National Breast & Ovarian Cancer Centre and Royal Australasian College of Surgeons

The National Breast Cancer Audit

Public Health Monitoring Report on 2006 Data

November 2009

Prepared by:
Australian Safety & Efficacy Register of New Interventional Procedures – Surgical

On behalf of:
The Section of Breast Surgery
and
The Royal Australasian College of Surgeons

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National Breast and Ovarian Cancer Centre and Royal Australasian College of Surgeons

National Breast Cancer Audit

Public Health Monitoring Series

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The following people were involved in the development of this report:

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Overview

A total of 2,474 Australian women with early invasive breast cancer which were treated by breast surgeons participating in the National Breast Cancer Audit (NBCA) in 2006 were analysed for this report. The majority of participating surgeons were full members of the Breast Section of the Royal Australasian College of Surgeons (RACS). These cases represented invasive breast cancers entered in the RACS NBCA database to August 2007. Details of these cancers and of their management are described in this report by age at diagnosis, treatment centre location, and referral source. Invasive breast cancers recorded by the NBCA among New Zealand women are not addressed.

Key findings

A number of notable findings by age were identified which are consistent with a poorer prognosis in women aged less than 50 years. When compared with older women, women less than 50 years were found to have a higher proportion of multifocal tumours (26% Vs 16%), a higher proportion of high grade tumours (39% Vs 29%) and higher proportion with lymphovascular invasion (38% Vs 24%).

After adjusting for differences in their clinical characteristics, younger women were more likely than 50-69 years olds to be referred for chemotherapy, ovarian ablation or treatment with Tamoxifen, whereas those aged 70 years or over were less likely to be referred for radiotherapy and chemotherapy.

Treatment characteristics also varied by treatment centre location. Patients surgically treated in Major Cities were more likely to undergo breast conserving surgery (65%) compared with those treated in Inner Regional (58%) or More Remote centres (56%), more likely to have sentinel node biopsy (59% Vs 50% Vs 33%), and more likely to have a breast reconstruction recorded if they had a mastectomy (11% Vs 3% Vs 2%). The proportion of patients receiving radiotherapy was also higher for Major Cities than for Inner Regional or More Remote centres (74% Vs 63% Vs 62%).

When compared with patients treated in More Remote centres, patients treated in Inner Regional centres were found to have a higher proportion of small cancers (44% Vs 32%) and node negative cancers (70% Vs 56%), as well as a lower rate of lymphovascular invasion (22% Vs 36%). Prognostic characteristics of patients treated in More Remote locations and those treated in a Major City were similar.

The percentage of these cancers that were small (<15mm) was highest for women 50-69 years (42%), followed by women in the adjacent 40-49 and 70-79 year age groups (35%), and with the lowest percentages applying to women under 40 years (29%) and those aged 80 years or over (26%). These differences would reflect the effect of mammographic screening. The BreastScreen Australia Program targets women aged 50-69 years, although women aged 40-49 and women 70 years and older are eligible to attend. Other favourable findings related to women who were referred through BreastScreen compared with symptomatic referrals. This group of women included a much higher percentage of small cancers (53% Vs 27%), and a higher proportion of

node negative cancers (76% Vs 54%) and low grade lesions (30% Vs 19%), with these trends persisting after allowing for differences in age.

Treatment related features distinguishing BreastScreen from symptomatic referrals were that the former were more likely to have sentinel node biopsies performed (67% Vs 50%), and among surgical cases, to have breast conserving surgery (75% Vs 58%). Additionally, when compared with symptomatic referrals, women referred through BreastScreen were more likely to be referred for radiotherapy (80% Vs 69%) but less likely to be referred for chemotherapy (35% Vs 60%).

While some of these findings may be influenced by factors which are not recorded in the RACS audit database, there are some patterns in both cancer characteristics and treatment characteristics which are noteworthy. It is important to acknowledge that this database represents only those breast cancer cases treated by members of the RACS breast section. It may therefore not be representative of the overall management of breast cancer across Australia and should be regarded as indicative only. However, it is a rich data source and the ongoing monitoring and regular reporting of this data will help inform our knowledge about gaps in care where further effort should be directed to improve outcomes in breast cancer care and cancer control.

Methods

This report describes exploratory analyses of a sample of data on invasive breast cancers diagnosed in Australia in 2006, as recorded on the Audit file. Cross-tabulations provide a descriptive overview. Since these would be subject to confounding, selected multivariable analyses also are presented.

The data apply to initial episodes of care. They are provided by age at diagnosis, referral source, and geographic location of treatment centre, broadly classified as Major City, Inner Regional or More Remote centre. While comparisons were undertaken between public and private patients, few differences presented and only results on immediate breast reconstruction are presented.

Nominal data are compared using the Pearson chi-square, substituting the likelihood-ratio chi-square when cell sizes are small. Ordinal data are similarly analysed and compared using rank tests (i.e., Kruskal-Wallis ANOVA for “nominal X ordinal” tables and Spearman correlation for “ordinal X ordinal” tables). Multinomial logistic regression analyses show differences in clinical characteristics by age, referral source and geographic location, in a multivariable context. All prognostic variables are retained in the regression models apart from progesterone receptor status, which is strongly correlated with oestrogen receptor status.

The results describe cancers encountered by surgeons and types of treatments provided. Combination therapies are not described, nor detailed breakdowns of treatment by tumour characteristic, since the purpose is to describe care in the broadest of terms, rather than investigate clinical quality or appropriateness.

Results and Discussion

By age

Cancer characteristics

Histological type

Histological type was recorded for 89.5% of all cancers, with this proportion decreasing with age from 93.1% for patients under 40 years to 67.4% for patients aged 80 years or over. Most cancers (82.1%) of known histological type comprised ductal carcinomas, 10.2% were lobular lesions, and 7.7% were less common types. There were differences by age (KW p=0.003), with patients 80 years or over having a lower proportion of ductal carcinomas (76.2%) and a higher proportion of lobular lesions (11.1%) than patients under 40 years (91.1% and 3.0%, respectively) (Table 1). Multivariate analysis confirmed that the relative odds of lobular lesions as opposed to ductal carcinomas tended to increase with age, although odds ratios were not statistically significant (p>0.050) (Table 11).

Diameter (mm)

Size was recorded for 94.4% of all cancers, with a lower figure of 89.8% applying to patients aged 80 years or over. The percentage of cancers of known size that were large (30+ mm) was 22.1%. Diameters varied by age (chi-square p<0.001), with small cancers (<15mm) comprising a lower proportion of all cancers at each end of the age distribution (ie, 28.8% for under 40 years, 26.2% for 80 years or over, and 39.3% for 40-79 years) (Table 1). Multivariate analysis also showed differences by age, with large tumours (30+ mm) being more common in women under 50 years, and those of 15mm diameter or more being more common in women age 70 years or over, when compared with the 50-69 year reference category (Table 11).

Histological grade

Histological grade was recorded for 93.5% of all patients, 89.3% of those aged 80 years or over, and 93.9% for patients under 40 years. Of recorded grades, 22.7% were low, 46.0% were intermediate, and 31.3% were high. The distribution varied by age (Sp p<0.001), with high grade lesions being a greater proportion of cancers in patients under 40 years (49.6%) and less so, patients 40-49 years (36.0%), than for women aged 50 years or over (28.6%) (Table 1). Multivariate analysis confirmed that histological grade became lower with increasing age at diagnosis (Table 11).

Nodal status

Nodal status was recorded for 88.3% of all patients, 91.2% of women under 70 years, 85.1% of women 70-79 years, and 63.6% of those aged 80 years or over. Positive nodes applied to 37.2% of patients with a recorded nodal status. This proportion was age related (MW p<0.001), with a lower figure applying in the 50-79 year age range (34.3%) than for women 49 years or under (44.1%) or 80 years or over (40.3%) (Table 1). Node positivity correlated with tumour size, such that after adjusting for this and other clinical characteristics, a clear difference in node positivity was not evident by age in the multivariate analysis (Table 11).

Hormone receptor status

Oestrogen receptor status was recorded for 92.1% of all patients, with the proportion decreasing with age from 93.8% for patients less than 40 years to 89.3% for those aged 80 years or over. Of those with a recorded hormone receptor status, 81.3% were oestrogen receptor status positive and 67.7% were progesterone receptor status positive. The proportion oestrogen receptor positive increased with age (MW p=0.015) from 71.3% for patients under 40 years to 85.0% for patients 80 years or over (Table 1). A clear trend was not evident in the multivariate analysis, however, after adjusting for other clinical characteristics (Table 11). Similarly, there was little variation in progesterone receptor status by age.

HER-2 status

HER-2 status was recorded for 78.8% of all patients, ranging from 82.8% of patients under 40 years to 72.7% for patients 80 years or over. Overall, 15.2% of patients with a recorded status were positive, with this proportion reducing with age from 22.5% for patients under 40 years to 9.6% for patients aged 80 years or over (MW p<0.001) (Table 1). This trend was confirmed in the multivariate analysis (Table 11).

Vascular/lymphatic invasion

Invasion status was reported for 91.1% of all patients, with the percentage ranging from 95.2% for patients under 40 years to 88.2% for patients aged 80 years or over. Of those patients with this characteristic recorded, 27.2% showed lymphovascular invasion. The proportion showing lymphovascular invasion varied by age (chi-square p<0.001), with higher proportions applying to patients under 40 years (40.6%) and 40-49 years (37.3%) than for women 50 years or over (23.6%) (Table 1). This trend was confirmed in the multivariate analysis (Table 11).

Extensive in-situ component (EIC)

Extensive in-situ component (EIC) was recorded for 84.4% of all patients, with this proportion declining from 88.3% in the youngest age group to 78.1% in patients aged 80 years or over. The proportion with EIC was 22.5% for patients for whom this characteristic was recorded. The proportion decreased with age from 35.9% in patients under 40 years to 13.0% in those aged 80 years or over (MW p<0.001) (Table 1).

Laterality

There was no statistically significant difference in laterality by age (Table 1). Overall, 50.4% of cancers were sited in the left breast and 49.6% in the right breast.

