NAoPri
National Audit of Primary Breast Cancer

NATCAN
National Cancer Audit Collaborating Centre

National Audit of Primary Breast Cancer State of the Nation Report 2026:

Methodology Supplement

An audit of care received by people diagnosed with primary breast cancer between 1 January 2021 and 31 December 2023 in England and Wales.

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The Royal College of Surgeons of England is an independent professional body committed to enabling surgeons to achieve and maintain the highest standards of surgical practice and patient care. As part of this it supports audit and the evaluation of clinical effectiveness for surgery. Registered Charity no: 212808.

The National Cancer Audit Collaborating Centre (NATCAN) is commissioned by the Healthcare Quality Improvement Partnership (HQIP) and funded by NHS England and Welsh Government as part of the National Clinical Audit and Patient Outcomes Programme (NCAPOP). NATCAN delivers national audits in, breast (primary and metastatic), kidney, lung, non-Hodgkin lymphoma, oesophago-gastric, ovarian, pancreatic and prostate cancers.

The Association of Breast Surgery is a registered charity dedicated to advancing the practice of breast surgery and the management of breast conditions for the benefit of the public. It is a multi-professional membership association, which promotes training, education, clinical trials and guideline composition and adoption. For further information, please refer to the website www.associationofbreastsurgery.org.uk. Registered charity no: 1135699

The UK Breast Cancer Group (UKBCG) is a forum for Clinical and Medical Oncologists. The UKBCG acts as a stakeholder to NICE, NHS England and other organisations; and undertakes key pieces of work, at times in collaboration with other bodies, with the overriding endpoint of improving patient care.
The Group's objectives include advancing the education of clinical and medical oncologists in the subject of breast cancer, concerning its identification, diagnosis and treatment; promoting research for the public benefit in all aspects of breast cancer and publishing the results; and assisting in the treatment and care of persons suffering from breast cancer, or in need of rehabilitation, by the provision of education for healthcare professionals.
Further information on the work of the UKBCG is communicated via this website on a regular basis https://ukbcg.org/. Registered charity no: 1177296

This work uses data that have been provided by patients and collected by the NHS as part of their care and support. For patients diagnosed in England, the data are collated, maintained and quality assured by the National Disease Registration Service (NDRS), which is part of NHS England. Access to the data was facilitated by the NHS England Data Access Request Service.

NHS Wales recently implemented Cancer Dataset Forms with the latest implementation date being January 2025. These have been designed to improve the data capture and reporting capabilities of NHS Wales. This implementation has impacted the data quality within NHS Wales. NHS Wales has committed to continue to submit audit data annually until data submissions are sourced exclusively from the new cancer informatics solution. This will be from 2027 onwards that NHS Wales will be able to supply quarterly data using this new integrated, and more accessible digital platform.

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Contents

1. Introduction ... 1
2. Sources of Data ... 2
3. Inclusion and Exclusion Criteria ... 2
4. Key Data Items ... 3
5. Indicator Definitions ... 4
Performance Indicator 1: Triple Diagnostic Assessment (TDA) in a single hospital visit ... 5
Performance Indicator 2: Contact with a Clinical Nurse Specialist (CNS) ... 6
Performance Indicator 3: Breast-conserving surgery or mastectomy within 12 months of diagnosis ... 6
Performance Indicator 4: Neo-adjuvant chemotherapy ... 7
Performance Indicator 5: Adjuvant radiotherapy following breast-conserving surgery or mastectomy ... 8
Performance Indicator 6: Chemotherapy ... 9
Performance Indicator 7: Immediate reconstruction following a mastectomy ... 10
Performance Indicator 8: Re-operation within 12 months of their initial breast-conserving surgery ... 10
Performance Indicator 9: Overnight hospital admission for treatment-related toxicity within 30 days of a systemic anti-cancer therapy (SACT) cycle ... 11
Performance Indicator 10: 3-year survival ... 11
6. NHS organisations ... 12
7. Statistical Analysis ... 13
7.1 Cause-specific survival ... 13
7.2 Suppression ... 13
7.3 Risk-adjustment of indicators ... 13
7.4 Handling of missing data ... 14
8. Outlier Process ... 15
Appendix 1: Routine data sources ... 16
Appendix 2: Secondary Care Administrative Records Frailty (SCARF) Index ... 17
Appendix 3: OPCS Codes ... 18
Appendix 4: Charlson co-morbidity score ... 19
Appendix 5: Histology ... 20

1. Introduction

This document provides supporting material to the 2026 State of the Nation (SotN) Report for the National Audit of Primary Breast Cancer (NAoPri) and its data tables and data viewer. The document describes the data used in the report with details on sources of data, criteria for inclusion and how data completeness, patient characteristics and performance indicators are derived and reported.

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2. Sources of Data

The audit uses information from routine national healthcare datasets in England and Wales. These datasets capture details on the diagnosis, management, treatment and outcome of every patient newly diagnosed with cancer in the NHS in England and Wales.

For England, the audit received information from the National Disease Registration Service (NDRS) at a tumour level for this State of the Nation report. The information held in the National Cancer Registration Data (NCRD) is compiled from a variety of sources including the Cancer Outcomes and Services Dataset (COSD), Hospital Episode Statistics admitted patient care (HES APC) records, the Systemic Anti-Cancer Therapy dataset (SACT), the Radiotherapy dataset (RTDS) and data submitted by pathology laboratories. The audit also received linked information from COSD (linked at tumour level), HES APC, HES Outpatients data (HES OP), SACT, RTDS and the Primary Care Prescription Database (PCPD) (all linked at patient level). **Appendix 1** provides more detail on the data sources listed below and the information they contain.

The English data received by the National Cancer Audit Collaborating Centre (NATCAN) included data on patients registered with cancer from 01 January 2015 up to 31 December 2023.

As with cancer registries in other countries, cancer registrations in England can take up to 5 years after the end of a given calendar year to approach 100% completeness and stability. NDRS uses an active system of gathering information on cancer diagnoses from multiple sources across the patient pathway. Completeness varies by tumour type because different patient pathways provide different opportunities for data flows into NDRS. The 'Gold standard' cancer registration dataset that is used in cancer statistics bulletins and available for analysis outside of NDRS contains over 98% of all the people that will eventually be found by the registration process, and the completeness for a calendar year of data increases over time. More information about the cancer registration process can be found here.

