patients treated with mastectomy were referred for radiotherapy. There was no statistically significant difference in referral for radiotherapy between referral sources (p=0.183).

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: oestrogen positive invasive tumours

Referral source	SERMs only (%)	SERMs & Aromatase inhibitors (%)	Aromatase inhibitors only (%)
BSA (n=907)	31.1	9.6	39.7
Non-BSA (n=1219)	32.4	8.7	39.1
p value		0.884	

SERMS: Selective Oestrogen Receptor Modulators; number of women receiving SERMS plus ovarian ablation, Ovarian ablation only, ovarian ablation plus aromatase inhibitors and all three hormonal treatments are not shown due to small numbers (<4) but remain included in the total number of women from each referral source.

Comments

The distribution of hormonal treatment in oestrogen positive invasive tumours did not differ by referral source (p=0.884).Invasive tumours were more likely to receive SERMS (31.8%) or Aromotase Inhibitors (39.4%) alone compared to other hormonal treatments or combinations.

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.

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 received (%)	No chemotherapy prescribed (%)	Referred but not used (%)
BSA (n=1006)	27.1	62.5	10.3
Non-BSA (n=940)	46.1	44.0	9.9
p value		<0.001	

Comments

The proportion of all patients 70 years old or younger who received chemotherapy treatment was significantly lower in the BSA group (27.1%) than in the non-BSA group (46.1%).