Number of cancer foci

Number of cancer foci was recorded for 94.5% of patients, ranging from 95.9% of those under 50 years to 88.8% of those aged 80 years or over. The proportion of patients reported as having only one focus of cancer was 81.8%, whereas 8.1% had two and 10.1% had more than two foci. The proportion of cancers that were multi-focal reduced markedly with age (Sp p<0.001) from 27.4% in women under 40 years to 13.2% in women aged 80 years or over (Table 1). This trend was confirmed in the multivariate analysis (Table 11).

Clinical management

Sentinel node biopsy

This procedure related to 56.2% of patients. There was a difference by age (chi-square p<0.001), with lower proportions applying to women 70-79 years (50.9%) and those aged 80 years or over (32.1%) than to younger age groups (59.4%).

Breast surgery

Overall, 98.5% of patients received breast surgery as part of their initial episode of care, with this proportion decreasing from 100% for patients under 40 years to 94.1% for those aged 80 years or over (Table 1). Almost two thirds of breast surgery was a breast-conserving excision (63.4%) as opposed to a mastectomy (36.6%). Type of surgery varied by age (chi-square p=0.009), with a lower proportion of mastectomies applying to women aged 60-69 years (34.1%) and 70-79 years (32.8%) than to women in all other age groups.

Adjuvant therapies

Adjuvant therapies were all age related, with most types occurring less frequently in older age groups (Table 1). For example, between the youngest (under 40 years) and oldest age groups (80 years or over), the percentage receiving:

- Radiotherapy reduced from 81.9% to 25.0% (MW p<0.001). This reduction applied to surgical cases, irrespective of whether they received breast conserving therapy or a mastectomy (Table 4)
- Chemotherapy reduced from 87.1% to 11.0% (MW p<0.001)
- Tamoxifen reduced from 58.0% to 46.1% (MW p<0.001)
- Immunotherapy reduced from 16.7% to 1.6% (MW p<0.001)
- Ovarian ablation reduced from 11.4% to zero per cent (MW p<0.001)

By comparison, referral for treatment with an aromatase inhibitor increased with age (MW p<0.001) from 15.7% for patients under 40 years to over 40% for those aged 50 years or over (Table 1).

Breast reconstruction

The proportion of women recorded as having a breast reconstruction, if they had a mastectomy (MW p<0.001), ranged from 6.9% in women under 40 years to zero in women aged 70 years or over.

Comments

The tendency for women over 80 years of age to have fewer cancer measures recorded on the database, and to receive more mastectomies and less radiotherapy, chemotherapy, Tamoxifen, immunotherapy and ovarian ablation, is consistent with data from other Australian sources and other countries. It is likely that in many instances, frailty and co-morbidities would have impacted on the treatments recommended and received.

By treatment centre location

This section applies to the 96.7% of patients for whom location of treatment centres could be inferred from the clinic names recorded on the database. Locations were categorized as Major City, Inner Regional or More Remote, using Australian Standard Geographical Classification (ASGC) definitions.

Cancer characteristics

Diameter (mm)

The distribution of diameters varied by treatment centre location (KW p=0.016), with a higher proportion of cancers being small (<15mm) in Inner Regional (43.8%) than Major City (36.7%) or More Remote locations (31.9%) (Table 2). Conversely, the proportion of cancers that were large (30+ mm) was lower in the Inner Regional (16.5%) than Major City (22.9%) or More Remote (23.4%) sites. These trends were confirmed in the multivariate analysis, in that compared with the Major City reference category, women in Inner Regional areas were less likely to have cancers of 20mm and over (Table 12).

Histological grade

This feature was not found to differ by treatment centre location (KW p=0.902) in the univariate analyses (Table 2), although higher grade lesions were suggested in Inner Regional areas than Major Cities after adjusting for other clinical characteristics (Table 12).

Nodal status

Nodal status also differed by treatment centre location (chi-square p=0.003), with the proportion of nodes recorded as positive being lower for Inner Regional (29.8%) than Major City (38.5%) or More Remote (43.7%) locations (Table 2). After adjusting for diameter and other clinical characteristics, nodal differences, although pointing in the same direction, were no longer statistically significant (p>0.050) (Table 12).

Vascular/lymphatic invasion

The prevalence of lymphovascular invasion was heterogeneous by treatment centre location (chi-square p=0.005) and followed the pattern expected from observed differences in diameter and nodal status. The proportion of cancers showing lymphovascular invasion was lower for Inner Regional (21.9%) than Major City (28.3%) or More Remote (35.8%) locations (Table 2). After adjusting for diameter and other clinical characteristics, this feature was not found to differ in the multivariate analysis (Table 12).

Other cancer characteristics

No differences were indicated by treatment centre location for histological type, hormone receptor status, HER-2 status, EIC, laterality, or number of cancer foci (Tables 2 & 12).

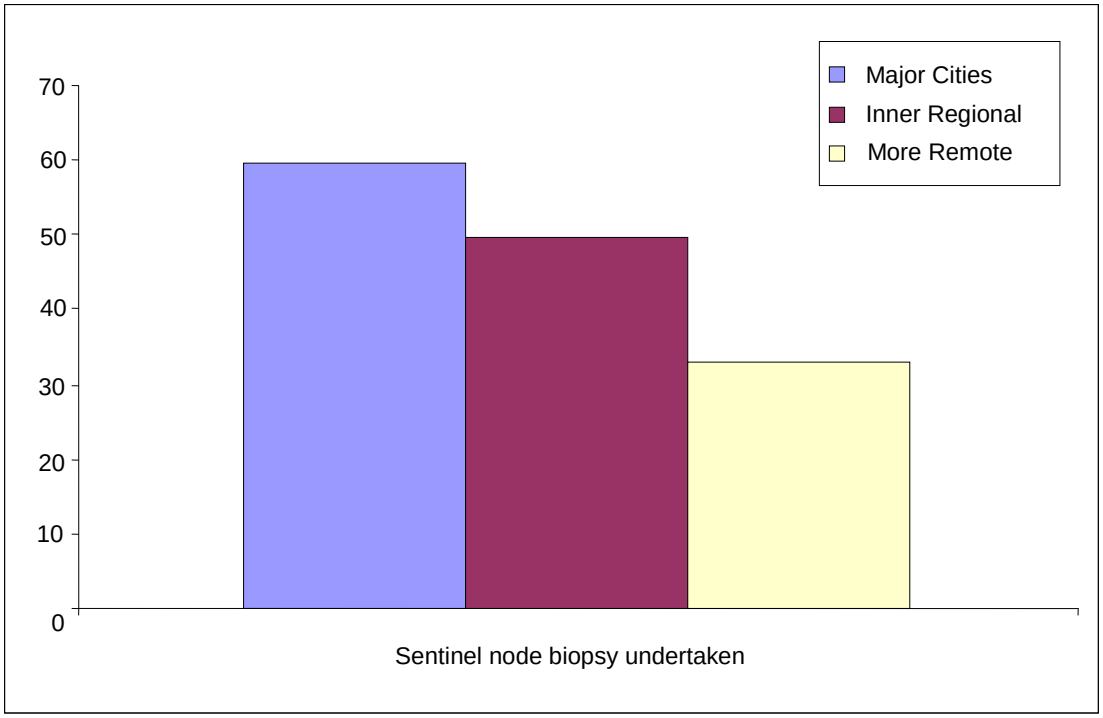
Clinical management

Sentinel node biopsy

Sentinel node biopsy varied in frequency by treatment centre location (chi-square p<0.001). The proportion of patients reported to have had this procedure was higher

for Major City (59.4%) than Inner Regional (49.6%) or More Remote (32.9%) locations (Table 2; Figure 1).

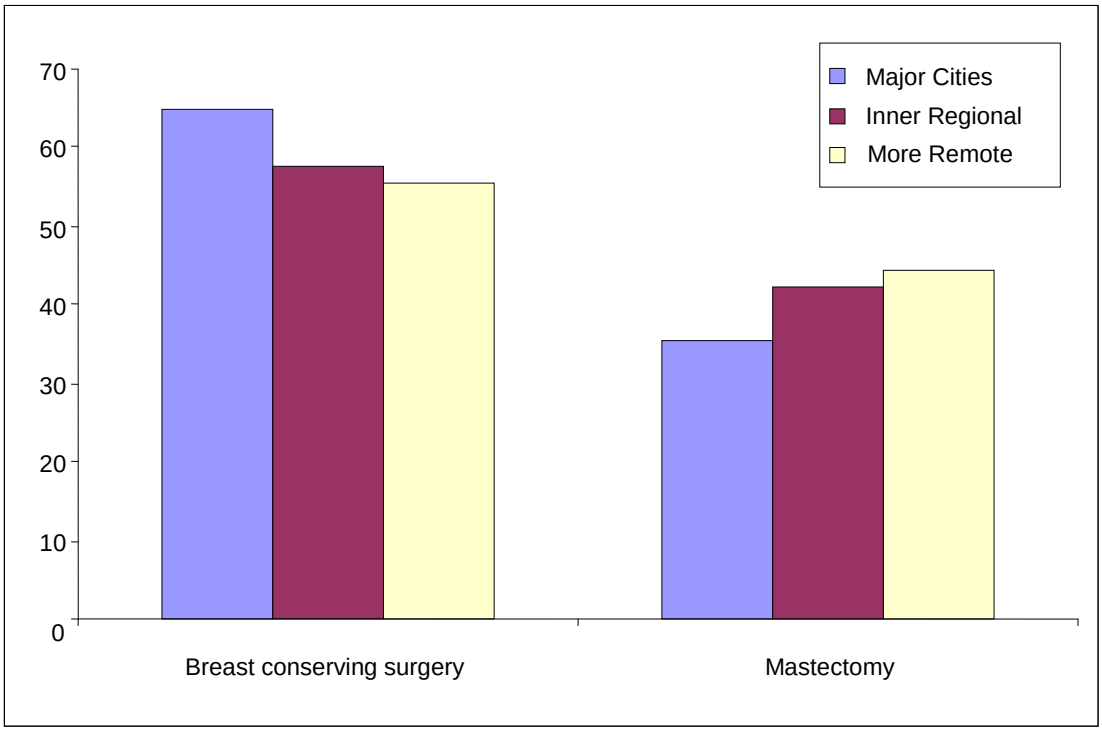
Figure 1 Percentage cancers investigated by sentinel node biopsy by location of treatment centre



Breast surgery

The proportion of surgical procedures classified as breast conserving, as opposed to mastectomy, varied by treatment centre location (chi-square p=0.007). The proportion of patients who had breast conserving surgery was higher for Major City (64.7%) than Inner Regional (57.8%) or More Remote (55.5%) locations (Table 2; Figure 2). Statistically signficant differences were not observed, however, after adjusting for clinical characteristics (Table 13).