For Wales, the audit was provided with a registration dataset at patient level for patients diagnosed with cancer from 01 January 2015 up to 31 December 2023. Welsh cancer registration data is captured through the Cancer Network Information System Cymru (CaNISC) and the new sytem: Cancer Dataset Froms (CDF). The audit also received linked datasets of records from the Patient Episode Database for Wales (PEDW) containing information on inpatient and day case activity, and mortality data from the Office for National Statistics (ONS). Data from England and Wales were harmonised and analysed together.

3. Inclusion and Exclusion Criteria

The data received for England and Wales is checked and filtered for eligible participants, tables 3.1 and 3.2 explain the process in defining the final cohort to be used in the audit.

People were included for analysis within the SotN Report based on the following inclusion and exclusion criteria:

Table 3.1: Audit Inclusion Criteria

Inclusion Criteria	Details
Type of cancer	ICD-10 diagnosis codes: C50 (invasive breast cancer); D05 (in-situ breast cancer).
Adults	Age >=18
Valid Diagnosis Date	01 January 2021 to 31 December 2023
Cancer Stage	Stages 0 to 3C breast cancer or with an "unknown" staging.

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Table 3.2: Audit Exclusion Criteria	
Exclusion Criteria	**Details**
Metastatic disease recorded	Stage 4 or ICD-10 diagnosis recording secondary cancer within hospital admissions data within 6 months of date of diagnosis.
Histology	Disease not invasive or DCIS (e.g., lobular carcinoma in situ)
Reported by death certificate only or Date of diagnosis corresponds to date of death	**For English data:** Using NCRD: basisofdiagnosis = 0 (Death certificate) and/or dco = Y (tumour registered from a death certificate only) and/or date_diagnosis=ONS_date_death **For Welsh data:** Date_diagnosis = ONS_date_death and/or basisofdiagnosis=0
Diagnosed outside of an eligible NHS organisation in England or Wales.	Diagnosed outside of an NHS organisation in England or Wales OR Diagnosed at an NHS organisation with no active breast unit OR Diagnosed within an NHS organisation with less than 30 allocated registrations of breast cancer per year OR Diagnosed at a tertiary centre Summary level national figures do include people with no place of diagnosis. However, people are excluded from indicators and data completeness if no place of diagnosis is recorded as it is not clear where they would be placed.
Multiple cancer registrations during the audit period	>1 tumour ID in the cancer registration dataset (e.g., bilateral cancer)

4. Key Data Items

Details of the variables and datasets used to compile the data completeness information are shown below in Table 4.1.

Table 4.1: Data Completeness Variables				
Data Item	**Source**			
	England		**Wales**	
	Data field	**Dataset(s)**	**Data field**	**Dataset**
Clinical Nurse Specialist	CR2050	COSD	CNS_Nurse Seen HasSeenClinicalNurseSpecialist	CaNISC CDF
Triple Diagnostic Assessment	BR4400 (not provided)	COSD	N/A BreastTripleDiagnosticAssessment	CDF
ER status[A]	ER_STATUS; ER_SCORE / pBR4220	NCRD /COSD	ErStatus ErStatus, ErAllredScore	CaNISC CDF
HER2 status	HER2_STATUS; pBR4280	NCRD/COSD	Her2Status; Her2FishStatus Her2Status, Her2IshStatus	CaNISC CDF
PR status	PR_STATUS; PR_SCORE / pBR4290	NCRD/COSD	PrStatus PrStatus, PrAllredScore	CaNISC CDF
Stage (overall)	STAGE_BEST, T-stage, N-stage, M-stage	NCRD	StageGroupIntegrated StageGroupFinalPreTreatment	CaNISC CDF
T-stage	T_BEST	NCRD	FirstTStagePathological TStageFinalPreTreatment	CaNISC CDF
N-stage	N_BEST	NCRD	FirstNumberOfNodesExamined FirstNumberOfNodesPositive TStageFinalPreTreatment	CaNISC CDF
Grade	GRADE	NCRD	FirstGradeOfDifferentiationPathology GradeOfDifferentiationDiagnosis	CaNISC CDF

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[A] The percentage reported for data completeness reflects the data quality as received by the NAoPri, without augmentation with data for endocrine therapy prescription, to highlight the need for improved data quality. When oestrogen receptor status was used for risk adjustment or for subgroup analyses, this was augmented with data from Primary Care Prescription Database, where persons receiving endocrine therapy were assumed to be ER-positive.

Details of the variables and datasets used to compile the patient and tumour characteristics are shown below in Table 4.2.

Table 4.2: Patient and Tumour Characteristics Variables

Data Item	Source			
	England		Wales	
	Data field	Dataset	Data field	Dataset
Year of Diagnosis	DIAGNOSISDATEBEST / CR2030	NCRD/COSD	DateOfPrimaryDiagnosis DateOfPrimaryDiagnosis	CaNISC CDF
Age at Diagnosis	Birthmonth; birthyear / CR0100	NCRD/COSD	AgeAtDiagnosis Age at Diagnosis	CaNISC CDF
Sex	SEX	NCRD	Gender Gender	CaNISC CDF
Screened	SCREEN_DETECTED / CR1600	NCRD/COSD	CancerReferralSource CancerReferralSource	CaNISC CDF
Ethnic Group	ETHNICITY / CR0150	NCRD/COSD	N/A PatientEthnicGroupDescription	CaNISC CDF
Index of Multiple Deprivation Quintile	QUINTILE_2019 / CR0080	NCRD/COSD	LSOA_ Deprivation Quintile Group DeprivationQuintile	LSOA LSOA
SCARF index[A]	DIAG_nn	HES APC	Diagnosis_n	PEDW
Charlson co-morbidity score	DIAG_nn	HES APC	Diagnosis_n	PEDW
Stage (overall)	STAGE_BEST, T-stage N-Stage, M-stage (from M_Best) SITE_ICD10.	NCRD	StageGroupIntegrated StageGroupFinalPreTreatment and DiagnosisICD10	CaNISC CDF
T-stage	T_BEST	NCRD	FirstTStagePathological	CaNISC
N-stage	N_BEST	NCRD	FirstNumberOfNodesExamined, FirstNumberOfNodesPositive	CaNISC
Grade	GRADE	NCRD	FirstGradeOfDifferentiationPathology GradeOfDifferentiationDiagnosis	CaNISC CDF
Histology	HISTOLOGY_CODED	NCRD	DiagnosisICD10	CaNISC
Disease Group	Derived from stage, above	NCRD	Derived from stage, above	CaNISC/CDF
Date of Death	Vitalstatus, vitalstatusdate, deathdatebest	NCRS/ONS	DeathDate	ONS

[A] See Appendix 2.

