Patterns of care over 10 years in young breast cancer patients in the Netherlands, a nationwide population-based study

Nansi Maliko\textsuperscript{a,b}, Nina Bijker\textsuperscript{c}, Monique EMM. Bos\textsuperscript{d}, Michel WJM. Wouters\textsuperscript{a,b,e}, Marie-Jeanne TFD. Vrancken Peeters\textsuperscript{b,f,*}, On behalf of the NABON Breast Cancer Audit

\textsuperscript{a} Scientific Bureau, Dutch Institute for Clinical Auditing, Leiden, the Netherlands
\textsuperscript{b} Department of Surgical Oncology, Netherlands Cancer Institute/Antoni van Leeuwenhoek, Amsterdam, the Netherlands
\textsuperscript{c} Department of Radiation Oncology, AmsterdamUMC, Amsterdam, the Netherlands
\textsuperscript{d} Department of Medical Oncology, Erasmus MC Cancer Institute, University Medical Centre Rotterdam, Rotterdam, the Netherlands
\textsuperscript{e} Department of Biomedical Data Sciences, Leiden University Medical Centre, Leiden, the Netherlands
\textsuperscript{f} Department of Surgery, AmsterdamUMC, Amsterdam, the Netherlands

\textbf{A B S T R A C T}

\textbf{Introduction:} Each year, around 600 young (\(<40\) years) breast cancer (BC) patients are registered in the national NABON Breast Cancer Audit (NBCA). The aim of this study is to compare patient and treatment characteristics of young and older age BC patients over time with a focus on outcome of quality indicators (QIs). Furthermore, we analysed whether de-escalation trends of treatment can be recognized to the same degree in both patient groups.

\textbf{Material and methods:} From October 2011 to October 2020 all patients treated for stage I-III invasive BC were included. Tumour characteristics, treatment variables and outcome of QIs of two age categories young (\(<40\) years) and older patient (\(\geq 40\) years) were analysed.

\textbf{Results:} In total 114,700 patients were included: 4.6\% young patients and 95.4\% older patients. Young patients more often presented with a palpable mass, higher stage, and triple-negative BC. Overall, young patients more often started with neoadjuvant systemic treatment (NST) (54.3\% vs. 18.6\%) and a greater proportion of the young patients retained their breast contour after surgery (73.5\% vs. 69.3\%). De-escalation trends such as decrease in axillary lymph node dissections and in the use of boost were observed. The omission of radiation treatment after breast conserving surgery was only observed in older patients.

\textbf{Conclusion:} Although this study shows that young women more often present with unfavourable tumours, therapeutic procedures are performed with a higher adherence to the QIs than for older patients and young women do benefit from some de-escalation trends to the same extend as older patients.

1. Introduction

Breast cancer (BC) is the most common type of cancer in women in the Netherlands and one of the most common cancers in young women (\(<40\) years) [1,2]. Each year, 600 new young patients (4.5\% of all new BC patients) are registered in the NABON Breast Cancer Audit (NBCA), a national multidisciplinary audit that started in the Netherlands in 2011 [3]. The main aim of the NBCA is to monitor the quality of BC care by compiling a multidisciplinary set of quality indicators (QIs), drafted by mandated members of all medical associations involved in BC care, patient advocates, The Breast Cancer Patients Association (BVN) [4] and the Dutch health insurance companies (ZN) [5]. The results of these QIs are reported on hospital level enabling comparison and reflection. Based on the results, this set of QIs is adapted on a yearly basis. All Dutch hospitals participate in the NBCA [3].

Because of the increased complexity of BC care, a multidisciplinary approach is required for optimal disease management. This approach has resulted in improved overall prognosis and local disease control, enabling several de-escalation trends such as breast-conserving therapy (BCT) and performing less extensive axillary surgery [6-10]. Systemic treatment is increasingly being used in the neoadjuvant setting to tailor locoregional treatment and currently new trials are designed to even...
de-escalate systemic treatment [11–13]. De-escalation trends in radiation therapy that are currently being investigated are omission of the boost dose [14] and applying partial breast irradiation [15].

Given the more aggressive tumours found in young BC patients (<40 years of age) [6–9] combined with the more aggressive treatment, it is not known whether younger BC patients benefit to the same extent from these (loco regional) de-escalation trends as older patients.