Figure 2 Percentage cancers treated by surgery by location of treatment centre

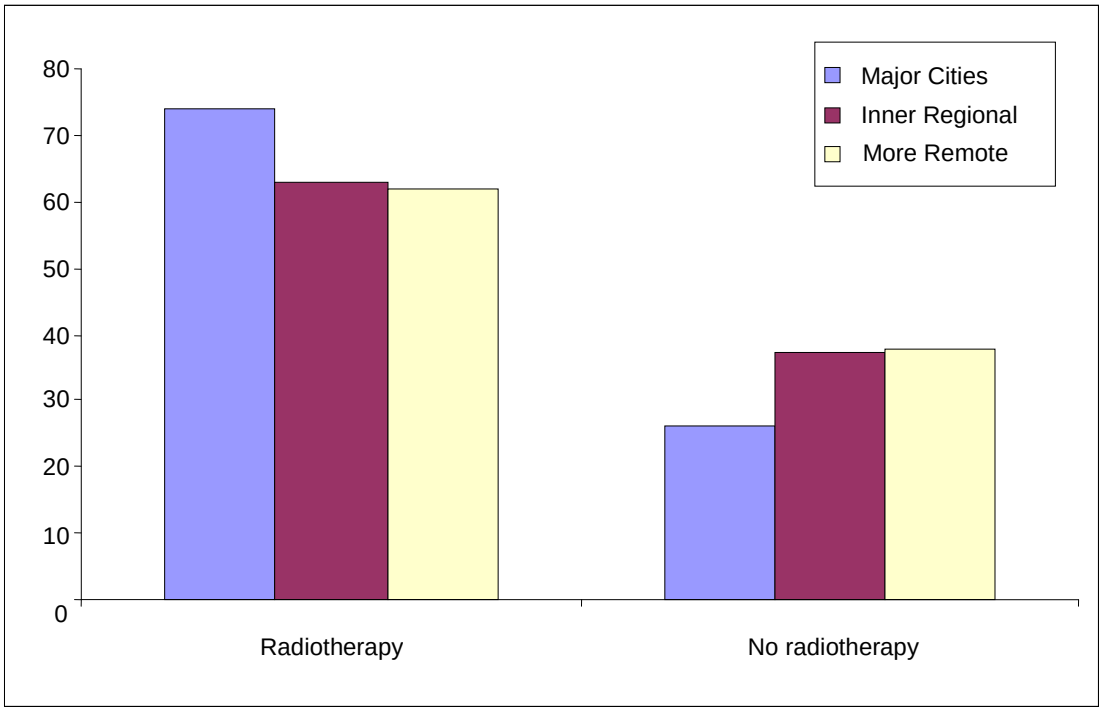


Adjuvant therapies

Radiotherapy was location related (chi-square p<0.001), being more common for Major City (73.8%) than Inner Regional (62.5%) or More Remote (62.1%) locations (Table 2; Figure 3), although this trend was not apparent for women receiving breast conserving surgery (Table 5). Multivariate analysis, after adjusting for clinical characteristics, also showed a difference by location of treatment centre, in that radiotherapy was less evident for Inner Regional (p<0.001) and More Remote (p=0.002) than Major City locations.

While differences were not indicated by treatment centre location for referral for chemotherapy, ovarian ablation, aromatase inhibitor or immunotherapy, either in the univariate or multivariate analysis, less exposure to Tamoxifen was indicated in Inner Regional than Major City locations, after adjusting for clinical characteristics (p=0.008).

Figure 3 Percentage cancers treated by radiotherapy by location of treatment centre



Breast reconstruction

The proportion of women recorded as having a breast reconstruction, if they had a mastectomy, was location related (chi-square $p<0.001$), ranging from 11.3% for Major City to 3.2% for Inner Regional and 1.5% for More Remote treatment locations.

Comments

These data indicate that patients treated in Inner Regional locations had a relatively good prognosis, as reflected in their cancer sizes, nodal status, and extent of lymphovascular invasion. Those treated in a Major City were more likely to have a sentinel node biopsy and immediate breast reconstruction. While they also were more likely to have conservative surgery, as opposed to a mastectomy, this did not apply after adjusting for differences in clinical characteristics. Meanwhile, women treated in Inner Regional areas were less likely to receive radiotherapy or Tamoxifen than those seen in Major City centres, after adjusting for differences in clinical characteristics of the cancer. These findings would have been influenced by referral patterns and may not be an accurate reflection of the cancer profiles and management for residents of these locations.

By referral source

This section applies to the 88.9% of patients for whom referral source was recorded on the database. Sources were categorized as BreastScreen (i.e., mostly screen-detected non-symptomatic), symptomatic referral, or ‘other’ (including referrals from de facto screening through Medicare).

Cancer characteristics

Diameter (mm)

Diameters varied by referral source (KW p<0.001), with small cancers (<15mm) being a higher proportion of cancers referred from BreastScreen (i.e., 53.0% compared with 27.0% for symptomatic referrals and 48.3% for 'other') (Table 3). Conversely, BreastScreen referrals included a low proportion with a large size (30+ mm) (i.e., 11.4% compared with 27.3% for symptomatic referrals and 20.9% for 'other'). These trends were confirmed in the multivariate analysis (Table 13).

Histological grade

Grade was distributed differently by referral source (KW p<0.001), with low grade representing 30.2% of BreastScreen referrals, 18.8% of symptomatic cases, and 21.3% of 'other' (Table 3). Conversely, high grade constituted a low proportion of BreastScreen referrals (i.e., 20.1% compared with 36.8% for symptomatic cases and 31.4% for 'other'). Similar results applied to the multivariate analysis, in that high grade lesions were less common among BreastScreen referrals than symptomatic patients (Table 13).

Nodal status

Nodal status also varied by referral source (chi-square p<0.001), with positive nodes applying to 24.1% of BreastScreen referrals compared with 45.8% of symptomatic cases and 29.9% of 'other' (Table 3). Multivariateanalysis also showed lower relative odds of positive nodes among BreastScreen and 'other' referrals than among symptomatic patients (Table 13).

Hormone receptor status

Hormone receptor status varied across referral groups. This applied both to the oestrogen receptor (chi-square p<0.001) and the progesterone receptor (chi-square p=0.031) (Table 3). BreastScreen referrals were more likely to be oestrogen receptor positive (i.e., 87.1% compared with 78.8% for symptomatic and 79.0% for 'other' cases) and progesterone receptor positive (i.e., 71.9% compared with 66.4% for symptomatic and 64.6% for 'other' cases). Although statistical significance was not achieved, a similar trend was seen in the multivariate analysis for oestrogen receptor status (Table 13).

HER-2 status

This characteristic also differed by referral source (chi-square p=0.011), with symptomatic cases including more HER-2 positives (i.e., 16.7% compared with 11.8% for BreastScreen referrals and 10.8% for 'other' cases) (Table 3). Similar, although not statistically significant (p>0.050), findings arose from the multivariate analysis (Table 13).

Vascular/lymphatic invasion

The proportion showing lymphovascular invasion varied by referral source (chi-square p<0.001), with lower proportions applying to BreastScreen (18.2%) and 'other' cases (21.8%) than to symptomatic referrals (34.2%) (Table 3). Statistically significant differences were not observed, however, after adjusting for tumour size and other clinical characteristics (Table 13).

Number of cancer foci

The proportion of patients reported as having just one focus of cancer was 85.4% for BreastScreen cases, compared with 80.4% for symptomatic and 78.2% for 'other'cases. The distribution by numbers of cancer foci varied across these groups (KW p=0.005) (Table 3). Again, this was not a statistically significant finding after adjusting for tumour size and other clinical characteristics (Table 13).

Other cancer characteristics

Differences were not found by referral source for histological type, EIC or laterality of cancer (p>=0.117).

Clinical management

Sentinel node biopsy

This procedure was more commonly reported for BreastScreen referrals (67.1%) than symptomatic (49.8%) and 'other' cases (55.4%) (chi-square p<0.001) (Table 3).

Breast surgery

There was a pronounced difference in type of surgery by referral source (chi-square p<0.001), with a higher proportion having breast conserving surgery as opposed to a mastectomy in BreastScreen (74.8%) than symptomatic (57.8%) or 'other' cases (54.3%) (Table 3).

Adjuvant therapies

Apart from Tamoxifen, provision of these therapies was related to referral source, in that:

- Radiotherapy was recommended to 79.5% of BreastScreen compared with 68.6% of symptomatic and 58.2% of 'other' cases (chi-square p<0.001). Radiotherapy was more common in BreastScreen referrals than other women who had breast conserving surgery, but not in BreastScreen referrals who received a mastectomy (Table 6)
- Chemotherapy was recommended to 59.5% of symptomatic compared with 35.4% of BreastScreen and 43.0% of 'other' cases (chi-square p<0.001)
- Aromatase inhibitor therapy was recommended to 44.5% of BreastScreen compared with 38.5% of symptomatic and 38.6% of 'other' cases (chi-square p=0.051)
- Immunotherapy was recommended to 8.2% of symptomatic compared with 5.5% of BreastScreen and 3.5% of 'other' cases (chi-square p=0.044)
- Ovarian ablation was recommended to 3.7% of symptomatic compared with 1.6% of BreastScreen and 2.6% of 'other' cases (chi-square p=0.058)

Multivariate analysis confirmed that, compared with symptomatic patients, BreastScreen referrals were more likely to be referred for chemotherapy (p=0.003) and 'other' cases were less likely to ve referred for radiotherapy (p=0.012).