5. Indicator Definitions

The audit uses key indicators to monitor progress against its healthcare improvement goals. These indicators align with national guidelines and standards. Definitions of how the indicators included in the SotN report were derived from data for England and Wales are described below.

Some indicators are focused on subgroups of patients as defined by route to diagnosis, stage, histopathology, or treatment, as these factors are important determinants of whether particular treatments or processes are suitable for patients.

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Performance Indicator 1: Triple Diagnostic Assessment (TDA) in a single hospital visit

Percentage of patients who underwent Triple Diagnostic Assessment (TDA) (clinical examination, imaging and biopsy) within a single clinic visit.

For England, there is a bespoke TDA data item (BR4400) which was introduced in NDRS data in 2022. However, as this report covers patients diagnosed between 2021 and 2023, information for this data item was not provided by NDRS. For England, TDA was therefore estimated from the date of first contact (from the Cancer Waiting Times dataset) and the date of the biopsy sample (from COSD). Because most biopsies are performed under image guidance, we assumed that if the date of first contact matches the biopsy date, the patient had undergone TDA. A one-day difference between the sample taken and sample received dates was permitted, recognising that a biopsy may be collected on one day and received for processing on the following day. We also provide the percentage of TDA 'where known' i.e. where the denominator is limited to where people were present in both datasets and where therefore eligible to have matching dates. While reliable and timely imaging data would have further increased the validity of this indicator, such data were not available at the time. In future, we hope to use the bespoke TDA data item for England.

In Wales, the new CDF dataset includes TDA as a data item, but this is only available for people in the latter half of 2023. We have used this more accurate data item for this indicator for this restricted time frame.

Table 5.1: Percentage of patients who underwent Triple Diagnostic Assessment (TDA) in a single hospital visit

	England	Wales
Dates of diagnosis:	1/1/2021 to 31/12/2023	Pre-CDF: 1/1/2021 to 31/12/2022 Recorded in CDF: from mid-2023 to 31/12/2023
Numerator: Number of people who undergo Triple Diagnostic Assessment (TDA) in a single hospital visit.	Number of people who have a biopsy date (COSD_date_sampletaken1, COSD_date_samplereceipt or COSD_date_samplereceipt-1) in the COSD pathology dataset which matches the date first seen (date_first_seen) in Cancer Waiting Times data.	Pre-CDF: Number of people who have RowType recorded as Investigations, where Investigation is recorded as biopsy/cytology or mammogram and InvestigationDate is the same. CDF: Number of people who have the BreastTripleDiagnosticAssessment item completed as "yes" in the CDF dataset.
Denominator: Number of people diagnosed with primary breast cancer outside of screening.	Final cohort as described in section 3, inclusion and exclusion criteria, excluding those people diagnosed via national screening programme. A secondary denominator was defined as people meeting the above criteria who had available data in both the COSD and Cancer Waiting Times datasets and were therefore eligible for assessment of matching dates. This is shown in the Data Viewer as 'n data available to assess TDA' and 'percent TDA where data present'	Final cohort as described in section 3, inclusion and exclusion criteria, excluding those people diagnosed via national screening programme. Pre-CDF: those people provided in the CaNISC dataset. CDF: Those people present in the CDF data set.
Construction notes:	The screening status is determined by NDRS using data supplied to it by the NHS Breast Screening Programme.	CaNISC screening status is provided in SOURCE OF REFERRAL. CDF: screening status is provided in CancerReferralSource
Country reporting:	England & Wales – combined and separate.	
Organisational Reporting level:	English NHS Trusts. People were allocated to the trust of diagnosis	Welsh Health Boards

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	recorded in the national cancer registry data.	
Subgroup Reporting:	Gender, age-group, diagnosis year, stage 0.	Gender, age-group, diagnosis year, CaNISC vs CDF, stage 0.
Risk adjusted:	No.	
Outlier reporting:	No	

Performance Indicator 2: Contact with a Clinical Nurse Specialist (CNS)

Percentage of patients who had contact with a Clinical Nurse Specialist (CNS) recorded after diagnosis.

For England and Wales, contact with a CNS is captured in bespoke data items from COSD and CaNISC and CDF, respectively.

Table 5.2: Percentage of patients who had contact with a Clinical Nurse Specialist (CNS) recorded as 'yes' within 30 days of the date of diagnosis.		
	England	**Wales**
Dates of diagnosis:	1/1/2021 to 31/12/2023	1/1/2021 to 31/12/2023
Numerator: Percentage of patients who had contact with a Clinical Nurse Specialist (CNS) recorded as 'yes' within 30 days of the date of diagnosis	Number of people who have COSD data item CR2050 (*Clinical Nurse Specialist Indication Code)* recorded as yes.	Number of people who have CaNISC data item CNS_Nurse Seen or CDF data item HasSeenClinicalNurseSpecialist recorded as yes.
Denominator: Number of people diagnosed with primary breast cancer.	Final cohort as described in section 3, inclusion and exclusion criteria.	Final cohort as described in section 3, inclusion and exclusion criteria.
Country reporting:	England & Wales – combined and separate.	
Organisational Reporting level:	English NHS Trusts. People were allocated to trusts based on the organisation responsible for the decision to treat, as recorded in the Cancer Waiting Times dataset.	Welsh Health Boards
Subgroup Reporting:	Gender, age-group and diagnosis year.	Gender, age-group and diagnosis year.
Risk adjusted:	No – not required as we expect this to be yes, regardless of case-mix.	
Outlier reporting:	No	

Performance Indicator 3: Breast-conserving surgery or mastectomy within 12 months of diagnosis

Percentage of patients who have surgery (breast-conserving or mastectomy) within 12 months of diagnosis.

Receipt of surgery is derived from the Cancer Registry Treatment dataset and HES data for England and CaNISC and PEDW data for Wales. The type of surgery is established using OPCS codes (See **Appendix 3**).