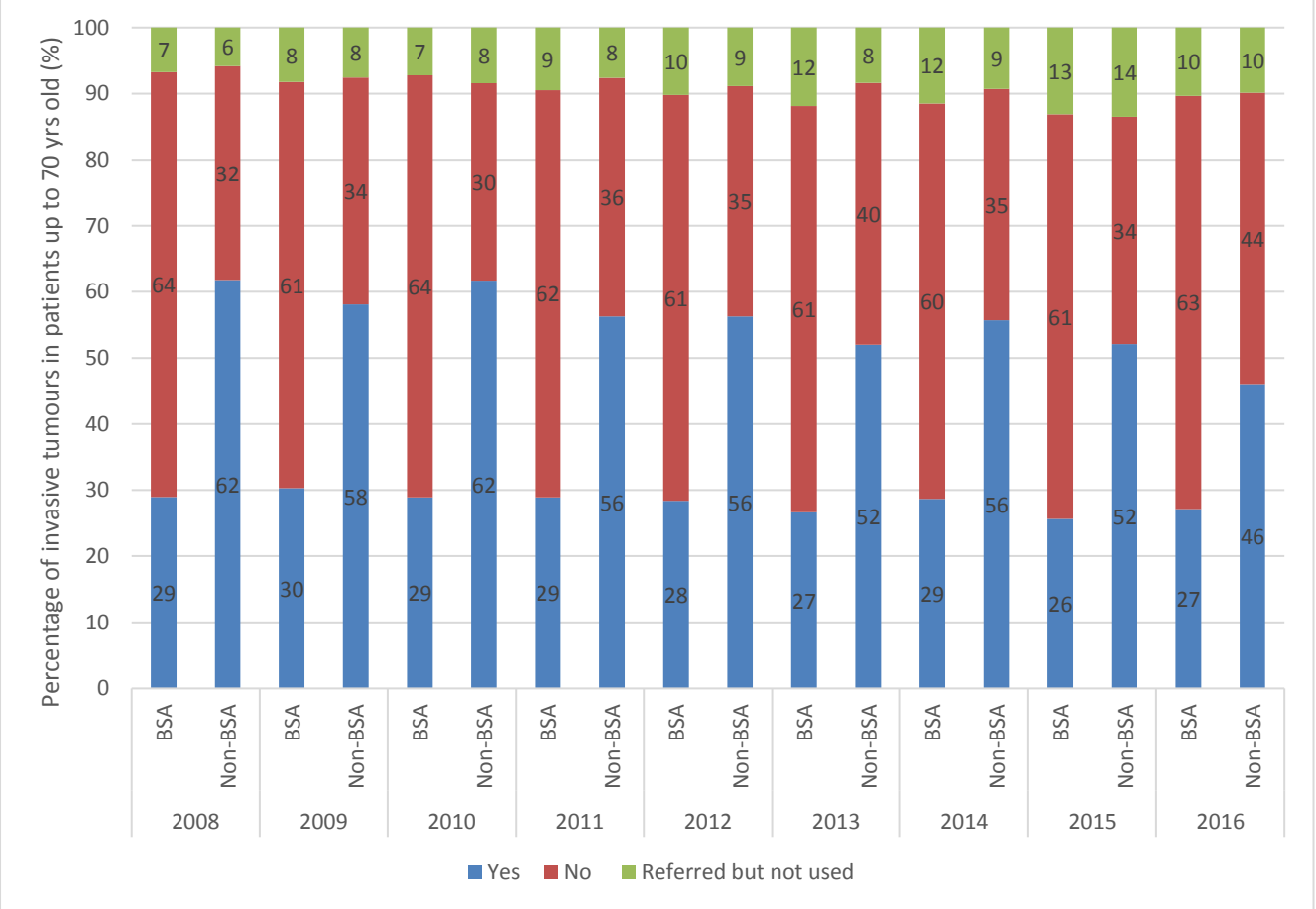

Figure 9 Chemotherapy treatment for patients aged ≤70 yrs by referral source

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

Referral source	Chemotherapy received (%)	No chemotherapy prescribed (%)	Referred but not used (%)
BSA (n=15)	6.7	80.0	13.3
Non-BSA (n=570)	10.2	79.7	10.2
p value		0.852	

Comments

A small percentage of over 70 year old New Zealand patients had chemotherapy treatment (10.1%). The distribution of prescribed chemotherapy treatment did not differ significantly between BSA and non-BSA groups for patients over the age of 70 years (p=0.852).