Breast reconstruction

The proportion of women recorded as having a breast reconstruction, if they had a mastectomy, varied by referral source (chi-square p=0.0540), 1), ranging from 7.9% for BreastScreen cases, 7.2% for symptomatic and 15.2% for 'other' cases.

Comments

BreastScreen cases had better prognostic features than other cases, as indicated by cancer size, grade, nodal status, hormone receptor status, lymphovascular invasion, and number of cancer foci, although 'other' referrals also showed comparatively small cancer sizes, little node positivity, and limited lymphovascular invasion. By comparison, HER-2 receptor positive was more commonly reported among symptomatic cases.

The treatment of BreastScreen cases was characterized by conservative surgery, as opposed to a mastectomy, and more radiotherapy, treatment with an aromatase inhibitor, immunotherapy and ovarian ablation, but less chemotherapy. Most of these differences were explained by differences in prognostic features, especially differences in tumour size, but the lower exposure of BreastScreen referrals to chemotherapy remained after adjusting for these factors.

It will be important, given the targeting of breast screening by age, to test through multivariate analysis whether these differences persist after adjusting for age.

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* In February 2008, National Breast Cancer Centre (NBCC) changed its name to National Breast and Ovarian Cancer Centre (NBOCC).

Table 1 Percentage distribution of female-breast cancer characteristics and management practices by age at diagnosis: RACS Audit, 2006 diagnoses

Female-breast cancer characteristics		Age at diagnosis (years)						P value *
		Under 40 [n=145]	40-49 [n=463]	50-59 [n=686]	60-69 [n=657]	70-79 [n=336]	80+ [n=187]	
Histology	Ductal [n=1,818]	91.1	83.3	83.0	82.0	76.9	76.2	KW p=0.003
	Lobular [n=227]	3.0	9.8	9.5	11.1	13.8	11.1	$\chi^2_{(10)}$ p=0.022
	Other [n=170]	5.9	7.0	7.5	7.0	9.3	12.7	
	Sub-total [n=2,215]	100	100	100	100	100	100	
	Unknown [n=259]	[n=10]	[n=33]	[n=56]	[n=53]	[n=46]	[n=61]	
Diameter (mm)	Under 10 [n=383]	12.9	14.2	18.5	19.0	15.2	9.5	Sp p=0.020
	10-14 [n=499]	15.9	19.0	21.7	24.4	22.8	16.7	$X^2_{(10)}$p<0.001
	15-19 [n=433]	18.2	16.7	20.5	17.2	19.9	24.4	
	20-29 [n=505]	20.5	22.6	20.9	21.2	21.5	24.4	
	30-39 [n=264]	15.2	12.0	9.1	7.8	13.9	17.3	
	40+ [n=252]	17.4	15.6	9.4	10.4	6.6	7.7	
	Sub-total [n=2,336]	100	100	100	100	100	100	
	Unknown [n=138]	[n=13]	[n=20]	[n=36]	[n=30]	[n=20]	[n=19]	
Grade	Low [n=526]	14.6	16.0	23.9	25.6	26.5	25.1	Sp p<0.001
	Intermediate [n=1,064]	35.8	48.1	44.7	47.6	48.4	43.1	$\chi^2_{(10)}$ p<0.001
	High [n=724]	49.6	36.0	31.3	26.8	25.2	31.7	
	Sub-total [n=2,314]	100	100	100	100	100	100	
	Unknown [n=160]	[n=8]	[n=18]	[n=51]	[n=37]	[n=26]	[n=20]	
Nodal status	Negative [n=1,372]	55.1	56.1	63.2	67.4	67.5	59.7	MW p<0.001
	Positive [n=812]	44.9	43.9	36.8	32.6	32.5	40.3	$\chi^2_{(5)}$ p=0.001
	Sub-total [n=2,184]	100	100	100	100	100	100	
	Unknown [n=290]	[n=9]	[n=37]	[n=64]	[n=62]	[n=50]	[n=68]	
Oestrogen receptor status	Positive [n=1,853]	71.3	80.7	81.2	82.7	82.3	85.0	MW p=0.015
	Negative [n=425]	28.7	19.3	18.8	17.3	17.7	15.0	$\chi^2_{(5)}$ p=0.041
	Sub-total [n=2,278]	100	100	100	100	100	100	
	Unknown [n=196]	[n=9]	[n=33]	[n=48]	[n=55]	[n=31]	[n=20]	
Progesterone receptor status	Positive [n=1,546]	66.9	74.7	64.6	66.3	66.6	69.0	MW p=0.145
	Negative [n=738]	33.1	25.3	35.4	33.7	33.4	31.0	$\chi^2_{(5)}$ p=0.022
	Sub-total [n=2,284]	100	100	100	100	100	100	
	Unknown [n=190]	[n=9]	[n=33]	[n=50]	[n=51]	[n=28]	[n=19]	
HER-2 status	Positive [n=296]	22.5	18.2	16.5	14.0	10.2	9.6	MW p<0.001
	Negative [n=1,653]	77.5	81.8	83.5	86.0	89.8	90.4	$\chi^2_{(5)}$ p=0.003
	Sub-total [n=1,949]	100	100	100	100	100	100	
	Unknown [n=525]	[n=25]	[n=90]	[n=148]	[n=149]	[n=62]	[n=51]	
Vascular/ lymphatic invasion	Positive [n=614]	40.6	37.3	27.6	19.6	21.9	26.1	MW p<0.001
	Negative [n=1,641]	59.4	62.7	72.4	80.4	78.1	73.9	$\chi^2_{(5)}$ p<0.001
	Sub-total [n=2,255]	100	100	100	100	100	100	
	Unknown [n=219]	[n=7]	[n=34]	[n=67]	[n=55]	[n=34]	[n=22]	
Extensive in-situ component	Positive [n=470]	35.9	28.5	24.1	19.1	16.2	13.0	MW p<0.001
	Negative [n=1,617]	64.1	71.5	75.9	80.9	83.8	87.0	$\chi^2_{(5)}$ p<0.001
	Sub-total [n=2,087]	100	100	100	100	100	100	
	Unknown [n=387]	[n=17]	[n=67]	[n=106]	[n=98]	[n=58]	[n=41]	

Female-breast cancer characteristics		Age at diagnosis (years)						P value *
		Under 40 [n=145]	40-49 [n=463]	50-59 [n=686]	60-69 [n=657]	70-79 [n=336]	80+ [n=187]	
Laterality	Left [n=1,217]	48.3	46.5	53.0	50.9	50.8	50.3	MW p=0.347
	Right [n=1,196]	51.8	53.5	47.0	49.1	49.2	49.7	$\chi^2_{(5)}$ p=0.421
	Sub-total [n=2,413]	100	100	100	100	100	100	
	Unknown [n=61]	[n=2]	[n=9]	[n=20]	[n=15]	[n=7]	[n=8]	
Number of invasive cancers	1 [n=1,911]	72.7	75.0	83.6	83.3	85.8	86.7	Sp p<0.001
	2 [n=189]	10.1	7.9	7.3	8.9	7.3	8.4	$\chi^2_{(10)}$ p<0.001
	3+ [n=237]	17.3	17.1	9.0	7.8	6.9	4.8	
	Sub-total [n=2,337]	100	100	100	100	100	100	
	Unknown [n=137]	[n=6]	[n=19]	[n=44]	[n=28]	[n=19]	[n=21]	
Sentinel node biopsy reported	Yes [n=1,390]	59.3	54.2	62.2	60.1	50.9	32.1	MW p<0.001
	No [n=1,084]	40.7	45.8	37.8	39.9	49.1	67.9	$\chi^2_{(5)}$ p<0.001
	Total [n=2,474]	100	100	100	100	100	100	
Surgery	Breast conserving [n=1,545]	60.0	60.9	58.9	65.9	67.2	55.7	MW p=0.526
	Mastectomy [n=892]	40.0	39.1	41.1	34.1	32.8	44.3	$\chi^2_{(5)}$ p=0.009
	Sub-total [n=2,437]	100	100	100	100	100	100	
	Any surgery [n=2,437]	100	98.7	99.3	98.8	97.9	94.1	MW p<0.001
	No surgery [n=37]	0	1.3	0.7	1.2	2.1	5.9	$\chi^2_{(LR)}$ p<0.001
	Total [n=2,474]	100	100	100	100	100	100	
Radiotherapy	Yes [n=1,561]	81.9	76.4	77.3	75.9	63.8	25.0	MW p<0.001
	No [n=623]	18.1	23.6	22.7	24.1	36.2	75.0	$\chi^2_{(5)}$ p<0.001
	Sub-total [n=2,184]	100	100	100	100	100	100	
	Not yet [n=57]	0.7	4.1	2.9	2.2	2.6	0	
	Unknown [n=233]	[n=6]	[n=48]	[n=59]	[n=62]	[n=27]	[n=31]	
Chemotherapy	Yes [n=1,100]	87.1	74.6	59.1	41.2	17.4	11.0	MW p<0.001
	No [n=1,100]	12.9	25.4	40.9	58.8	82.6	89.0	$\chi^2_{(5)}$ p<0.001
	Sub-total [n=2,200]	100	100	100	100	100	100	
	Not yet [n=45]	0	2.1	2.1	2.0	3.2	0.6	
	Unknown [n=229]	[n=6]	[n=41]	[n=60]	[n=62]	[n=28]	[n=32]	
Tamoxifen	Yes [n=843]	58.0	58.6	38.1	38.2	37.9	46.1	MW p<0.001
	No [n=1,091]	42.0	41.4	61.9	61.8	62.1	53.9	$\chi^2_{(5)}$ p<0.001
	Sub-total [n=1,934]	100	100	100	100	100	100	
	Not yet [n=150]	4.0	9.0	9.7	5.8	6.1	3.2	
	Unknown [n=390]	[n=21]	[n=84]	[n=108]	[n=106]	[n=41]	[n=30]	
Ovarian Ablation	Yes [n=58]	11.4	9.9	1.4	0.2	1.4	0	MW p<0.001
	No [n=1,902]	88.6	90.1	98.6	99.8	98.6	100	$\chi^2_{(LR)}$ p<0.001
	Sub-total [n=1,960]	100	100	100	100	100	100	
	Not yet [n=49]	8.8	8.0	1.6	0.2	0	0	
	Unknown [n=465]	[n=20]	[n=111]	[n=123]	[n=124]	[n=44]	[n=43]	
Aromatase Inhibitor	Yes [n=721]	15.7	22.7	45.1	49.3	45.1	42.0	MW p<0.001
	No [n=1,065]	84.3	77.3	54.9	50.7	54.9	58.0	$\chi^2_{(5)}$ p<0.001
	Sub-total [n=1,786]	100	100	100	100	100	100	
	Not yet [n=169]	8.9	9.0	10.7	9.0	7.0	1.4	
	Unknown [n=519]	[n=33]	[n=119]	[n=137]	[n=124]	[n=64]	[n=42]	