Table 5.3: Percentage of patients who had i) breast-conserving surgery or ii) mastectomy within 12 months of diagnosis.		
	England	**Wales**
Dates of diagnosis:	1/1/2021 to 31/12/2023	1/1/2021 to 31/12/2023
Numerator: Number of women who had breast-conserving surgery	Number of women who have breast-conserving surgery (in HES or Cancer Registry Treatment Dataset) recorded	Number of women who have breast-conserving surgery recorded (in CaNISC, CDF or PEDW) up to 90 days before date

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within 12 months of diagnosis.	up to 90 days before date of diagnosis and within 12 months of diagnosis.	of diagnosis and within 12 months of diagnosis.
Denominator: Number of people diagnosed with early breast cancer (stage 0 to stage 3A or "unknown" staging) who received surgery within 12 months of diagnosis.	Final cohort as described in section 3, inclusion and exclusion criteria. Restricted to women with early breast cancer who received surgery within 12 months of diagnosis.	Final cohort as described in section 3, inclusion and exclusion criteria. Restricted to women with early breast cancer who received surgery within 12 months of diagnosis.
Construction notes:	The first recorded breast surgery is used for this indicator.	The first recorded breast surgery is used for this indicator.
Country reporting:	England & Wales – combined and separate.	
Organisational Reporting level:	English NHS Trusts. People were allocated to trusts based on the organisation responsible for the decision to treat, as recorded in the Cancer Waiting Times dataset.	Welsh Health Boards
Subgroup Reporting:	Gender, age-group, diagnosis year, T-stage.	Gender, age-group, diagnosis year, T-stage.
Risk adjusted:	Yes - age (spline), tumour grade, Charlson co-morbidity score[A], SCARF index[B], invasive cancers only: ER status T-stage, N-stage, histology[C] and diagnosis year.	
Outlier reporting:	No	

[A] See Appendix 4 [B] See Appendix 2 [C] See Appendix 5

Performance Indicator 4: Neo-adjuvant chemotherapy

Percentage of patients who receive neo-adjuvant chemotherapy for triple negative or HER2-positive stage 2 to 3A breast cancer.

Information regarding the use of neo-adjuvant chemotherapy is derived from Systemic Anti-Cancer Therapy and HES data for England and CaNISC and CDF data for Wales. The new CDF datasets for Wales had disrupted data flows for chemotherapy and the rates in Wales therefore appear lower in 2023.

Table 5.4: Percentage of patients who received neo-adjuvant chemotherapy.		
	England	**Wales**
Dates of diagnosis:	1/1/2021 to 31/12/2023	1/1/2021 to 31/12/2023
Numerator: Number of people who receive neo-adjuvant chemotherapy.	Number of people who receive neo-adjuvant chemotherapy (chemotherapy before the date of surgery) using the SACT dataset.	Number of people who receive neo-adjuvant chemotherapy (chemotherapy before the date of surgery) using the CaNISC and CDF dataset.
Denominator: Number of people with early invasive breast cancer (stage 2 to stage 3A), who are triple negative or HER2 positive who have had surgery within 12 months of diagnosis.	Final cohort as described in section 3, inclusion and exclusion criteria. Restricted to those with stage 2 to 3A, triple negative or HER2-positive disease and those who have had surgery within 12 months of diagnosis.	Final cohort as described in section 3, inclusion and exclusion criteria. Restricted to those with stage 2 to 3A, triple negative or HER2-positive disease and those who have had surgery within 12 months of diagnosis.
Construction notes:	Date of chemotherapy is constructed from date of administration in SACT where chemotherapy is one of: cabazitaxel, capecitabine, carboplatin, cisplatin, cyclophosphamide, docetaxel, doxorubicin, epirubicin, eribulin, etoposide, fluorouracil, methotrexate, mitomycin, mitoxantrone, paclitaxel, vindesine, vinorelbine	CaNISC: Use of data item: DateOfChemotherapy CDF: firsttreatmentmodality, secondtreatmentmodality or thirdtreatmentmodality is "Anti-cancer drug regimen (cytotoxic chemotherapy)"
Country reporting:	England & Wales – combined and separate.	

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Organisational Reporting level:	English NHS Trusts. People were allocated to trusts based on the organisation responsible for the decision to treat, as recorded in the Cancer Waiting Times dataset.	Welsh Health Boards
Subgroup Reporting:	Gender, age-group, diagnosis year, and hormone receptor status.	Gender, age-group, diagnosis year, and hormone receptor status.
Risk adjusted:	Yes - age (spline), T-stage, N-stage, tumour grade, Charlson co-morbidity score[A], SCARF index[B], ER status, HER2 status, adjuvant radiotherapy, histology[C] and diagnosis year.	
Outlier reporting:	No	

[A] See Appendix 4 [B] See Appendix 4 [C] See Appendix 5

Performance Indicator 5: Adjuvant radiotherapy following breast-conserving surgery or mastectomy

Percentage of patients who received adjuvant radiotherapy following breast-conserving surgery or mastectomy.

Information for this indicator is derived from RTDS and HES data for England and CaNISC, CDF and radiotherapy data for Wales. The new CDF datasets for Wales had disrupted data flows for chemotherapy and the rates in Wales therefore appear lower in 2023.

Table 5.5: Percentage of patients who received adjuvant radiotherapy following i) breast-conserving surgery and ii) mastectomy.

	England	**Wales**
Dates of diagnosis:	1/1/2021 to 31/12/2023	1/1/2021 to 31/12/2023
Numerator: Number of women who received adjuvant radiotherapy following breast-conserving surgery or mastectomy	The number of women who are recorded as receiving any adjuvant radiotherapy within 6-month after surgery OR within 12 months after surgery if adjuvant chemotherapy was given.	The number of women who are recorded as receiving any adjuvant radiotherapy within 6-month after surgery OR within 12 months after surgery if adjuvant chemotherapy was given.
Denominator: Number of women with early breast cancer (stage 0 to stage 3A or "unknown" staging) who have had i) breast-conserving surgery or ii) mastectomy within 12 months of diagnosis.	Final cohort as described in section 3, inclusion and exclusion criteria. Restricted to women with early breast cancer (stage 1-stage 3A including stage unknown) and undergoing surgery within 12 months of diagnosis, either i) breast conserving surgery or ii) mastectomy. An appendix is provided for women with DCIS (Stage 0)	Final cohort as described section 3, inclusion and exclusion criteria. Restricted to women with early breast cancer (stage 1-stage 3A including stage unknown) and undergoing surgery within 12 months of diagnosis, either i) breast conserving surgery or ii) mastectomy. An appendix is provided for women with DCIS (Stage 0)
Country reporting:	England & Wales – combined and separate.	
Organisational Reporting level:	English NHS Trusts. People were allocated to trusts based on the organisation responsible for the decision to treat, as recorded in the Cancer Waiting Times dataset.	Welsh Health Boards
Subgroup Reporting:	Gender, age-group, diagnosis year, stage and hormone receptor status.	Gender, age-group, diagnosis year, stage and hormone receptor status.
Risk adjusted:	Yes - age (spline), tumour grade, Charlson co-morbidity score[A], SCARF index[B] and diagnosis year, ER status, T-stage, N-stage, histology[C].	
Outlier reporting:	No	

[A] See Appendix 4 [B] See Appendix 2 [C] See Appendix 5

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Performance Indicator 6: Chemotherapy

Percentage of patients who received any chemotherapy (neo-adjuvant or adjuvant).

