NBOCA
National Bowel Cancer Audit

NATCAN
National Cancer Audit Collaborating Centre

National Bowel Cancer Audit
State of the Nation Report 2025: Methodology Supplement

An audit of care received by people diagnosed with bowel cancer focusing on people diagnosed with or undergoing surgery between 1 January 2023 to 31 December 2023 in England and Wales.

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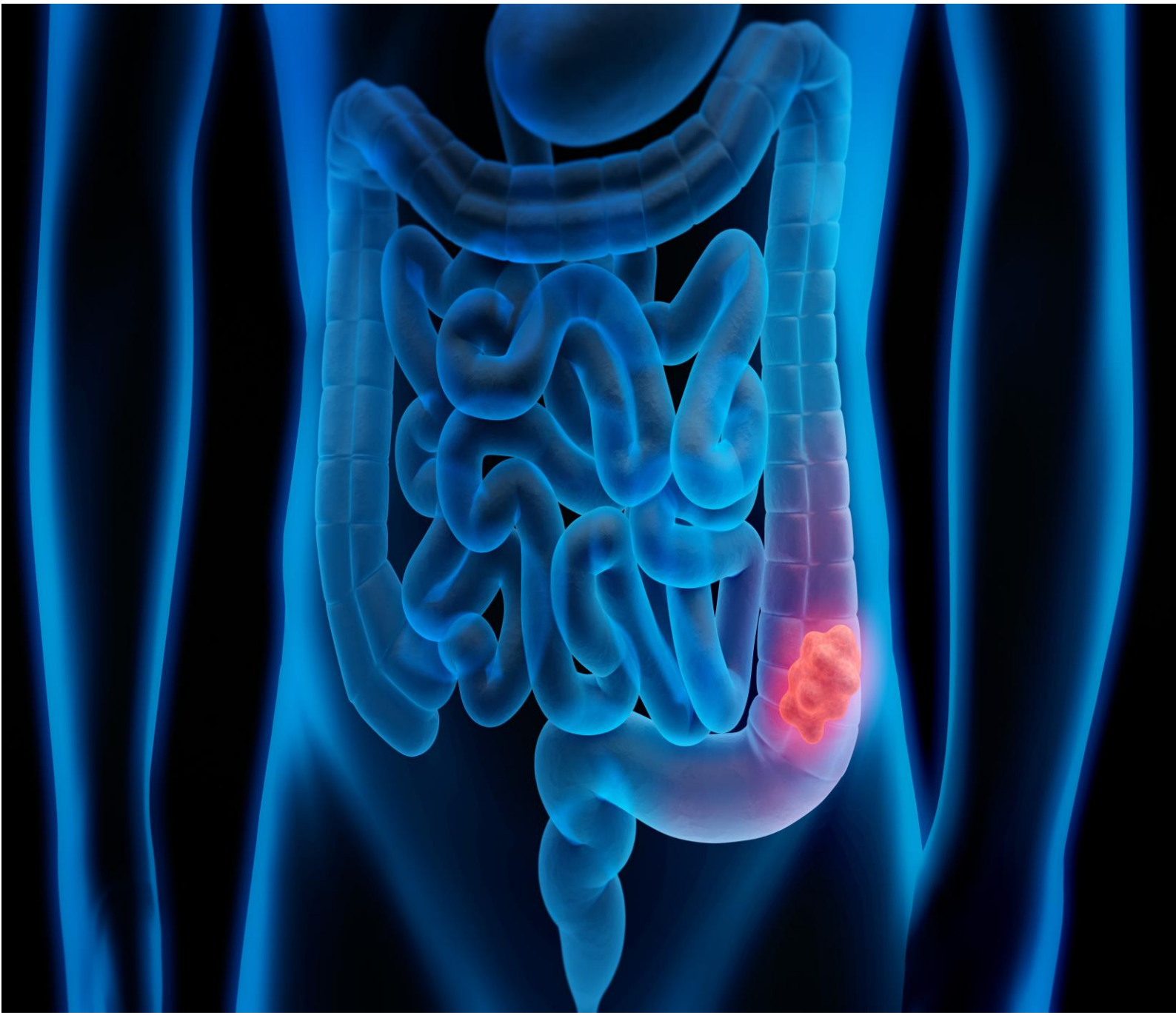

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The Royal College of Surgeons of England is an independent professional body committed to enabling surgeons to achieve and maintain the highest standards of surgical practice and patient care. As part of this it supports audit and the evaluation of 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 the Welsh Government as part of the National Clinical Audit and Patient Outcomes Programme (NCAPOP). NATCAN delivers national audits in bowel, breast (primary and metastatic), kidney, lung, non-Hodgkin lymphoma, oesophago-gastric, ovarian, pancreatic and prostate cancers.

Association of Coloproctology of Great Britain and Ireland (ACPGBI) is a group of 1000+ surgeons, nurses, and allied health professionals who advance the knowledge and treatment of bowel diseases in Britain and Ireland. Registered Charity no: 5962281

The Association of Cancer Physicians (ACP) is the specialist society for medical oncologists in the UK. It works with and for its members to support and promote the specialty and to help improve medical care for cancer patients.