Female-breast cancer characteristics		Age at diagnosis (years)						P value *
		Under 40 [n=145]	40-49 [n=463]	50-59 [n=686]	60-69 [n=657]	70-79 [n=336]	80+ [n=187]	
Immunotherapy	Yes [n=126]	16.7	8.7	8.1	7.2	1.9	1.6	MW p<0.001
	No [n=1,641]	83.3	91.3	91.9	92.8	98.1	98.4	$\chi^2_{(LR)}$ p<0.001
	Sub-total [n=1,767]	100	100	100	100	100	100	
	Not yet [n=51]	4.4	4.3	2.6	2.7	1.9	0.8	
	Unknown [n=656]	[n=32]	[n=138]	[n=180]	[n=175]	[n=72]	[n=59]	

* MW = Mann-Whitney; KW= Kruskal-Wallis; Sp = Spearman; $X^2_{(df)}$ = Pearson chi-square; $X^2_{(LR)}$ = Likelihood-ratio chi-square

Table 2: Percentage distribution of female-breast cancer characteristics and management practices by location of treatment centre: RACS Audit, 2006 diagnoses

Female-breast cancer characteristics		Treatment Centre Location			P value *
		Major Cities [n=1,876]	Inner Regional [n=371]	More Remote [n=146]	
Histology	Ductal [n=1,766]	82.2	81.6	83.5	$\chi^2_{(4)}$ p=0.988
	Lobular [n=215]	9.9	10.4	9.8	
	Other [n=168]	7.8	8.1	6.8	
	Sub-total [n=2,149]	100	100	100	
	Unknown [n=244]	[n=207]	[n=24]	[n=13]	
Diameter (mm)	Under 10 [n=371]	16.7	15.4	14.2	KW p=0.016
	10-14 [n=482]	20.0	28.4	17.7	$\chi^2_{(12)}$ p=0.016
	15-19 [n=429]	18.5	20.4	20.6	
	20-29 [n=491]	21.9	19.3	24.1	
	30-39 [n=250]	11.8	7.4	10.6	
	40+ [n=247]	11.1	9.1	12.8	
	Sub-total [n=2,270]	100	100	100	
	Unknown [n=123]	[n=110]	[n=8]	[n=5]	
Grade	Low [n=505]	22.9	20.3	23.1	KW p=0.902
	Intermediate [n=1,037]	45.5	49.2	46.9	$\chi^2_{(4)}$ p=0.739
	High [n=703]	31.6	30.6	30.1	
	Sub-total [n=2,245]	100	100	100	
	Unknown [n=148]	[n=134]	[n=11]	[n=3]	
Nodal status	Negative [n=1,327]	61.5	70.2	56.3	$\chi^2_{(2)}$ p=0.003
	Positive [n=791]	38.5	29.8	43.7	
	Sub-total [n=2,118]	100	100	100	
	Unknown [n=275]	[n=233]	[n=22]	[n=20]	
Oestrogen receptor status	Positive [n=1,795]	81.5	80.7	79.6	$\chi^2_{(2)}$ p=0.813
	Negative [n=414]	18.5	19.3	20.4	
	Sub-total [n=2,209]	100	100	100	
	Unknown [n=184]	[n=161]	[n=19]	[n=4]	
Progesterone receptor status	Positive [n=1,498]	66.9	72.2	65.7	$\chi^2_{(2)}$ p=0.135
	Negative [n=717]	33.1	27.8	34.3	
	Sub-total [n=2,215]	100	100	100	
	Unknown [n=178]	[n=156]	[n=19]	[n=3]	
HER-2 status	Positive [n=287]	15.4	15.0	12.9	$\chi^2_{(2)}$ p=0.742
	Negative [n=1,609]	84.6	85.0	87.1	
	Sub-total [n=1,896]	100	100	100	
	Unknown [n=497]	[n=439]	[n=44]	[n=14]	
Vascular/ lymphatic invasion	Positive [n=606]	28.3	21.9	35.8	$\chi^2_{(2)}$ p=0.005
	Negative [n=1,581]	71.7	78.1	64.2	
	Sub-total [n=2,187]	100	100	100	
	Unknown [n=206]	[n=178]	[n=19]	[n=9]	
Extensive in-situ component	Positive [n=462]	22.8	24.0	20.9	$\chi^2_{(2)}$ p=0.767
	Negative [n=1,558]	77.2	76.0	79.1	
	Sub-total [n=2,020]	100	100	100	
	Unknown [n=373]	[n=328]	[n=33]	[n=12]	

Female-breast cancer characteristics		Treatment Centre Location			P value *
		Major Cities [n=1,876]	Inner Regional [n=371]	More Remote [n=146]	
Laterality	Left [n=1,175]	50.9	47.4	51.0	$\chi^2_{(2)}$ p=0.474
	Right [n=1,159]	49.1	52.6	49.0	
	Sub-total [n=2,334]	100	100	100	
	Unknown [n=59]	[n=56]	[n=2]	[n=1]	
Number of invasive cancers	1 [n=1,852]	81.0	86.2	78.2	KW p=0.902
	2 [n=185]	8.5	6.1	9.9	$\chi^2_{(4)}$ p=0.739
	3+ [n=231]	10.6	7.7	12.0	
	Sub-total [n=2,268]	100	100	100	
	Unknown [n=125]	[n=113]	[n=8]	[n=4]	
Sentinel node biopsy reported	Yes [n=1,346]	59.4	49.6	32.9	$\chi^2_{(2)}$ p<0.001
	No [n=1,047]	40.6	50.4	67.1	
	Total [n=2,393]	100	100	100	
Surgery	Breast conserving [n=1,490]	64.7	57.8	55.5	$\chi^2_{(2)}$ p=0.007
	Mastectomy [n=873]	35.3	42.2	44.5	
	Sub-total [n=2,363]	100	100	100	
	Any surgery [n=2,363]	98.5	99.7	100	$\chi^2_{(LR)}$ p=0.010
	No surgery [n=30]	1.5	0.3	0	
	Total [n=2,393]	100	100	100	
Radiotherapy	Yes [n=1,505]	73.8	62.5	62.1	$\chi^2_{(2)}$ p<0.001
	No [n=607]	26.2	37.5	37.9	
	Sub-total [n=2,112]	100	100	100	
	Not yet [n=56]	1.4	6.2	7.7	
	Unknown [n=225]	[n=206]	[n=16]	[n=3]	
Chemotherapy	Yes [n=1,070]	51.3	46.2	48.9	$\chi^2_{(2)}$ p=0.213
	No [n=1,056]	48.7	53.8	51.1	
	Sub-total [n=2,126]	100	100	100	
	Not yet [n=45]	1.1	5.3	4.9	
	Unknown [n=222]	[n=204]	[n=14]	[n=4]	
Tamoxifen	Yes [n=815]	42.8	46.3	48.6	$\chi^2_{(2)}$ p=0.326
	No [n=1,052]	57.2	53.7	51.4	
	Sub-total [n=1,867]	100	100	100	
	Not yet [n=149]	5.6	13.5	13.9	
	Unknown [n=377]	[n=307]	[n=46]	[n=24]	
Ovarian ablation	Yes [n=57]	3.3	2.4	0.9	$\chi^2_{(2)}$ p=0.268
	No [n=1,837]	96.7	97.6	99.1	
	Sub-total [n=1,894]	100	100	100	
	Not yet [n=48]	1.7	5.8	3.4	
	Unknown [n=451]	[n=365]	[n=59]	[n=27]	
Aromatase inhibitor	Yes [n=691]	40.4	38.1	36.6	$\chi^2_{(2)}$ p=0.609
	No [n=1,043]	59.6	61.9	63.4	
	Sub-total [n=1,734]	100	100	100	
	Not yet [n=168]	6.8	15.5	16.5	
	Unknown [n=491]	[n=412]	[n=54]	[n=25]	

Female-breast cancer characteristics		Treatment Centre Location			P value *
		Major Cities [n=1,876]	Inner Regional [n=371]	More Remote [n=146]	
Immunotherapy	Yes [n=121]	7.1	7.2	5.9	$\chi^2_{(2)}$ p=0.886
	No [n=1,595]	92.9	92.8	94.1	
	Sub-total [n=1,716]	100	100	100	
	Not yet [n=51]	2.5	4.6	3.3	
	Unknown [n=626]	[n=538]	[n=64]	[n=24]	

* KW = Kruskal-Wallis; $X^2_{(df)}$ = Pearson chi-square; $X^2_{(LR)}$ = Likelihood-ratio chi-square

Table 3: Percentage distribution of female-breast cancer characteristics and management practices by referral source: RACS Audit, 2006 diagnoses