Information regarding the use of neo-adjuvant or adjuvant chemotherapy is derived from Systemic Anti-Cancer Therapy data for England and CaNISC and CDF data for Wales. The new CDF datasets for Wales had disrupted data flows for chemotherapy and the rates in Wales therefore appear lower in 2023.

Table 5.6: Percentage of patients who received any chemotherapy (neo-adjuvant or adjuvant).		
	England	**Wales**
Dates of diagnosis:	1/1/2021 to 31/12/2023	1/1/2021 to 31/12/2023
Numerator: Number of people who have chemotherapy.	Number of people recorded as having received any chemotherapy using the SACT dataset.	Number of people recorded as having received any chemotherapy using the CaNISC or CDF dataset.
Denominator: Number of people with early breast cancer (stage 1 to stage 3A or "unknown" staging) who have had surgery within 12 months of diagnosis.	Final cohort as described in section 3, inclusion and exclusion criteria. Restricted to those with early invasive breast cancer (stage 1-stage 3A including stage unknown) and undergoing surgery within 12 months of diagnosis.	Final cohort as described in section 3, inclusion and exclusion criteria. Restricted to those with early invasive breast cancer (stage 1-stage 3A including stage unknown) and undergoing surgery within 12 months of diagnosis.
Construction notes:	Date of chemotherapy is constructed from date of administration in SACT where chemotherapy is one of: cabazitaxel, capecitabine, carboplatin, cisplatin, cyclophosphamide, docetaxel, doxorubicin, epirubicin, eribulin, etoposide, fluorouracil, methotrexate, mitomycin, mitoxantrone, paclitaxel, vindesine, vinorelbine. Where date of chemotherapy occurred before date of first surgery the person was recorded as having neoadjuvant chemotherapy.	Date of chemotherapy is constructed from: CaNISC: DateOfChemotherapy CDF: FirstTreatmentModality, SecondTreatmentModality or ThirdTreatmentModality is "Anti-cancer drug regimen (cytotoxic chemotherapy)" and from FirstTreatmentStartDate, SecondTreatmentStartDate andThirdTreatmentStartDate Where date of chemotherapy occurred before date of first surgery the person was recorded as having neoadjuvant chemotherapy.
Country reporting:	England & Wales – combined and separate.	
Organisational Reporting level:	English NHS Trusts. People were allocated to trusts based on the organisation responsible for the decision to treat, as recorded in the Cancer Waiting Times dataset.	Welsh Health Boards
Subgroup Reporting:	Gender, age-group, diagnosis year, stage and hormone receptor status.	Gender, age-group, diagnosis year, stage and hormone receptor status.
Risk adjusted:	Yes - age (spline), T-stage, N-stage, tumour grade, Charlson co-morbidity score[A], SCARF index[B], ER status, HER2 status, histology[C] and diagnosis year.	
Outlier reporting:	No	

[A] See Appendix 4 [B] See Appendix 2 [C] See Appendix 5

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Performance Indicator 7: Immediate reconstruction following a mastectomy

Percentage of patients who have an immediate reconstruction at the same time as their mastectomy.

Receipt of immediate reconstruction is derived from the Cancer Registry Treatment dataset and HES data for England, and CaNISC and PEDW data for Wales. Immediate reconstruction is identified using relevant OPCS codes (see Appendix 3).

Table 5.7: Percentage of patients who had an immediate reconstruction following a mastectomy.		
	England	**Wales**
Dates of diagnosis:	1/1/2021 to 31/12/2023	1/1/2021 to 31/12/2023
Numerator: Number of women who have mastectomy with immediate breast reconstruction.	The number of women who are recorded as having an immediate breast reconstruction – defined as reconstruction happening on the same date and laterality (where available) as the mastectomy.	The number of women who are recorded as having an immediate breast reconstruction – defined as reconstruction happening on the same date and laterality (where available) as the mastectomy.
Denominator: Number of women with early breast cancer (stage 0 to stage 3A or "unknown" staging) who have had a mastectomy within 12 months of diagnosis.	Final cohort as described in section 3, inclusion and exclusion criteria. Restricted to women with early breast cancer (stage 0-stage 3A including stage unknown) and undergoing mastectomy within 12 months of diagnosis.	Final cohort as described section 3, inclusion and exclusion criteria. Restricted to women with early breast cancer (stage 0-stage 3A including stage unknown) and undergoing mastectomy within 12 months of diagnosis.
Construction notes:	Identify occurence of relevant OPCS codes[A] in HES or Cancer Treatment dataset, with date of episode.	Identify occurrence of relevant OPCS codes[A] in PEDW episodes, with date of episode.
Country reporting:	England & Wales – combined and separate.	
Organisational Reporting level:	English NHS Trusts. People were allocated to trusts based on the organisation responsible for the decision to treat, as recorded in the Cancer Waiting Times dataset.	Welsh Health Boards
Subgroup Reporting:	Age-group, diagnosis year and stage.	Age-group, diagnosis year and stage.
Risk adjusted:	Yes - age (spline), tumour grade, Charlson co-morbidity score[B], SCARF index[C], diagnosis year; invasive only: ER status, T-stage, N-stage, histology[D].	
Outlier reporting:	No	

[A] See Appendix 3 [B] See Appendix 4 [C] See Appendix 2 [D] See Appendix 5

Performance Indicator 8: Re-operation within 12 months of their initial breast-conserving surgery

Percentage of patients who have a re-operation within 12 months of their initial breast-conserving surgery.

Re-operations are derived from the Cancer Registry and Treatment Dataset and HES data for England, and CaNISC and PEDW data for Wales. Re-operation is identified using relevant OPCS codes and laterality (where available).