The aim of the current study is to compare patient and tumour characteristics, and types of treatment over time between the young and older age groups with a focus on the adherence of the NBCA QIs as well as the implementation of treatment de-escalation trends.

1.1. Material and methods

1.1.1. Study design

We conducted a retrospective analysis using data from the NBCA [3]. In the NBCA, all surgically treated BC patients above the age of 18 years with primary invasive BC or ductal in situ carcinoma (DCIS) in the Netherlands are registered. Exclusion criteria for the NBCA registration are patients who had any prior breast surgery for BC, patients with Lobular Carcinoma In Situ, Phyllodes tumours, sarcomas and lymphomas.

1.2. Patient selection and collected parameters

Patients with stage I-III (according to the eighth edition of American Journal Committee of Cancer (AJCC)) invasive BC, from all different Dutch hospitals, registered from October 2011 to October 2020 were included. Two age categories were analysed: young group (<40 years) and older group (≥40 years). Data from the NBCA dataset include demographic variables, tumour and treatment variables see Appendix 1. No formal consent from an ethics committee in the Netherlands was required for this retrospective study, which is in accordance with the Central Committee on Research involving Human Subjects.

1.2.1. NBCA quality indicators

Since 2011 the NBCA multidisciplinary QI set, drafted by mandated members of all medical associations involved in BC care, is used by the national health department to monitor the quality of BC care [3]. We have chosen to evaluate the most recent QIs in this study (Table 1).

1.2.2. Statistical analyses

Two age categories were analysed: a young group (<40 years) and an older group (≥40 years). This selection was made because no difference was seen in patient and tumour characteristics under the age of 40 years. By grouping the patients by their tumour stage, it was possible to distinguish between diagnosis and treatment in both age groups. To analyse trends in applied treatment, we compared data from 2011 until 2015 with data from 2016 until 2020, considering that the COVID-19 pandemic has affected the patient volume and the treatment of BC patients. Descriptive analyses were used to show patient, tumour, and treatment characteristics for women with stage one to three BC. Categorical variables were analysed using the chi-square test, and continuous variables were analysed using Student’s t-test. Because information on adjuvant treatments requires a longer period (~9 months), these data for the year 2020 were not yet available. Analysis on adjuvant treatment (radiation treatment and systemic treatment) were analysed from January 1, 2012 till December 31, 2019. To evaluate treatment trends in the outcome of QIs, the $\chi^2$ trend test was used. A p-value <0.05 was considered statistically significant. The median was used to represent the time interval between diagnosis and first treatment. All analyses were performed using R studio version 3.6.1 (for Windows, RStudio, Inc).

2. Results

Between October 2011 and October 2020, 141,327 patients with BC in 82 Dutch hospitals were registered in the NBCA. Patients with stage IV disease (n = 1524), pure DCIS (n = 18,277), unknown type of operation (n = 317), tumour stage (n = 344) and date of birth (n = 17) were excluded from further analyses. Of the remaining 114,700 included BC patients, 4.6% (n = 5238) were younger than 40 years (mean age 34.7 years) and 95.4% (n = 109,462) were older than 40 years (mean age 62.4 years).

The proportion of patients <40 years stays stable over the years with yearly about 600 young patients (Fig. 1).

2.1. Tumour characteristics

As shown in Table 2, BC is detected by screening in 1.3% of young patients versus 39.1% in the older patient group. The majority of the young patients presented with a palpable mass (91.4%) and were diagnosed with a higher tumour grade (42.0% grade III), tumour and nodal stage compared to older patients. Majority of young patients had an invasive BC of no special type (90.5% versus 79.0% in the older patients) whereas invasive lobular cancer was barely observed in the young group; 3.1% versus 12.3% in the older patient group. Young women more frequently had a HER2 positive or triple-negative (TN) tumour compared to older women, although in both age groups hormone receptor positive BC occurred most frequently (47.9% and 75.3%).

2.2. Treatment characteristics

2.2.1. Systemic treatment

Systemic treatment can be either given prior to locoregional treatment (neoadjuvant chemotherapy (NAC)) or thereafter (adjuvant systemic treatment). Over the ten years’ time interval, in total 21.4% (24,546 of 114,700) patients started with NAC. Over the years, we observed a significant increase in the use of NAC in both young and older patients. However, this upward trend was most pronounced in the young patients (Fig. 2). Fig. 2 shows the shift from adjuvant to NAC (excluding hormone therapy) in BC patients over the years for both young and older patients.