Female-breast cancer characteristics		Referral source			P value *
		BreastScreen [n=714]	Symptomatic presentation [n=1,311]	Other [n=175]	
Histology	Ductal [n=1,650]	80.8	83.0	82.2	$\chi^2_{(4)}$ p=0.631
	Lobular [n=209]	10.9	9.9	12.1	
	Other [n=148]	8.3	7.1	5.7	
	Sub-total [n=2,007]	100	100	100	
	Unknown [n=193]	[n=36]	[n=139]	[n=18]	
Diameter (mm)	Under 10 [n=334]	23.9	10.2	23.8	KW p<0.001
	10-14 [n=455]	29.2	16.8	24.4	$\chi^2_{(2)}$ p<0.001
	15-19 [n=409]	18.2	20.7	13.4	
	20-29 [n=463]	17.4	25.0	17.4	
	30-39 [n=225]	4.6	13.5	14.5	
	40+ [n=231]	6.8	13.9	6.4	
	Sub-total [n=2,117]	100	100	100	
	Unknown [n=83]	[n=18]	[n=62]	[n=3]	
Grade	Low [n=476]	30.2	18.8	21.3	KW p<0.001
	Intermediate [n=972]	49.7	44.4	47.3	$\chi^2_{(4)}$ p<0.001
	High [n=648]	20.1	36.8	31.4	
	Sub-total [n=2,096]	100	100	100	
	Unknown [n=104]	[n=28]	[n=70]	[n=6]	
Nodal status	Negative [n=1,245]	75.9	54.2	70.1	$\chi^2_{(2)}$ p<0.001
	Positive [n=738]	24.1	45.8	29.9	
	Sub-total [n=1,983]	100	100	100	
	Unknown [n=217]	[n=41]	[n=155]	[n=21]	
Oestrogen receptor status	Positive [n=1,685]	87.1	78.8	79.0	$\chi^2_{(2)}$ p<0.001
	Negative [n=383]	12.9	21.2	21.0	
	Sub-total [n=2,068]	100	100	100	
	Unknown [n=132]	[n=42]	[n=77]	[n=13]	
Progesterone receptor status	Positive [n=1,413]	71.9	66.4	64.6	$\chi^2_{(2)}$ p=0.031
	Negative [n=664]	28.1	33.6	35.4	
	Sub-total [n=2,077]	100	100	100	
	Unknown [n=123]	[n=39]	[n=73]	[n=11]	
HER-2 status	Positive [n=272]	11.8	16.7	10.8	$\chi^2_{(2)}$ p=0.011
	Negative [n=1,580]	88.2	83.3	89.2	
	Sub-total [n=1,852]	100	100	100	
	Unknown [n=348]	[n=97]	[n=196]	[n=55]	
Vascular/ lymphatic invasion	Positive [n=570]	18.2	34.2	21.8	$\chi^2_{(2)}$ p<0.001
	Negative [n=1,471]	81.8	65.8	78.2	
	Sub-total [n=2,041]	100	100	100	
	Unknown [n=159]	[n=43]	[n=106]	[n=10]	
Extensive in-situ component	Positive [n=428]	22.5	22.4	25.2	$\chi^2_{(2)}$ p=0.782
	Negative [n=1,465]	77.5	77.6	74.8	
	Sub-total [n=1,893]	100	100	100	
	Unknown [n=307]	[n=65]	[n=186]	[n=56]	

Female-breast cancer characteristics		Referral source			P value *
		BreastScreen [n=714]	Symptomatic presentation [n=1,311]	Other [n=175]	
Laterality	Left [n=1,110]	53.7	49.7	46.6	$\chi^2_{(2)}$ p=0.117
	Right [n=1,076]	46.3	50.3	53.4	
	Sub-total [n=2,186]	100	100	100	
	Unknown [n=14]	[n=3]	[n=10]	[n=1]	
Number of invasive cancers	1 [n=1,733]	85.4	80.4	78.2	KW p=0.005
	2 [n=163]	7.3	7.9	7.6	$\chi^2_{(4)}$ p=0.011
	3+ [n=221]	7.2	11.7	14.1	
	Sub-total [n=2,117]	100	100	100	
	Unknown [n=83]	[n=20]	[n=58]	[n=5]	
Sentinel node biopsy reported	Yes [n=1,229]	67.1	49.8	55.4	$\chi^2_{(2)}$ p<0.001
	No [n=971]	32.9	50.2	44.6	
	Total [n=2,200]	[n=1,311]	[n=175]	[n=274]	
Surgery	Breast conserving [n=1,368]	74.8	57.8	54.3	$\chi^2_{(2)}$ p<0.001
	Mastectomy [n=799]	25.2	42.2	45.7	
	Sub-total [n=2,167]	100	100	100	
	Any surgery [n=2,167]	99.9	97.7	98.9	$\chi^2_{(2)}$ p<0.001
	No surgery [n=33]	0.1	2.3	1.1	
	Total [n=2,200]	100	100	100	
Radiotherapy	Yes [n=1,405]	79.5	68.6	58.2	$\chi^2_{(2)}$ p<0.001
	No [n=566]	20.5	31.4	41.8	
	Sub-total [n=1,971]	100	100	100	
	Not yet [n=56]	2.1	3.3	1.8	
	Unknown [n=173]	[n=52]	[n=114]	[n=7]	
Chemotherapy	Yes [n=1,003]	35.4	59.5	43.0	$\chi^2_{(2)}$ p<0.001
	No [n=986]	64.6	40.5	57.0	
	Sub-total [n=1,989]	100	100	100	
	Not yet [n=43]	7.6	7.7	5.7	
	Unknown [n=168]	[n=56]	[n=99]	[n=13]	
Tamoxifen	Yes [n=746]	40.9	44.3	41.6	$\chi^2_{(2)}$ p=0.401
	No [n=991]	59.1	55.7	58.4	
	Sub-total [n=1,737]	100	100	100	
	Not yet [n=141]	7.6	7.7	5.7	
	Unknown [n=322]	[n=95]	[n=210]	[n=17]	
Ovarian ablation	Yes [n=51]	1.6	3.7	2.6	$\chi^2_{(2)}$ p=0.058
	No [n=1,708]	98.4	96.3	97.4	
	Sub-total [n=1,759]	100	100	100	
	Not yet [n=45]	1.6	3.3	0.7	
	Unknown [n=396]	[n=96]	[n=277]	[n=23]	
Aromatase inhibitor	Yes [n=669]	44.5	38.3	38.6	$\chi^2_{(2)}$ p=0.051
	No [n=989]	55.5	61.7	61.4	
	Sub-total [n=1,658]	100	100	100	
	Not yet [n=161]	11.9	7.3	7.3	
	Unknown [n=381]	[n=92]	[n=237]	[n=52]	

Female-breast cancer characteristics		Referral source			P value *
		BreastScreen [n=714]	Symptomatic presentation [n=1,311]	Other [n=175]	
Immunotherapy	Yes [n=116]	5.5	8.2	3.5	$\chi^2_{(2)}$ p=0.044
	No [n=1,561]	94.5	91.8	96.5	
	Sub-total [n=1,677]	100	100	100	
	Not yet [n=46]	2.5	3.0	0.9	
	Unknown [n=477]	[n=102]	[n=315]	[n=60]	

* KW = Kruskal-Wallis; $X^2_{(df)}$ = Pearson chi-square

Table 4: Percentage distribution of radiotherapy by age and surgical management: RACS Audit, 2006 diagnoses

		Age at diagnosis (years)						
	Radiotherapy	Under 40 [n=145]	40-49 [n=463]	50-59 [n=686]	60-69 [n=657]	70-79 [n=336]	80+ [n=187]	Total [n=2,474]
Breast conserving	Yes [n=1,276]	92.8	96.2	96.6	95.9	86.6	39.3	91.3
	No [n=121]	7.2	3.8	3.4	4.1	13.4	60.7	8.7
	Sub-total [n=1,397]	100	100	100	100	100	100	100
	Not yet [n=36]	1.1	4.1	2.2	2.1	2.4	0	2.3
	Unknown [n=112]	3.4	7.4	6.5	7.3	6.8	14.3	7.2
	Total [n=1,545]	100	100	100	100	100	100	100
Mastectomy	Yes [n=273]	65.5	47.4	36.9	32.6	25.0	9.2	36.0
	No [n=485]	34.5	52.6	63.1	67.4	75.0	90.8	64.0
	Sub-total [n=758]	100	100	100	100	100	100	100
	Not yet [n=20]	0	3.2	3.4	1.4	2.4	0	2.2
	Unknown [n=114]	5.2	14.9	12.5	13.6	9.8	16.7	12.8
	Total [n=892]	100	100	100	100	100	100	100
Any surgery	Yes [n=1,549]	81.9	77.0	77.4	76.0	64.1	26.2	71.9
	No [n=606]	18.1	23.0	22.6	24.0	35.9	73.8	28.1
	Sub-total [n=2,155]	100	100	100	100	100	100	100
	Not yet [n=56]	0.7	3.7	2.6	1.8	2.4	0	2.3
	Unknown [n=226]	4.1	10.5	8.5	9.4	7.9	15.3	9.3
	Total [n=2,437]	100	100	100	100	100	100	100
No surgery	Yes [n=12]	-	33.3	75.0	66.7	50.0	0	41.4
	No [n=17]	-	66.7	25.0	33.3	50.0	100	58.6
	Sub-total [n=29]	-	100	100	100	100	100	100
	Not yet [n=1]	0	0	0	12.5	0	0	2.7
	Unknown [n=7]	0	0	20.0	12.5	14.3	36.4	18.9
	Total [n=37]	100	100	100	100	100	100	100

Table 5: Percentage distribution of radiotherapy by location of treatment centre and surgical management: RACS Audit, 2006 diagnoses