This work uses data that has been provided by patients and collected by the NHS as part of their care and support. For patients diagnosed in England, the data is 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 is implementing a new cancer informatics system. As a result, the quality and completeness of data from Wales is likely to have been impacted due to implementation of this new system across multiple NHS organisations (Health Boards), which has resulted in data being supplied by both old and new systems. Additionally, and reflecting the uncertainty of data quality, the data submitted to the audit may not have undergone routine clinical validation prior to submission to the Wales Cancer Network (WCN), Public Health Wales.

Contents

1. Introduction

This document provides supporting material to the 2025 State of the Nation (SotN) Report for the National Audit of Bowel Cancer (NBOCA) 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.

The majority of the report relates to diagnoses or surgery for bowel cancer (also known as colorectal cancer) that took place between January and December 2023.

2. Sources of Data

The audit uses information from routine national health care 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 patient level for this State of the Nation report. The information held in NCRD and RCRD 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), RTDS and data submitted by pathology laboratories. The audit also used linked information from COSD (linked at tumour level), HES APC, SACT and RTDS (all linked at patient level). Appendix 1 provides more detail on the data sources listed below and the information they contain.

The NCRD and linked datasets were received by the National Cancer Audit Collaborating Centre (NATCAN) in December 2024 and included data on patients registered with bowel cancer up to December 2022. This was used to construct the longer-term performance indicators 18-month ileostomy and 2 year all-cause mortality.

The RCRD and linked datasets were received by the National Cancer Audit Collaborating Centre (NATCAN) in January 2025 and included data on patients registered with cancer up to October 2024. Data for patients registered with bowel cancer up to December 2023 was used to produce the main body of the report including all remaining performance indicators.

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 reach approximately 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:

Timeliness of the National Cancer Registration Dataset (NCRD) - National Cancer Audit Collaborating Centre

Data collection and quality assurance of administrative data - GOV.UK

For Wales, the audit was provided with a registration dataset at patient level for patients diagnosed with cancer in 2023. Welsh cancer registration data is captured through a national system, Cancer Information System for Wales (CaNISC) and the new Welsh Clinical Portal. 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). This was combined with the dataset created for the 2024 State of the Nation Report in order to allow the same analyses to be performed on the Welsh data.Data for diagnoses prior to

April 2022 was submitted via the Clinical Audit Platform (CAP) system; data for diagnoses from April 2022 has been submitted directly to the audit.

England and Wales data were managed separately and then combined for analysis.

3. Inclusion and Exclusion Criteria

The data submitted by NDRS and WCN is checked and filtered for eligible participants, tables 3.1 and 3.2 explains the process in defining the final diagnosis cohort to be used in the audit.

People were included for analysis within the SotN Report if they met the following inclusion and not the exclusion criteria:

Table 3.1: Audit Inclusion Criteria

Inclusion Criteria	**Details**
Type of cancer	One of the following ICD10 diagnostic codes for bowel cancer within cancer registration record: • C18 Malignant neoplasm of colon* • C19 Malignant neoplasm of rectosigmoid junction • C20 Malignant neoplasm of rectum
Adults	Age >=18
First Diagnosis	1. Earliest diagnosis (diagnosisdatebest) was included in the cohort if dates of diagnosis differed. 2. If dates of diagnosis were the same then inclusion based on selecting in order: a. The tumour with the more advanced stage (stage_best) b. The tumour with the higher grade (grade)

* C181 (Appendix) records are excluded from the surgical performance indicators but not from the overall cohort

Table 3.2: Audit Exclusion Criteria

Exclusion Criteria	**Details**
Reported by death certificate only	**For English data:** Using NCRD: final_route = DCO (Death Certificate Only) and/or basisofdiagnosis = 0 (Death certificate)
Diagnosed and treated outside of an NHS organisation in England or Wales.	Trust of diagnosis was a Welsh health board (code starting with 7) & No record of pathway event via trust_code in England* & No record of org_code_of_drug_provider in England* in SACT & No record of orgcodeprovider in England* in RTDS *Trust code starting with "R" is in England
Presence of a morphology code for tumours not included in the Audit	Presence of a specified morphology code indicating sarcoma, lymphoma, melanoma, neuroendocrine/carcinoid tumours, or others listed in Appendix 2 were excluded from all datasets

The majority of performance indicators (described in Section 5 below) are restricted to those undergoing major surgery (resection) for their cancer. Appendix Table 3 lists the OPCS codes that are used to define which surgical procedure is used for analysis.

4. Key Data Items

For diagnoses/ treatment in England, the NCRD dataset was used as the data source for 2-year overall survival and 18-month ileostomy after anterior resection. RCRD was used for all other analyses in this State of the Nation report. Both of these datasets may contain multiple tumour records, the methodology for restricting this to one tumour record per person is detailed below. Welsh data is supplied as single record per person, a small number of patients had records in both data collection systems and so the record with the most complete data was kept.