Especially in young women, we saw that the use of NAC, or NAC plus HER2 blockade for patients with a HER2pos subtype of BC increased dramatically over the years for all subtypes: from respectively 36.9% in 2012–2015 to 48.4% in 2016–2020 in HRpos/HER2neg patients, from 25.8% in 2012–2015 to 72.4% in 2016–2020 for HRpos/HER2pos patients; from 37.7% in 2012–2015 to 78.9% in 2016–2020 in HRneg/HER2neg patients and from 44.3% in 2012–2015 to 82.3% in 2016–2020 in TN young patients.

---

Table 1
NABON Breast Cancer Audit quality indicators 2019.

| NBCA Quality Indicator 2019 | Department |
|----------------------------|------------|
| Breast MRI in patients treated with NAC | Radiology |
| Tumour-positive margins after first primary breast conserving surgery for invasive breast cancer | Surgery |
| Breast contour preserving procedure* | Surgery |
| Immediate breast reconstruction after first ablative surgery | Surgery |
| Consultation with radiation oncologist prior to NAC | Radiotherapy |
| Radiotherapy for locally advanced breast cancer (excluding T3N0) treated with mastectomy | Radiotherapy |
| Transit time between diagnosis and primary treatment (NAC or primary surgery) | Multidisciplinary |

NBCA, NABON Breast Cancer Audit; neoadjuvant chemotherapy, NAC, neoadjuvant chemotherapy * Since 2015, the quality indicator breast contour preserving procedure is used in the NABON Breast Cancer Audit as a parameter to encompass all strategies to preserve breast contour: 1. primary BCS, 2. BCS after NAC, and 3. mastectomy with IBR [14].
In total 21,755 (≈21.0% of the 103,488 fully registered patients) received adjuvant chemotherapy or adjuvant chemotherapy plus HER2 blockade without prior, over the years a decrease was observed (Fig. 3).

When looking at all HRpos patients (n = 85,254) adjuvant hormone therapy was given in 46.2%. Over the years, an increase in the use of adjuvant hormone therapy was observer in both patient groups; in young patients from 39.4% to 77.3% and in the older patients from 28.5% to 60.0%.

### Table 2

| Patient | Age 18–39 years | Age ≥ 40 years | p-value |
|---------|-----------------|----------------|---------|
| Mean age | n = 5238 | 4.6% | n = 109,462 | 95.4% |
| Gender | Male | 10 | 0.2 | 785 | 0.7 | <0.001 |
| | Female | 5226 | 99.8 | 108,666 | 99.3 |
| Detected by screening | No | 5168 | 98.7 | 66,655 | 60.9 | <0.001 |
| | Yes | 70 | 1.3 | 42,807 | 39.1 |
| Palpable | No | 337 | 7.3 | 35,508 | 35.7 | <0.001 |
| | Yes | 4248 | 91.4 | 62,217 | 62.6 |
| Histology | NST | 4742 | 90.5 | 86,501 | 79.0 | <0.001 |
| | Lobular | 161 | 3.1 | 13,427 | 12.3 |
| Combination | 47 | 0.9 | 3017 | 2.8 |
| Unknown | 288 | 5.4 | 6517 | 5.9 |
| Grade | I | 467 | 8.9 | 25,648 | 23.4 | <0.001 |
| | II | 1654 | 31.6 | 50,738 | 46.4 |
| | III | 2208 | 42.2 | 25,209 | 23.0 |
| Unknown | 909 | 17.4 | 7867 | 7.1 |
| Clinical tumor stage | cT0 | 1 | 0.0 | 21 | 0.0 | <0.001 |
| | cT1 | 2152 | 41.1 | 65,723 | 60.0 |
| | cT2 | 2396 | 45.7 | 35,658 | 32.6 |
| | cT3 | 600 | 11.5 | 5972 | 5.5 |
| | cT4 | 87 | 1.7 | 2067 | 1.9 |
| Clinical nodal stage | cN0 | 3536 | 67.5 | 91,484 | 83.6 | <0.001 |
| | cN1 | 1376 | 26.3 | 15,457 | 14.1 |
| | cN2 | 89 | 1.7 | 899 | 0.8 |
| | cN3 | 237 | 4.5 | 1622 | 1.5 |
| Clinical stage | I | 2115 | 40.4 | 65,412 | 59.8 | <0.001 |
| | II | 2432 | 46.4 | 37,399 | 34.2 |
| | III | 691 | 13.2 | 6651 | 6.1 |
| Receptor type | HR positive, HER2 negative | 2510 | 47.9 | 82,386 | 75.3 | <0.001 |
| | HR positive, HER2 positive | 872 | 16.6 | 8501 | 7.8 |
| | HR negative, HER2 positive | 380 | 7.3 | 4104 | 3.7 |
| | Triple negative | 1476 | 28.2 | 14,471 | 13.2 |