Table 5.8: Percentage of patients who had re-operation within 12 months of their initial breast-conserving surgery.		
	England	**Wales**
Dates of diagnosis:	1/1/2021 to 31/12/2023	1/1/2021 to 31/12/2023
Numerator: Number of women who have had a re-operation within 12	The number of women who have had an ipsilateral re-operation (where laterality available) defined as re-excision, repeat	The number of women who have had an ipsilateral re-operation (where laterality available) defined as re-excision, repeat

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months of their initial breast-conserving surgery.	breast-conserving surgery or completion mastectomy within 12 months of their initial breast-conserving surgery. Derived from both HES and the Cancer Registry Treatment Dataset.	breast-conserving surgery or completion mastectomy within 12 months of their initial breast-conserving surgery.
Denominator: Number of women with early breast cancer (stage 0 to stage 3A or "unknown" staging) who have had breast conserving surgery within 12 months of diagnosis.	Final cohort as described in section 3, inclusion and exclusion criteria. Restricted to women with early breast cancer (stage 0-stage 3A including stage unknown) and undergoing breast-conserving surgery as their first breast surgery within 12 months of diagnosis.	Final cohort as described in section 3, inclusion and exclusion criteria. Restricted to women with early breast cancer (stage 0-stage 3A including stage unknown) and undergoing breast-conserving surgery as their first breast surgery within 12 months of diagnosis.
Construction notes:	Re-operation[A] is defined as the presence of OPCS codes indicating either of the following: 1. Re-excision (OPCS code: B284) 2. Repeated breast-conserving surgery on the same side where laterality information is available. 3. Completion mastectomy on the same side where laterality information is available. Re-operation must be after the initial breast-conserving surgery but excluding the first 7 days to avoid capturing post-operative complications. Laterality of re-operation is checked against the laterality of the initial breast-conserving surgery where available.	
Country reporting:	England & Wales – combined and separate.	
Organisational Reporting level:	English NHS Trusts. People were allocated to trusts based on the organisation responsible for the decision to treat, as recorded in the Cancer Waiting Times dataset.	Welsh Health Boards
Subgroup Reporting:	Age-group and diagnosis year.	Age-group and diagnosis year.
Risk adjusted:	Age, grade, Charlson co-morbidity score[B], SCARF index[C], diagnosis year; invasive only: ER status, HER2 status, T-stage, N-stage, histology.	
Outlier reporting:	No	

[A] See Appendix 3 [B] See Appendix 4 [C] See Appendix 2

Performance Indicator 9: Overnight hospital admission for treatment-related toxicity within 30 days of a systemic anti-cancer therapy (SACT) cycle

This performance indicator remains under development and is not yet reported on.

Performance Indicator 10: 3-year survival

3-year breast cancer-specific survival for patients with primary breast cancer.

Mortality data for England and Wales is compiled by the Office for National Statistics.

Table 5.10: Percentage of patients who survived their breast cancer for at least 3 years from their initial breast cancer diagnosis		
	England	**Wales**
Dates of diagnosis:	1/1/2022 to 31/12/2023	1/1/2022 to 31/12/2023
Numerator:	People who are alive and free from breast cancer death within the specified time-period. Uses date of diagnosis from the Cancer Registry and ONS	People who are alive and free from breast cancer death within the specified time-period. Uses date of diagnosis from CaNISC and ONS mortality data

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	mortality data and cause of death from ONS mortality data	and cause of death from ONS mortality data.
Denominator: Number of people diagnosed with early invasive primary breast cancer (stage 1 to stage 3A).	Final cohort as described in section 3, inclusion and exclusion criteria, restricted to people with early invasive disease (stage 1-stage 3A)	Final cohort as described in section 3, inclusion and exclusion criteria, restricted to people with early invasive disease (stage 1-stage 3A)
Construction notes:	Flexible parametric survival models and competing risk analysis were used to estimate risk-adjusted 3-year cause-specific survival.	
Country reporting:	England & Wales – combined and separate.	
Organisational Reporting level:	English NHS Trusts. People were allocated to trusts based on the organisation responsible for the decision to treat, as recorded in the Cancer Waiting Times dataset.	Welsh Health Boards
Subgroup Reporting:	None	None
Risk adjusted:	Age, grade, Charlson co-morbidity score[A], SCARF index[B], gender, ER status, HER2 status, T-stage, N-stage.	
Outlier reporting:	Yes	

[A] See Appendix 4 [B] See Appendix 2 [C] See Appendix 5

6. NHS organisations

The audit presents organisation-level findings by the NHS organisation of diagnosis. This is because this is the organisation where diagnosis and multidisciplinary team decisions are likely to be made.

There are some tertiary centres that mainly provide oncological treatment for people with breast cancer. This includes the Christie NHS Foundation Trust, Clatterbridge Cancer Centre NHS Foundation Trust, and Velindre NHS Trust. These tertiary centres are not included directly within audit outputs where findings are reported by the diagnosing NHS organisation. This is because patients are not diagnosed at these centres.

This audit assigns people in England to trusts by three different methods:

- Trust assigned as “diagnosis trust”
- Trust responsible for the decision to treat
- Trust of first surgery

Trust assigned as “diagnosis trust”: NDRS provides the trust of diagnosis for each person based on the trust where pathology-based diagnosis is made.

Trust responsible for the decision to treat: As some trusts provide screening and follow-up services to other trusts, this results in the diagnosis being made at the screening trust and people are therefore assigned to the trust of screening rather than trusts that are responsible for their care. We therefore identified the trust responsible for the decision to treat, where available, which resolves many issues of trust assignment due to screening. However, we note that in some cases neo-adjuvant chemotherapy services are provided by a central trust and that in these cases almost all people receiving neo-adjuvant chemotherapy are re-assigned while people not receiving NACT remain in their trust of origin.

The trust responsible for the decision to treat was identified from the Cancer Waiting Times dataset using org_dec_to_treat variable. Records were eligible where the cancer site code was C50 or D05 and the recorded date fell between 90 days before and 365 days after the date of diagnosis. Where this was missing, org_treat_start was used as a surrogate. For the small minority of patients for whom both variables were missing, the trust of diagnosis provided by NDRS was used to retain these patients in the analysis.

Trust of first surgery: Trust of first surgery is identified by taking the Trust found in HES-APC or in the Cancer Treatment dataset for surgery.