		Treatment centre location			P value *
	Radiotherapy	Major Cities [n=1,876]	Inner Regional [n=371]	More Remote [n=146]	
Breast conserving	Yes [n=1,224]	91.1	92.3	87.7	$X^2_{(2)}$ p=0.612
	No [n=120]	8.9	7.7	12.3	
	Sub-total [n=1,344]	100	100	100	
	Not yet [n=36]	1.2	7.5	7.4	
	Unknown [n=110]	8.7	1.9	2.5	
	Total [n=1,490]	100	100	100	
Mastectomy	Yes [n=269]	40.9	21.0	30.5	$X^2_{(2)}$ p<0.001
	No [n=471]	59.1	79.0	69.5	
	Sub-total [n=740]	100	100	100	
	Not yet [n=20]	1.4	3.8	7.7	
	Unknown [n=113]	15.3	7.7	1.5	
	Total [n=873]	100	100	100	
Any surgery	Yes [n=1,493]	74.3	62.7	62.1	$X^2_{(2)}$ p<0.001
	No [n=591]	25.7	37.3	37.9	
	Sub-total [n=2,084]	100	100	100	
	Not yet [n=56]	1.2	5.9	7.5	
	Unknown [n=223]	11.0	4.3	2.1	
	Total [n=2,363]	100	100	100	
No surgery	Yes [n=12]	44.4	0	-	FET p=1.000
	No [n=16]	55.6	100	-	
	Sub-total [n=28]	100	100	-	
	Not yet [n=0]	0	0	-	
	Unknown [n=2]	6.9	0	-	
	Total [n=30]	100	100	-	

Table 6: Percentage distribution of radiotherapy by referral source: RACS Audit, 2006 diagnoses

		Referral source			P value *
	Radiotherapy	BreastScreen [n=714]	Symptomatic presentation [n=1,311]	Other [n=175]	
Breast conserving	Yes [n=1,149]	95.9	89.5	85.1	$X^2_{(2)}$ p<0.001
	No [n=104]	4.1	10.5	14.9	
	Sub-total [n=1,253]	100	100	100	
	Not yet [n=35]	1.3	3.4	3.2	
	Unknown [n=80]	6.4	5.7	4.3	
	Total [n=1,368]	100	100	100	
Mastectomy	Yes [n=244]	27.7	39.3	26.3	$X^2_{(2)}$ p=0.006
	No [n=447]	72.3	60.7	73.7	
	Sub-total [n=691]	100	100	100	
	Not yet [n=20]	3.9	2.4	0	
	Unknown [n=88]	10.0	12.4	3.8	
	Total [n=799]	100	100	100	
Any surgery	Yes [n=1,393]	79.6	69.1	57.7	$X^2_{(2)}$ p<0.001
	No [n=551]	20.4	30.9	42.3	
	Sub-total [n=1,944]	100	100	100	
	Not yet [n=55]	2.0	3.0	1.7	
	Unknown [n=168]	7.3	8.5	4.0	
	Total [n=2,167]	100	100	100	
No surgery	Yes [n=12]	0	41.7	100	FET p=0.203
	No [n=15]	100	58.3	0	
	Sub-total [n=27]	100	100	100	
	Not yet [n=1]	0	3.3	0	
	Unknown [n=5]	0	16.7	0	
	Total [n=33]	100	100	100	

Table 7: Percentage distribution of aromatase inhibitor therapy by location of treatment centre and age: RACS Audit, 2006 diagnoses

Treatment centre location	Aromatase inhibitor	Age at diagnosis (years)						
		Under 40 [n=141]	40-49 [n=450]	50-59 [n=661]	60-69 [n=634]	70-79 [n=329]	80+ [n=178]	Total [n=2,393]
Major Cities	Yes [n=552]	11.9	21.4	45.4	51.1	45.0	45.9	40.4
	No [n=813]	88.1	78.6	54.6	48.9	55.0	54.1	59.6
	Sub-total [n=1,365]	100	100	100	100	100	100	100
	Not yet [n=99]	7.3	5.0	6.3	6.0	3.6	69.0	5.3
	Unknown [n=412]	24.4	25.5	21.3	20.0	19.7	24.1	22.0
	Total [n=1,876]	100	100	100	100	100	100	100
Inner Regional	Yes [n=102]	16.7	30.4	52.4	36.9	41.9	20.0	38.1
	No [n=166]	83.3	69.6	47.6	63.1	58.1	80.0	61.9
	Sub-total [n=268]	100	100	100	100	100	100	100
	Not yet [n=49]	7.1	13.4	22.2	7.7	14.3	0	13.2
	Unknown [n=54]	7.1	17.9	14.1	11.5	17.5	16.7	14.6
	Total [n=371]	100	100	100	100	100	100	100
More Remote	Yes [n=37]	66.7	23.1	31.3	45.2	42.9	25.0	36.6
	No [n=64]	33.3	76.9	68.8	54.8	57.1	75.0	63.4
	Sub-total [n=101]	100	100	100	100	100	100	100
	Not yet [n=20]	0	11.5	9.8	22.4	5.9	11.1	13.7
	Unknown [n=25]	25.0	38.5	12.2	14.3	11.8	0	17.1
	Total [n=146]	100	100	100	100	100	100	100

Table 8: Percentage distribution of aromatase inhibitor therapy by referral source and age: RACS Audit, 2006 diagnoses

Referral source	Aromatase inhibitor	Age at diagnosis (years)						
		Under 40 [n=121]	40-49 [n=417]	50-59 [n=603]	60-69 [n=595]	70-79 [n=300]	80+ [n=164]	Total [n=2,200]
BreastScreen	Yes [n=244]	50.0	34.1	45.8	45.0	48.6	27.3	44.4
	No [n=304]	50.0	65.9	54.2	55.0	51.4	72.7	55.6
	Sub-total [n=548]	100	100	100	100	100	100	100
	Not yet [n=74]	0	13.2	11.2	9.6	10.2	0	10.4
	Unknown [n=92]	0	22.1	11.6	11.9	14.3	0	12.9
	Total [n=714]	100	100	100	100	100	100	100
Symptomatic presentation	Yes [n=381]	12.3	20.4	43.7	57.6	42.9	43.1	38.3
	No [n=615]	87.7	79.6	56.3	42.4	57.1	56.9	61.7
	Sub-total [n=996]	100	100	100	100	100	100	100
	Not yet [n=78]	6.4	6.3	8.1	6.8	4.0	0.7	5.9
	Unknown [n=237]	20.0	21.4	18.0	16.8	12.5	18.5	18.1
	Total [n=1,311]	100	100	100	100	100	100	100
Other	Yes [n=44]	33.3	27.8	43.8	32.1	42.1	54.5	38.6
	No [n=70]	66.7	72.2	56.3	67.9	57.9	45.5	61.4
	Sub-total [n=114]	100	100	100	100	100	100	100
	Not yet [n=9]	11.1	3.2	6.1	2.4	7.7	5.6	5.1
	Unknown [n=52]	22.2	38.7	28.6	31.0	19.2	33.3	29.7
	Total [n=175]	100	100	100	100	100	100	100

Table 9: Percentage distribution of ovarian ablation by location of treatment centre and age: RACS Audit, 2006 diagnoses

Treatment centre location	Ovarian ablation	Age at diagnosis (years)						
		Under 40 [n=141]	40-49 [n=450]	50-59 [n=661]	60-69 [n=634]	70-79 [n=329]	80+ [n=178]	Total [n=2,393]
Major Cities	Yes [n=49]	11.7	10.4	1.6	0.3	1.4	0	3.3
	No [n=1,436]	88.3	89.6	98.4	99.7	98.6	100	96.7
	Sub-total [n=1,485]	100	100	100	100	100	100	100
	Not yet [n=26]	8.1	3.6	0.6	0	0	0	1.4
	Unknown [n=365]	15.4	23.5	17.5	20.6	14.9	24.1	19.5
	Total [n=1,876]	100	100	100	100	100	100	100
Inner Regional	Yes [n=7]	7.7	11.9	1.4	0	0	0	2.4
	No [n=287]	92.3	88.1	98.6	100	100	100	97.6
	Sub-total [n=294]	100	100	100	100	100	100	100
	Not yet [n=18]	7.1	16.4	5.1	1.0	0	0	4.9
	Unknown [n=59]	0	20.9	22.2	10.6	11.1	20.8	15.9
	Total [n=371]	100	100	100	100	100	100	100
More Remote	Yes [n=1]	33.3	0	0	0	0	0	0.9
	No [n=114]	66.7	100	100	100	100	100	99.1
	Sub-total [n=115]	100	100	100	100	100	100	100
	Not yet [n=4]	0	11.5	2.4	0	0	0	2.7
	Unknown [n=27]	25.0	38.5	14.6	20.4	0	0	97.3
	Total [n=146]	100	100	100	100	100	100	100

Table 10: Percentage distribution of ovarian ablation by referral source and age: RACS Audit, 2006 diagnoses

Referral source	Ovarian ablation	Age at diagnosis (years)						
		Under 40 [n=121]	40-49 [n=417]	50-59 [n=603]	60-69 [n=595]	70-79 [n=300]	80+ [n=164]	Total [n=2,200]
BreastScreen	Yes [n=10]	50.0	14.3	0.5	0.4	0	0	1.6
	No [n=597]	50.0	85.7	99.5	99.6	100	100	98.4
	Sub-total [n=607]	100	100	100	100	100	100	100
	Not yet [n=11]	0	9.0	1.3	0.3	0	0	1.5
	Unknown [n=96]	0	17.9	12.1	15.2	9.2	0	13.4
	Total [n=714]	100	100	100	100	100	100	100
Symptomatic presentation	Yes [n=37]	10.6	9.3	2.0	0	2.0	0	3.7
	No [n=963]	89.4	90.7	98.0	100	98.0	100	96.3
	Sub-total [n=1,000]	100	100	100	100	100	100	100
	Not yet [n=34]	7.3	6.6	1.6	0	0	0	2.6
	Unknown [n=277]	15.5	25.5	21.7	22.4	13.1	22.2	21.1
	Total [n=1,311]	100	100	100	100	100	100	100
Other	Yes [n=4]	28.6	4.2	2.4	0	0	0	2.6
	No [n=147]	71.4	95.8	97.6	100	100	100	97.4
	Sub-total [n=151]	100	100	100	100	100	100	100
	Not yet [n=1]	11.1	0	0	0	0	0	0.6
	Unknown [n=23]	11.1	22.6	14.3	7.1	0	27.8	13.1
	Total [n=175]	100	100	100	100	100	100	100