NST, no special type a In the Netherlands breast cancer population screening is being performed between the age of 50 and 75 years. In patients younger than 50 years of age screening is only performed in women with a gene mutation.b Data of this item are available till the year 2019.

2.2.2. Surgery of the breast

Of all the included patients, data of surgery was present in 112,965 (98.5%) patients. In total 79.8% of these patients (n = 90,102; n = 2750 < 40 years of age and n = 20,113 ≥ 40 years of age) underwent primary surgery and 20.2% of patients (n = 22,863; n = 22,863 < 40 years of age and n = 87,790 ≥ 40 years of age) underwent surgery after neoadjuvant systemic treatment (NST).

Trends in surgery are shown in Fig. 3. In the young patient group primary surgery BCS rates increased from 43.2% to 47.2% and mastectomy with immediate breast reconstruction (IBR) rates from 26.3% to
35.0% whereas the number of mastectomies without IBR decreased from 30.5% to 17.8%.

In the older patient group primary surgery BCS rates increased from 62.0% to 69.0%, mastectomy with IBR from 6.1% to 7.2% and a decrease in the number of mastectomies without IBR from 31.9% to 23.8% was observed.

The same trends were observed in the different types of surgery after NST; both in young and older patients.

2.2.3. Axillary surgery

Over the years, we saw an impressive decline in axillary lymph node dissections (ALND) in both age groups in all clinical axillary lymph node stages. Of the young patients who underwent primary surgery 27.1% received ALND in 2012–2015 and 8.7% in 2016–2020. Of the young patients who had surgery after NST 39.0% had ALND in 2012–2015 and 32.6% in 2016–2020. In the older patients overall decline over time in ALND’s in primary surgery was seen from 17.6% to 6.9% and after NST from 42.5% to 21.7% (Table 3). Decline in ALND was most pronounced in cN1 disease where in 2012–2015 still 67% of young patient underwent ALND compared to only 29.7% in 2016–2020.

2.2.4. Radiotherapy

Of all registered surgically treated BC patients 72.2% patients received RT (n = 74,760). Among the patients who underwent BCS 94.0% (n = 61,119) received RT. The results show an increase in the use of RT after BCS over the years from 92.8% in 2012–2015 and 8.7% in 2016–2020. Of the young patients who had surgery after NST 39.0% had ALND in 2012–2015 and 32.6% in 2016–2020. In the older patients overall decline over time in ALND’s in primary surgery was seen from 17.6% to 6.9% and after NST from 42.5% to 21.7% (Table 3). Decline in ALND was most pronounced in cN1 disease where in 2012–2015 still 67% of young patient underwent ALND compared to only 29.7% in 2016–2020.

3. Discussion

From this analysis of the Dutch data of all surgically treated patients with BC we now know that the number BC patients younger than 40 years remained stable over the last decade while reports in several other countries (e.g. United States) describe an increase in the number of young BC patients [16,17]. In the Netherlands we treat around 600 young patients per year. This corresponds with 4.5% of the total group of newly diagnosed BC patients which is in accordance with the international literature [17–20].