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7. Statistical Analysis

All statistical analyses were conducted using *Stata version 17.*

Most results in the SotN Report are descriptive. The results of categorical data items are reported as percentages (%). Results are typically provided as an overall figure and broken down by NHS organisation of diagnosis (see NHS organisations section). Note that within tables in the SotN Report, the total percentage may not equal 100% due to rounding.

7.1 Cause-specific survival

3-year cause-specific survival was calculated from the date of breast cancer diagnosis using ONS mortality data. To ensure the data was timely and to decrease the impact of the COVID-19 pandemic, breast-cancer specific survival metrics were limited to individuals diagnosed in 2022 and 2023. For those patients with no ONS date of death, a “date last known alive” or censoring date was calculated for use in survival analyses. For English patients provided by the NDRS, this was taken to be the vital status date provided; where this date was missing, the day after the last reported date of death was used. For Welsh patients, the day after the last reported date of death was used. Standardised breast cancer-specific cumulative incidence function (CIF) for the risk of breast cancer death in the presence of the competing risk of death from other causes was estimated.

7.2 Suppression

Data suppression is primarily used to protect patient privacy by preventing the disclosure of sensitive information when dealing with small sample sizes or specific combinations of data points. It involves withholding certain data elements to minimize the risk of identifying individuals. For data quality and completeness, disclosure risk is deemed negligible and results have not been suppressed. For performance indicators, organisations with indicator denominator values of less than 10 have suppressed. Because small numbers are instable and may lead to spurious conclusions if not provided within context and with appropriate uncertainties, risk-adjusted percentages for indicators with fewer than 10 in the denominator have also been suppressed.

To avoid residual disclosure which could occur by summing across subcategories, where only a single trust within a cancer alliance has been supressed, a second trust has had the number and unadjusted percentage supressed to prevent residual disclosure however the risk adjusted percentage is provided.

In the patient characteristics table, for categories with small numbers (1-4) the number has been supressed by converting it to 2 and editing the numbers of a larger group to maintain the overall total. Therefore, the percentage provided for <5 is similar to the real value and the other numbers in the indicator group may contain a small amount of ‘jitter’. Where the category value is ‘Unknown’, 'Not in HESAPC', 'Not in PEDW' or 'Not Recorded', i.e. it represents missing data, we have not suppressed small numbers.

7.3 Risk-adjustment of indicators

Multivariable logistic regression was performed to ‘risk adjust’ relevant indicators. The regression model is used to estimate the probability of a patient having an outcome (e.g. a given treatment) given patient and tumour characteristics. When summed, these individual probabilities produce the expected number of events at an organisation. The adjusted indicator value for an organisation is then calculated as: the observed number of events at an institution divided by the expected number (based on the national model), multiplied by the overall national average. This is called indirect standardisation. The tables of performance indicators state whether risk adjustment has been performed. Table 7.1 provides details on the datasets and variables used for risk adjustment.

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Table 7.1: Risk Adjustment Variables		
Data Item	**Additional detail**	
	England	**Wales**
Age at diagnosis	Age, included as a spline (birthmonth; birthyear from NCRD)	Age, included as a spline (AgeAtDiagnosis from CaNISC or Age at Diagnosis CDF)
Grade	GRADE from NCRD	FirstGradeOfDifferentiationPathology from CaNISC GradeOfDifferentiationDiagnosis from CDF
Charlson co-morbidity score[A]	The Charlson co-morbidity score is a commonly used scoring system for medical comorbidities, consisting of a grouped score calculated based on the absence (0) and presence (≥1) of 14 pre-specified medical conditions (**Appendix 4**). The score was calculated using information on secondary diagnoses (ICD-10 codes) recorded in HES APC (England) / PEDW (Wales) within the 24-month period prior to a person's diagnosis. For analysis, the Charlson co-morbidity score is grouped into four categories: • **0:** none of the 14 pre-specified comorbidities. • **1:** 1 of the 14 pre-specified comorbidities. • **2:** 2 of the 14 pre-specified comorbidities. • **3+:** 3 or more of the 14 pre-specified comorbidities (some risk adjustment may use 2+ in the event that very few people have a score of 3+).	
SCARF Index[B]	Using DIAG_01-DIAG20 from HES APC	Using Diagnosis01-12 from PEDW
Diagnosis year	Year extracted from diagnosisdatebest (NCRD)	Year extracted from DATE OF DIAGNOSIS (CaNISC) or DateOfPrimaryDiagnosis (CDF)
ER Status (Invasive only)	Using ER_STATUS; ER_SCORE from NCRD, supplemented with Primary Care Prescription Database Prescriptions dataset to identify people with ER positive breast cancer. See Footnote of Table 4.1	Using ERStatus from CaNISC and ErStatus and ErAllredScore from CDF
HER2 Status (Invasive only)	Using HER2_STATUS from NCRD	Using Her2Status and Her2FIshStatus from CaNISC and Her2Status and Her2IshStatus from CDF.
T-Stage (Invasive only)	Using T_BEST from NCRD	FirstTStagePathological from CaNISC and TStageFinalPreTreatment from CDF.
N-Stage (Invasive only)	Using N_BEST from NCRD	Using FirstNumberOfNodesExamined and FirstNumberOfNodesPositive from CaNISC and NStageFinalPreTreatment from CDF.
Adjuvant radiotherapy	Using treatment information from RTDS	Using CaNISC data for radiotherapy
Histology[C]	Histology categorised using variable: histology (see **Appendix 5**)	CaNISC: Histology categorised using: HISTOLOGICAL_TUMOUR_CODE and HISTOLOGICAL TUMOUR TYPE CDF: Histology categorised using MorphologyPathology (see **Appendix 5**)

[A] See Appendix 4 [B] See Appendix 2 [C] See Appendix 5

7.4 Handling of missing data

For the risk-adjustment, multiple imputation techniques are used to allow us to make fair comparisons between hospitals without excluding patients with incomplete records. Specifically, missing values within the risk adjustment model were imputed with multiple imputation using chained equations, creating ten datasets and pooling model estimates using Rubin's Rules. The imputation models included all the variables in the risk adjustment model.

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8. Outlier Process

The outlier process can be found in the separate audit outlier policy.

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Appendix 1: Routine data sources

Overview of the data sources used for the SotN Report.