Table 11: Relative odds (95% confidence limits) of specified age categories at diagnosis compared with the 50-69 year category: RACS Audit, 2006 diagnoses

– Multinomial logistic regression –

	Specified age category (years)	
Predictors	Under 50 [n=608]	70+ [n=523]
Histology type:		
Ductal (reference) [n=1,818]	1.00	1.00
Lobular [n=227]	0.71 [0.48, 1.04]	1.23 [0.85, 1.77]
Other [n=170]	1.11 [0.73, 1.67]	1.45 [0.97, 2.17]
Unknown [n=259]	1.23 [0.61, 2.45]	2.59 [1.46, 4.61]
Size (mm):		
Under 15 (reference) [n=882]	1.00	1.00
15-19 [n=433]	1.02 [0.76, 1.38]	1.63 [1.20, 2.21]
20-29 [n=505]	1.07 [0.80, 1.44]	1.50 [1.10, 2.04]
30+ [n=516]	1.43 [1.06, 1.95]	1.87 [1.33, 2.63]
Unknown [n=138]	3.12 [1.46, 6.66]	1.41 [0.58, 3.43]
Grade:		
Low (reference) [n=526]	1.00	1.00
Intermediate [n=1,064]	1.35 [1.01, 1.80]	0.98 [0.74, 1.30]
High [n=724]	1.65 [1.17, 2.33]	0.91 [0.64, 1.30]
Unknown [n=160]	0.68 [0.31, 1.50]	0.73 [0.36, 1.50]
Nodal involvement:		
No (reference) [n=1,372]	1.00	1.00
Yes [n=812]	0.98 [0.76, 1.25]	0.90 [0.69, 1.18]
Unknown [n=290]	0.76 [0.41, 1.42]	2.00 [1.18, 3.39]
Vascular/lymphatic invasion:		
No (reference) [n=1,641]	1.00	1.00
Yes [n=614]	1.54 [1.19, 1.99]	0.97 [0.72, 1.30]
Unknown [n=219]	0.87 [0.53, 1.64]	0.77 [0.46, 1.29]
Oestrogen receptor status:		
Positive (reference) [n=1,853]	1.00	1.00
Negative [n=425]	0.94 [0.71, 1.26]	0.96 [0.69, 1.34]
Unknown [n=196]	1.21 [0.71, 2.04]	0.90 [0.52, 1.56]
HER-2 receptor status:		
Positive (reference) [n=296]	1.00	1.00
Negative [n=1,653]	0.90 [0.67, 1.22]	1.49 [1.01, 2.18]
Unknown [n=525]	0.77 [0.53, 1.12]	1.20 [0.76, 1.89]
Numbers of tumours:		
One (reference) [n=1,911]	1.00	1.00
$\geq$ 2 [n=426]	1.63 [1.27, 2.09]	0.77 [0.56, 1.05]
Unknown [n=137]	0.81 [0.34, 1.91]	0.87 [0.36, 2.12]
Laterality:		
Left (reference) [n=1,217]	1.00	1.00
Right [n=1,196]	1.22 [1.00, 1.49]	1.02 [0.82, 1.25]
Unknown [n=61]	0.91 [0.40, 2.06]	0.69 [0.33, 1.47]

Table 12: Relative odds (95% confidence limits) of specified location of treatment centre compared with a major city location: RACS Audit, 2006 diagnoses

– Multinomial logistic regression –

	Treatment Centre Location	
Predictors	Inner Regional [n=371]	More Remote [n=146]
Histology type:		
Ductal (reference) [n=1,766]	1.00	1.00
Lobular [n=215]	1.14 [0.76, 1.72]	0.96 [0.51, 1.81]
Other [n=168]	1.16 [0.74, 1.81]	0.88 [0.43, 1.82]
Unknown [n=244]	1.68 [0.76, 3.70]	0.66 [0.26, 1.69]
Size (mm):		
Under 15 (reference) [n=853]	1.00	1.00
15-19 [n=429]	0.87 [0.63, 1.20]	1.24 [0.75, 2.05]
20-29 [n=491]	**0.71 [0.51, 0.98]**	1.18 [0.71, 1.95]
30+ [n=497]	**0.61 [0.43, 0.89]**	1.09 [0.64, 1.88]
Unknown [n=123]	0.78 [0.29, 2.12]	2.48 [0.72, 8.52]
Grade:		
Low (reference) [n=505]	1.00	1.00
Intermediate [n=1,037]	**1.43 [1.04, 1.96]**	0.91 [0.58, 1.45]
High [n=703]	1.43 [0.97, 2.12]	0.76 [0.42, 1.35]
Unknown [n=2,245]	0.95 [0.40, 2.34]	0.24 [0.04, 1.29]
Nodal involvement:		
No (reference) [n=1,327]	1.00	1.00
Yes [n=791]	0.81 [0.61, 1.08]	1.08 [0.71, 1.66]
Unknown [n=275]	**0.34 [0.15, 0.75]**	**2.49 [1.14, 5.40]**
Vascular/lymphatic invasion:		
No (reference) [n=1,581]	1.00	1.00
Yes [n=606]	0.87 [0.63, 1.19]	1.44 [0.93, 2.22]
Unknown [n=206]	0.80 [0.45, 1.42]	1.04 [0.46, 2.35]
Oestrogen receptor status:		
Positive (reference) [n=1,795]	1.00	1.00
Negative [n=414]	1.02 [0.73, 1.44]	1.27 [0.77, 2.10]
Unknown [n=184]	1.81 [0.98, 3.34]	0.65 [0.19, 2.22]
HER-2 receptor status:		
Positive (reference) [n=287]	1.00	1.00
Negative [n=1,609]	1.00 [0.71, 1.43]	1.26 [0.72, 2.17]
Unknown [n=497]	**0.44 [0.27, 0.71]**	0.49 [0.23, 1.07]
Numbers of tumours:		
One (reference) [n=1,852]	1.00	1.00
$\geq$ 2 [n=416]	0.76 [0.54, 1.06]	1.20 [0.78, 1.86]
Unknown [n=125]	0.92 [0.32, 2.63]	1.29 [0.32, 5.25]
Laterality:		
Left (reference) [n=1,175]	1.00	1.00
Right [n=1,159]	1.17 [0.93, 1.47]	0.99 [0.70, 1.40]
Unknown [n=59]	0.42 [0.09, 1.97]	0.49 [0.06, 4.32]
Age at diagnosis (years):		
Under 50 (reference) [n=591]	1.00	1.00
50-69 [n=1,295]	1.16 [0.87, 1.55]	**1.60 [1.03, 2.49]**
70+ [n=507]	1.37 [0.97, 1.93]	1.08 [0.61, 1.91]

Table 13: Relative odds (95% confidence limits) of specified referral source compared with symptomatic presentation: RACS Audit, 2006 diagnosis

– Multinomial logistic regression analysis –

	Referral source	
Predictors	BreastScreen [n=714]	Other [n=175]
Histology type:		
Ductal (reference) [n=1,650]	1.00	1.00
Lobular [n=209]	1.18 [0.82, 1.70]	1.21 [0.68, 2.14]
Other [n=148]	1.09 [0.72, 1.64]	0.68 [0.32, 1.46]
Unknown [n=193]	0.69 [0.34, 1.37]	0.82 [0.32, 2.10]
Size (mm):		
Under 15 (reference) [n=789]	1.00	1.00
15-19 [n=409]	0.50 [0.38, 0.67]	0.37 [0.22, 0.62]
20-29 [n=463]	0.41 [0.31, 0.55]	0.43 [0.27, 0.69]
30+ [n=466]	0.30 [0.22, 0.43]	0.52 [0.32, 0.85]
Unknown [n=83]	0.56 [0.23, 1.35]	0.17 [0.03, 0.87]
Grade:		
Low (reference) [n=476]	1.00	1.00
Intermediate [n=972]	0.99 [0.76, 1.30]	1.26 [0.79, 2.00]
High [n=648]	0.66 [0.47, 0.93]	1.25 [0.72, 2.19]
Unknown [n=104]	0.75 [0.38, 1.50]	0.78 [0.24, 2.55]
Nodal involvement:		
No (reference) [n=1,245]	1.00	1.00
Yes [n=738]	0.55 [0.43, 0.71]	0.65 [0.42, 1.00]
Unknown [n=2,171]	0.39 [0.21, 0.74]	0.98 [0.42, 2.28]
Vascular/lymphatic invasion:		
No (reference) [n=1,471]	1.00	1.00
Yes [n=570]	0.96 [0.72, 1.28]	0.77 [0.48, 1.23]
Unknown [n=159]	0.88 [0.54, 1.43]	0.72 [0.31, 1.65]
Oestrogen receptor status:		
Positive (reference) [n=1,685]	1.00	1.00
Negative [n=383]	0.76 [0.55, 1.05]	1.11 [0.69, 1.79]
Unknown [n=132]	1.95 [1.12, 3.40]	0.92 [0.43, 1.97]
HER-2 receptor status:		
Positive (reference) [n=272]	1.00	1.00
Negative [n=1,580]	1.14 [0.82, 1.60]	1.51 [0.81, 2.79]
Unknown [n=348]	0.84 [0.54, 1.31]	4.13 [2.10, 8.14]
Numbers of tumours:		
One (reference) [n=1,733]	1.00	1.00
≥ 2 [n=384]	0.88 [0.66, 1.18]	1.34 [0.87, 2.04]
Unknown [n=83]	1.29 [0.53, 3.16]	1.59 [0.39, 6.44]
Laterality:		
Left (reference) [n=1,110]	1.00	1.00
Right [n=1,076]	0.94 [0.76, 1.15]	1.17 [0.84, 1.63]
Unknown [n=14]	0.44 [0.11, 1.80]	0.77 [0.09, 6.35]
Age at diagnosis (years):		
Under 50 (reference) [n=1,311]	1.00	1.00
50-69 [n=714]	5.44 [4.06, 7.30]	1.60 [1.06, 2.42]
70+ [n=175]	2.10 [1.47, 3.00]	1.63 [1.00, 2.65]