Young patients are more often diagnosed with a palpable mass and a higher tumour grade and tumour and nodal stage. This can be partly

![Fig. 2. Trends in the use of NAC and the use of adjuvant chemotherapy, in breast cancer patients, separated by receptor type, age (<40 years vs ≥40 years) and time periods 2012–2015 vs 2016–2020.](image-url)
explained by the fact that young patients are more likely to be diagnosed with more aggressive biological subtypes. In line with previous literature, our study also showed that patients < 40 years more often have BC with a TN and HER2+ subtype, although HR+ tumours are relatively more common in both age groups [20–25]. Another factor that could influence higher tumour grade and tumour and nodal stage is time to diagnosis for young women. The National Breast Cancer Screening Programme does not start until the age of 50 [20]. Population-based screening in patients < 40 years of age is not recommended, due to the low incidence of sporadic breast cancer and the suboptimal performance of diagnostic modalities in these patients group [26,27]. In the Netherlands, women under 50 years of age are only being screened annually when a BRCA1 or 2 gene mutation is present. Unfortunately, because gene mutations are often still missing in the NBCA data, the proportion of patients with a gene mutation is not known. There is still a lot of debate whether it would be worthy to start population-based breast cancer screening at an earlier age than 50, so for example at the age of 45 [28,29].

The trend analyses show that both young and older patients are increasingly treated with NST followed by locoregional treatment which

Table 3
Axilla lymph node dissection in cN0, cN1, cN2 and cN3 breast cancer patients who received primary surgery and neoadjuvant systemic therapy before surgery, separated for age groups (< 40 years vs ≥ 40 years) and time periods (2012–2015 and 2016–2020).

|                  | Primary surgery | Surgery after NST |
|------------------|-----------------|------------------|
|                  | <40 yrs         | ≥40 yrs          | <40 yrs         | ≥40 yrs          |
|                  | 2012–2015       | 2016–2020        | 2012–2015       | 2016–2020        |
|                  | Total %         |                  | Total %         |                  |
|                  | ALND            |                  | ALND            |                  |
|                  |                  |                  |                  |                  |
| N0               | 167             | 1053             | 3735            | 1123             |
|                  | 15.9%           | 4.2%             | 10.0%           | 2.6%             |
| N1               | 165             | 185              | 3393            | 1952             |
|                  | 89.2%           | 63.6%            | 88.9%           | 79.3%            |
| N2               | 4               | 5                | 49               | 42               |
|                  | 80.0%           | 56.2%            | 78.5%           | 71.4%            |
| N3               | 3               | 6                | 86              | 93               |
|                  | 50.0%           | 64.6%            | 87.5%           | 84.6%            |
| Total            | 339             | 1249             | 7270            | 46,498           |
|                  | 27.1%           | 17.6%            | 42.5%           | 6.9%             |

yrs, years; ALND, axillary lymph node dissection; NST, neoadjuvant systemic therapy.

* It should be taken into account that the number of N-plus patients is small, especially in the group < 40 years.

Fig. 3. Multiple surgical treatment modalities in invasive breast cancer patients separated for age groups (< 40 years vs ≥ 40 years) and time periods 2012–2015 and 2016–2020.
Netherlands has access to the same reimbursed care. In the Netherlands basic health insurance package includes most of the essential medical immediate breast reconstruction; RT, radiotherapy.

...young patients declined a few percent over time. More importantly, we... as primary treatment.

...more pronounced increase in the use of NST was seen in young patients with TN-

is according to earlier reports [30–33]. In our analyses the most pronounced increase in the use of NST was seen in young patients with TN and HER2 positive tumours.

...and retain their breast contour after surgery. Young women do benefit... the use of the

Results from the United States using The National Cancer Database showed that young patients treated with breast conserving surgery more often received a boost than older patients, with a decrease in receiving a boost over the years in both age groups [34]. In line with the current guidelines we also found that the boost dose was more frequently given in the younger patients. And we did observe a decline in the use of the boost dose, especially in the older patient group.

The most pronounced de-escalation trend in locoregional treatment we saw in our study was the impressive decline in the percentage of ALND’s that we performed in both age groups and especially in young patients to retain their breast contour. Results from the United States using The National Cancer Database showed that young patients treated with breast conserving surgery more often received a boost than older patients, with a decrease in receiving a boost over the years in both age groups [34]. In line with the current guidelines we also found that the boost dose was more frequently given in the younger patients. And we did observe a decline in the use of the boost dose, especially in the older patient group.

The most pronounced de-escalation trend in locoregional treatment we saw in our study was the impressive decline in the percentage of ALND’s that we performed in both age groups and especially in young patients with nC1 treated with NST where ALND was only still performed in 29.7% patients during 2016 and 2020 whereas in the earlier years still in 67.0% of these patients an ALND was performed. This trend is also seen in other countries [35–37].