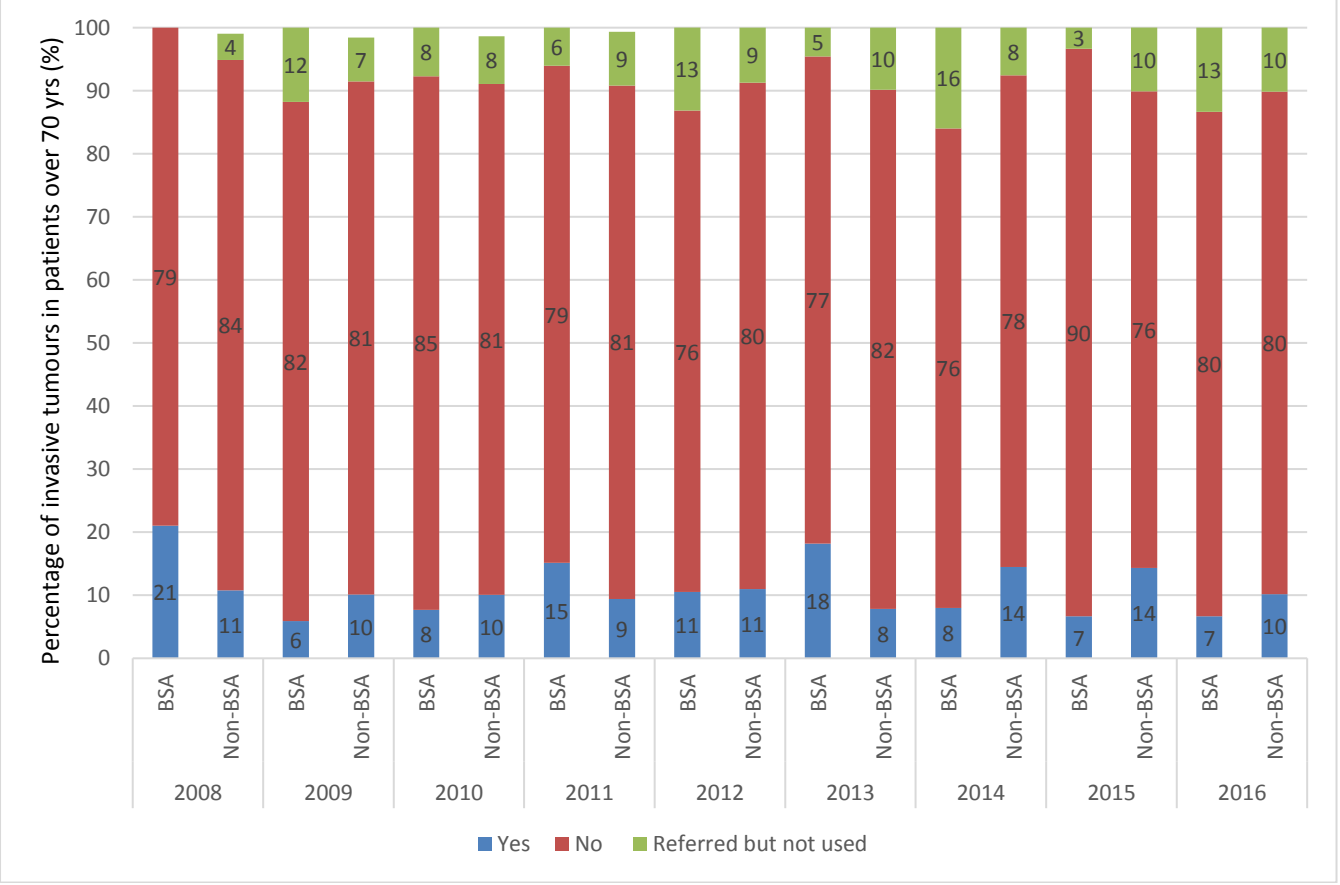

Figure 10 Chemotherapy treatment for patients aged >70 yrs by referral source

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			Not prescribed (%)
	Chemotherapy yes (%)	Chemotherapy No (%)	Chemotherapy unknown (%)	
BSA (n= 94)	78.7	2.1	0.0	19.2
Non-BSA (n= 190)	65.3	9.0	0.5	25.3
P value	0.04	0.74	NC	0.60

Herceptin treatment was not known for 1 BSA patients and 12 non-BSA patients; NC=insufficient observations for calculation

Comments

The majority of New Zealand patients with HER2 positive tumours over 1cm or with HER2 positive tumours and positive nodes received Herceptin treatment (76.8%). Proportions of patients receiving chemotherapy differed in those prescribed according to referral source (p=0.04).

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 to treat HER2 gene amplification and/or protein over expression.

14 KEY PERFORMANCE INDICATORS FOR THE MANAGEMENT OF NEW ZEALAND BREAST CANCERS DURING THE PERIOD 2014–2016

Note: The data provided here is descriptive reporting only. Statistical significance has not been determined for any differences.

KPI 1: Percentage of invasive cancer episodes undergoing breast conserving surgery which have been referred for radiotherapy (threshold 85%)

	Meeting KPI (%)
All NZ episodes (n=6785)	95.7
Episodes from BSA accredited surgeons (n=2901)	95.4

KPI 2: Percentage of invasive oestrogen positive cases referred for hormonal therapy treatment (threshold 85%)

	Meeting KPI (%)
All NZ episodes (n=6289)	83.3
Episodes from BSA accredited surgeons (n=3144)	79.4

KPI 3: Percentage of invasive cases undergoing axillary surgery (threshold 90%)

	Meeting KPI (%)
All NZ episodes (n=7457)	93.8
Episodes from BSA accredited surgeons (n=3719)	93.3

KPI 4: Percentage of in situ cases undergoing breast surgery without axillary clearance (threshold 90%)

	Meeting KPI (%)
All NZ episodes (n=1358)	98.6
Episodes from BSA accredited surgeons (n=659)	98.6

KPI 5: Percentage of high risk invasive cases undergoing mastectomy and referred for radiotherapy (RT) (threshold 85%)

	Meeting KPI (%)
All NZ episodes (n=1018)	87.5
Episodes from BSA accredited surgeons (n=494)	90.7

High risk is defined as invasive tumours of at least 50mm or with at least 4 positive lymph nodes

KPI 6: Percentage of high risk cases referred for chemotherapy (threshold 90%)

	Meeting KPI (%)
All NZ episodes (n=2577)	86.0
Episodes from BSA accredited surgeons (n=1240)	84.4

High risk is defined as invasive tumours that fall into any of the following categories:

- Age less than 55 AND Grade more than 1 AND Tumour size more than 2cm
- Age less than 55 AND Grade more than 1 AND Tumour size not more than 2cm AND Nodes involved
- Age not more than 70 AND Tumour Her2 Positive AND Tumour size more than 5mm
- Age not more than 70 AND Receptors Triple Negative AND Tumour size more than 5mm