Country	Data source	Content
England	Cancer registry (NCRD and RCRD)	Data on all aspects of the cancer registration including information from hospital pathology systems.
England	COSD	Cancer Outcomes and Services dataset (COSD) items, are submitted routinely by service providers via multidisciplinary team (MDT) electronic data collection systems to the National Cancer Data Repository (NCDR) on a monthly basis.
England	SACT	Systemic Anti-Cancer Therapy (SACT) data contains information on chemotherapy dates, regimen(s) and dose(s).
England	RTDS	Radiotherapy dataset (RTDS) contains information on radiotherapy treatment including dates, prescription region and dose.
England	HES	Hospital Episode Statistics (HES) is the administrative database of all NHS hospital admissions in England; records were supplied by NHS Digital to NCRAS.
England	PCPD	Primary Care Prescription Database (PCPD) contains information on the use of endocrine therapy.
Wales	CaNISC	Cancer Network Information System Cymru (Canisc) contains data on all aspects of the cancer registration including investigations. (OLD SYSTEM)
Wales	CDF	Cancer Dataset Form (CDF) contains data on all aspects of the cancer registration including investigations (NEW SYSTEM)
Wales	PEDW	Patient Episode Database for Wales (PEDW) is the administrative database of all NHS hospital admissions in Wales.
Wales	RTH	Radiotherapy data (RTH) contains information on radiotherapy treatment.
Wales	SACT	SEW SACT data contains information on chemotherapy treatment.
England & Wales	ONS	Office for National Statistics (ONS) death data including date of death and cause of death.

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Appendix 2: Secondary Care Administrative Records Frailty (SCARF) Index

Reference:

Jauhari Y, Gannon MR, Dodwell D, et al. Construction of the secondary care administrative records frailty (SCARF) index and validation on older women with operable invasive breast cancer in England and Wales: a cohort study. BMJ Open 2020;10:e035395. doi: 10.1136/bmjopen-2019-035395

Deficit			
Activity limitation	Diabetic complications	Hypotension	Requirement for care
Anaemia	Falls	Ischaemic heart disease	Respiratory disease
Arthritis	Foot problems	Incontinence	Skin ulcer
Cardiac arrhythmias	Fragility fracture	Neurodegenerative disorders	Sleep disturbance
Cerebrovascular disease	Hearing impairment	Nutritional Problems	Social vulnerability
Chronic kidney disease	Heart failure	Osteoporosis	Thyroid disease
Cognitive and mental health problems	Heart valve disease	Peptic ulcer	Urinary system disease
Diabetes	Hypertension	Peripheral vascular disease	Visual impairment

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Appendix 3: OPCS Codes

Breast conserving surgery	Mastectomy	Reconstruction
B28.1, B28.2, B28.3, B28.5, B28.7, B28.8, B28.9, B41.1, B41.2, B41.8, and B41.9	B27	B29.1, B29.2, B29.3, B29.4, B29.8 B29.9, B30.1, B30.5, B30.8, B30.9, B38.1, B38.2, B38.8, B38.9, B39.1, B39.2, B39.3, B39.4, B39.5, B39.6 B39.7, B39.8, B39.9, B42.1 B42.2 B42.8 B42.9 B43.1 B43.8 B43.9 B44.1 B44.2 B44.3 B44.8 B44.9 and S48.2.

Laterality of surgery was identified via Z94 codes. A reconstruction was defined as immediate if the OPCS-4 codes for mastectomy and reconstruction occurred on the same date of surgery and laterality matches where this is available.

Appendix 4: Charlson co-morbidity score

Reference:

Armitage JN, van der Meulen JH. Identifying co-morbidity in surgical patients using administrative data with the Royal College of Surgeons Charlson Score. Br J Surg 2010;97:772-81. doi https://doi.org/10.1002/bjs.6930

Pre-specified conditions included in the assignment of Charlson co-morbidity Score.

Charlson co-morbidity score conditions
Myocardial infarction
Dementia
Diabetes mellitus
Metastatic solid tumour
Congestive cardiac failure
Chronic pulmonary disease
Hemiplegia or paraplegia
AIDS/HIV infection
Peripheral vascular disease
Rheumatological disease
Renal disease
Cerebrovascular disease
Liver disease
Any malignancy

Note: AIDS/HIV diagnoses cannot be identified in HES APC data because of legal requirements for NHS trusts to remove patient identifiers from legally restricted records, including those containing diagnoses of HIV/AIDS. These diagnoses are also not found in linked PEDW data.

Appendix 5: Histology

Country	Histology	Histology criteria
Wales	Ductal carcinoma in situ (DCIS)	CaNISC: Histology = Non-infiltrating intraductal carcinoma, Noninfiltrating intraductal papillary adenocarcinoma, Ductal carcinoma in situ, solid type, Carcinoma in situ, non infil, Solid papillary carcinoma in situ, Papillary carcinoma in situ CDF: Histology = [M]Intraductal carcinoma, noninfiltrating NOS", "[M]Noninfiltrating intraductal papillary adenocarcinoma" Or Histological_tumour_code, M82302, M85002, M85013, M85072, M85232, M85433, M85032, M85042, M85092.
Wales	Infiltrating duct carcinoma (IDC/NST)	CaNISC: Histology = Infiltrating duct carcinoma, Infiltrating ductular carcinoma, Invasive ductal carcinoma with an extensive intraductal component, Paget's disease and infiltrating duct carcinoma of breast, Infiltrating duct carcinoma with, Infiltrating ductal carcinoma. CDF: Histology = [M]Infiltrating duct carcinoma Or Histological_tumour_code = M80223, M80353, M83103, M83143, M83153, M85003, M85005, M85009, M85103 M85123, M85133, M85143, M85213, M85233, M85413, M85703, M85713, M85723 M85733, M85743.
Wales	Lobular carcinoma (ILC)	CaNISC: Histology = Lobular carcinoma, Invasive lobular carcinoma, Pleomorphic lobular carcinoma, Invasive lobular carcinoma. CDF: Histology = [M]Lobular carcinoma NOS. Or Histological_tumour_code = M85203, M85205, M85243)
Wales	Other	Any other histology.
England	Ductal carcinoma in situ (DCIS)	Histology = 82302, 85002, 85013, 85072, 85232, 85433, 85032, 85042, 85092
England	Infiltrating duct carcinoma (IDC/NST)	Histology = 80223, 80353, 83103, 83143, 83153, 85003, 85005, 85009, 85103, 85123, 85133, 85143, 85213, 85233, 85413, 85703, 85713, 85723, 85733, 85743
England	Lobular carcinoma (ILC)	Histology = 85203, 85205, 85243
England	Other	Any other histology.