In the Netherlands, the central government is responsible for the content and scope of the statutory health insurance package, which is available to every inhabitant of The Netherlands. The government is advised by the independent National Health Care Institute (ZINL). The basic health insurance package includes most of the essential medical care, medications and medical devices. In this way, every citizen in the Netherlands has access to the same reimbursed care. In the Netherlands you have many health insurances and it is up to the citizen to choose one. In this system, patients, health insurers and healthcare providers all have an important role in guaranteeing and monitoring the quality of care [38].

The NBCA, a multidisciplinary clinical audit involving BVN and ZN [4,5], it becomes possible to measure quality of breast cancer care by analysing the results of the quality indicators [3].

In the present study we looked at quality of care; over time we saw an improvement in almost all NBCA QIs, with improvements being most pronounced in the young patients. The results suggest that QIs are more strictly adhered to in young patients. This could also be attributed to the motivation of the doctor to use all available means for the younger patient. These substantial improvements in QIs within a relatively short time period, suggest that benchmarked feedback and the use of audit results can lead to new insights and catalyse quality improvement at national level.

In the era of improved prognosis, quality of life is becoming increasingly important [39–41]. In our study we looked at the NBCA Q1 breast contour preservation, an important aspect of retaining quality of life, especially in young women [41] and saw an upward trend in preserving the breast contour by increased numbers of breast conserving surgery and use of IBC after mastectomy in both age groups and in both primary surgery setting as well as in the groups of patients that underwent surgery after NST. This upward trend seems to be consistent with research results from the United Kingdom, although the study results do not distinguish between age and type of BC [42]. However, these results are in contrast with a national study from the United States. From 1988 to 2016 there was a decline in breast-conserving therapy in young early-stage BC patients (from 60% to 35%) [43].

Strength of the present study is the use of population-based, externally validated data of a large number of BC patients reflecting daily practice. This study has shown that the data is suitable for observing trends over time. But there are also some limitations. The NBCA lacks information regarding type of chemotherapy which cause a significant escalation for young patients. For example introduction of dose-dense principle, adding Carboplatin in TN BC, and continuing post NAC treatment with Capecitabine in case of an incomplete remission after NST [44,45]. Also, patient and tumour characteristics that are of importance with the emergence of shared decision making and individualized BC treatment. We were unable to evaluate the patient preference and missed patients’ characteristics such as family history and genetic mutations. Furthermore, the NBCA does not provide information account delayed reconstruction after mastectomy, recurrence, and survival.

4. Conclusion

Although this study shows that young women more often present with unfavourable BC with higher stage of disease, diagnostic and therapeutic procedures are performed with a higher adherence to the QIs than for older patients. Young women are more likely to receive NST and retain their breast-contour after surgery. Young women do benefit from de-escalation trends like fewer performed ALNDs.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Statement of ethics

The Dutch Institute for Clinical Auditing (DICA) is one of the leading organizations that facilitates clinical auditing in the Netherlands. DICA offers participants in its clinical audits the possibility of submitting an application to receive data from clinical audits for the purpose of scientific research under strict conditions. These applications are assessed

Table 4

| Indicator | Age group | 2012-2015 | 2016-2020 | P-value* |
|-----------|-----------|-----------|-----------|----------|
| Breast MRI in patients treated | <40 | 89.0 | 93.6 | <0.001 |
| with NAC | ≥40 | 85.5 | 90.3 | <0.001 |
| Tumour-positive margins after first BCS for invasive BC | <40 | 3.3 | 2.7 | 0.663 |
| ≥40 | 3.2 | 2.7 | <0.001 |
| Tumour contour was preserved (BCPP) in pt with invasive BC | <40 | 68.1 | 77.6 | <0.001 |
| ≥40 | 65.7 | 72.2 | <0.001 |
| Breast contour was preserved by BCS as primary treatment | <40 | 24.5 | 16.7 | <0.001 |
| ≥40 | 52.8 | 53.1 | <0.001 |
| Breast contour was preserved following NST | <40 | 14.8 | 26.2 | <0.001 |
| ≥40 | 5.6 | 10.7 | <0.001 |
| Breast contour was preserved by mastectomy with IBC | <40 | 28.9 | 34.7 | <0.001 |
| ≥40 | 7.4 | 8.4 | <0.001 |
| IBC with first ablative surgery | <40 | 53.1 | 62.4 | <0.001 |
| ≥40 | 20.5 | 25.5 | <0.001 |
| Prior to NST seen by radiation oncologist | <40 | 60.3 | 74.3 | <0.001 |
| ≥40 | 80.6 | 85.6 | 0.139 |
| RT for locally advanced BC treated with mastectomy | <40 | 70.8 | 76.7 | <0.001 |
| ≥40 | 24 | 27 | <0.001 |

NAC, neoadjuvante chemotherapy therapy; NST, neoadjuvante chemotherapy and immune therapy; BCS, breast conserving surgery; BC, breast cancer; IBC, immediate breast reconstruction; RT, radiotherapy.

* Using X² test.

† Tumour positive margins defined as more than focally involved margins according to the Dutch guidelines (=tumour cells in surgical resection over an area of >4 mm, requiring re-excision).

‡ Analyses from one year previously, for adjuvant indicators there are no results yet available from 2020 (periods: 2012-2015 and 2016-2019).

...that we performed in both age groups and especially in young patients... to the

...this study shows that young women more often present with unfavourable BC with higher stage of disease, diagnostic and therapeutic procedures are performed with a higher adherence to the QIs than for older patients. Young women are more likely to receive NST and retain their breast-contour after surgery. Young women do benefit from de-escalation trends like fewer performed ALNDs.
at several levels. In the participation agreement between DICA and the participants in clinical audits, to which the DICA Regulations also apply, further conditions are set for the use of data for scientific research. These conditions include that only pseudonymised or anonymised data that cannot (directly) be traced back to individual patients may be made available. The parties also agree that, in accordance with the applicable laws and regulations, the participants will set up a system of no-object that offers the patient the possibility to explicitly object to the use of his/her data for scientific research in advance. In this way, the patient’s privacy will be protected as much as possible.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supplementary data

Supplementary data to this article can be found at https://doi.org/10.1016/j.breast.2022.11.002.

References

[1] Close AG, Dreyzin A, Miller KD, Seynnaeve BKN, Rapkin LB. Adolescent and young adult oncology—past, present, and future. CA Cancer J Clin [Internet] 2019;69(6):485–96. Available from: https://doi.org/10.1002/caac.21585.
[2] van der Meer DJ, Kramer I, van Maaren MC, van Diest PJ, Linn SC, Maduro JH, et al. Comprehensive trends in incidence, treatment, survival and mortality of first primary invasive breast cancer stratified by stage, age and receptor subtype in The Netherlands between 1989 and 2017. Int J Cancer [Internet] 2021;148(9):2289–303. https://doi.org/10.1002/ijc.33417. Available from:.
[3] van Bommel ACM, Sprook PER, Vranken Peeters MJTFD, Jager A, Lobbes M, Maduro JH, et al. Clinical auditing as an instrument for quality improvement in breast cancer care in The Netherlands: the national NABON Breast Cancer Audit. J Surg Oncol [Internet] 2017;115(3):243–9. https://doi.org/10.1002/jso.24516. Available from:.
[4] [Internet]. Cited Wij zijn er voor mensen met borstkanker | Borstkankervereniging Nederland. Oct 2). Available from: https://www.borstkanker.nl/.
[5] [Internet]. Cited Zoegverzekeraren Nederland - Home. Dec 22). Available from: https://www.znv.nl/.
[6] Chow CJ, Habermann EB, Abraham A, Zhu Y, Vickers SM, Rothenberger DA, et al. Does enrollment in cancer trials improve survival? J Am Coll Surg [Internet] 2013;216(4):774–80. https://doi.org/10.1016/j.jamcollsurg.2012.12.036. Available from:.
[7] Biganzoli L, Cardoso F, Beishon M, Cameron D, Cataliotti L, Coles CE, et al. The requirements of a specialist breast centre. The Breast [Internet] 2020. https://doi.org/10.1016/j.breast.2020.02.003. Jun 1 [cited 2021 Nov 8];51:56–84. Available from:.
[8] Makris A, Powles TW, Ashley SE, Chang J, Hickish T, Tidy VA, et al. Reduction in requirements of a specialist breast centre. The Breast [Internet] 2020. https://doi.org/10.1016/j.breast.2020.02.011 [cited 2021 Mar 7];22(6):1063–9. Available from:.
[9] Puig CA, Hoskin TL, Day CN, Habermann EB, Bougeois JY. National trends in the use of neoadjuvant chemotherapy for hormone receptor-negative breast cancer: a national cancer data base study. Ann Surg Oncol [Internet] 2017;24(5):1179–84. https://doi.org/10.1007/s10434-016-5739-y. Available from:.
[10] van Loefzijl AA, van der Noordaa MEM, van Werkhoven ED, Loo CE, Winter-Warnars GAO, Wierma T, et al. Minimally invasive complete response assessment of the breast after neoadjuvant systemic therapy for early breast cancer (MICRA trial): interim analysis of a multicenter observational cohort study. Jun 1 [cited 2022 Jun 4] Ann Surg Oncol [Internet] 2021;28(6):2186. https://doi.org/10.1245/s10434-021-08777-8. Available from:.
[11] van der Voort A, Dezentj N, Maliko et al. Breast cancer in adolescent and young adults aged under the age of 40 years. JCO Oncol Pr [Internet] 2021. https://doi.org/10.6010/jcoopen.pr.2021.05.20. Available from:.
[12] Heil J, Sinn P, Richter H, Pfoh A, Schäfer B, Hennigs A, et al. Responder -arm, intra-individually-controlled, open, diagnostic trial. BMC Cancer [Internet] 2018;18(1):851. https://doi.org/10.1186/s12885-018-4760-6. Available from:.
[13] Macdonald T, Bryar J, Jager A, Lobbes M, Maduro JH, et al. Variation in the use of boost irradiation in breast-conserving therapy in The Netherlands: the effect of a national guideline and confounding factors. Clin Oncol [Internet] 2019;31(4):250–9. https://doi.org/10.1016/j.clonc.2018.11.033. Available from:.
[14] Schreuder K, Maduro JH, Spronk PER, van Dales T, et al. Fewer reoperations after lumpectomy for breast cancer with neoadjuvant rather than adjuvant chemotherapy: a report from the national cancer Database. J Am Coll Surg [Internet] 2019. https://doi.org/10.1016/j.jamcollsurg.2019.08.016. Available from:.
[15] Heipel JT, Wazer DE. Partial irradiation is the preferred standard of care for a majority of women with early-stage breast cancer. J Clin Oncol [Internet] 2020. https://doi.org/10.1200/JCO.2019.37.24_suppl.305. Available from:.
[16] Villarreal-Gara C, Aguilila C, Magallanes-Hoyos M, Mohar A, Bargalló E, Menezes A, et al. Breast cancer in young women in Latin America: an unmet, growing burden. Dec [cited 2021 Sep 19] Oncol Lett [Internet] 2013;18(1). Available from:.
[17] Schreuder K, Maduro JH, Spronk PER, van Dales T, et al. Fewer reoperations after lumpectomy for breast cancer with neoadjuvant rather than adjuvant chemotherapy: a report from the national cancer Database. J Am Coll Surg [Internet] 2019. https://doi.org/10.1016/j.jamcollsurg.2019.08.016. Available from:.
[18] de Jonge WL, Schreuder K, van der Velden P, Maduro JH, et al. Variation in the use of boost irradiation in breast-conserving therapy in The Netherlands: the effect of a national guideline and confounding factors. Clin Oncol [Internet] 2019;31(4):250–9. https://doi.org/10.1016/j.clonc.2018.11.033. Available from:.
[19] Heil J, Sinn P, Richter H, Pfoh A, Schäfer B, Hennigs A, et al. Responder -arm, intra-individually-controlled, open, diagnostic trial. BMC Cancer [Internet] 2018;18(1):851. https://doi.org/10.1186/s12885-018-4760-6. Available from:.
[20] Heil J, Sinn P, Richter H, Pfoh A, Schäfer B, Hennigs A, et al. Responder -arm, intra-individually-controlled, open, diagnostic trial. BMC Cancer [Internet] 2018;18(1):851. https://doi.org/10.1186/s12885-018-4760-6. Available from:.
[21] Schreuder K, Maduro JH, Spronk PER, van Dales T, et al. Fewer reoperations after lumpectomy for breast cancer with neoadjuvant rather than adjuvant chemotherapy: a report from the national cancer Database. J Am Coll Surg [Internet] 2019. https://doi.org/10.1016/j.jamcollsurg.2019.08.016. Available from:.