NCRD

The NCRD tumour file consists of one record for each tumour in a specific location of the bowel, recorded as 4-character ICD-10 codes. People diagnosed with tumours in multiple sites of the bowel within the time frame of the extract will have multiple tumour records (2.1% of people with a bowel cancer diagnosis in the extract).

Initially, data relating to diagnoses in Wales, death certificate only and morphology exclusions were removed from the dataset. If multiple tumours were still present, those records containing the most staging data were kept and the earliest diagnosis date recorded. Later records that did not have a histological diagnosis were removed along with any records dated >366 days after the minimum.

The NCRD treatment file was restricted to OPCS-codes representing major resection (Appendix 3) and the record(s) for the earliest date of surgery retained. If more than one surgical procedure was recorded on the same date, the dataset was restricted to one surgical procedure in the following way:

Initially, the most appropriate surgery for the recorded tumour location was kept e.g., right hemicolectomy for a right-sided colorectal tumour. If an individual had more than one tumour location and multiple procedures recorded, records where the tumour location, procedure and date matched a surgical record in HES-APC were kept. If multiple records per individual remained, the record with the most advanced TNM staging was selected, followed by records with the most advanced tumour grading or number of nodes examined, and finally, if multiple records still remained, the location furthest to the right side of the bowel was selected.

If a tumour record did not have a linked major resection, they were linked to records for non-resectional surgery if present and the most appropriate procedure defined.

RCRD

The rapid tumour file consists of one record for each 3-character ICD-10 code diagnosis for each individual during the time period of the extract. The rapid events pathway file (event pathway 9 and 18) contains further information about final and provisional 4-character ICD-10-code diagnoses and associated stage (1-4). If multiple tumours were present in this data, those records containing the most/highest staging data were kept.

Surgical data was sourced from two datasets linked at individual level. The rapid events pathway file (event_type 14) and COSD data. These were separately searched for the OPCS-codes representing major resection (Appendix 3) and then combined to obtain the first date of major resection for each tumour. Trust information was only present in the events file data and therefore if a surgical procedure was only present in the COSD data it was not allocated a trust and excluded from surgical performance indicators.

The same two datasets were used to obtain information about local excisions, and standalone formation of stoma in individuals with no recorded major resection.

The rapid tumour file, additional diagnostic information and surgical information were combined and similar methodology as described for the NCRD used to obtain a dataset for the best single tumour.

Details of the variables and datasets used to compile the data completeness variable for those undergoing major surgery are shown below in Table 4.1

Table 4.1: Data Completeness Variables

Data Item	**Source**			
	England		**Wales**	
	Data field	**Dataset**	**Data field**	**Dataset**
Age at diagnosis	derived from birthmonth and birthyear	RCRD	derived from birthmonth and birthyear	PEDW
Sex	gender	RCRD	gender	Canisc, New informatics
Site of cancer	site_icd10	RCRD tumour file updated from pathway file	TUMOUR_SITE_CODE/DiagnosisICD10Code	Canisc, New informatics
Performance status	performancestatus	COSD	PERFORMANCE_STATUS	Canisc, New informatics
Pathological T Stage	*See below for more information		POST_TREATMENT_T_pathological/ FinalPathologyTCategory	Canisc, New informatics
Pathological N Stage			POST_TREATMENT_N_pathological/ FinalPathologyNCategory	
Pathological M Stage			POST_TREATMENT_M_pathological/ FinalPathologyMCategory	

Creation of staging variables across datasets

All staging variables (stage and TNM) were converted to single digit forms eg M1 not M1a; Stage 3 not Stage 3a. In TNM staging any variable that was not numerical was considered to be missing eg Tx, T9, Nx, N9, Mx and M9. Welsh data was submitted directly as pre-treatment and pathological TNM with staging 1-4 created from pre-treatment TNM.

The following tables (4.1a and 4.1b) show how pre-treatment and pathological TNM variables were created from RCRD and NCRD variables for people diagnosed in England.

Table 4.1a: Staging from NCRD

	Pre-treatment TNM			Pathological TNM			
	Primary Source	If Primary Source missing updated from		Primary Source	If Primary Source missing updated from		
		1	2		1	2	3
T	T_best	T_img	T_path	T_path	T_best		
N	N_best	N_img	N_path	N_path	N_best		
M	M_best	M_img	M_path	M_path	Derived pre-treatment M	M_best	Stage_best 1-3 = M0 4 = M1

TNM_best TNM stage flagged by the registry as the 'best' TNM stage
TNM _img pre-treatment TNM
TNM _path pathology TNM
Stage_best best 'registry' stage at diagnosis of the tumour

Table 4.1b: Staging from RCRD

	Pre-treatment TNM [a]			Pathological TNM [b]			
	Primary Source	If Primary Source missing updated from*		Primary Source	If Primary Source missing updated from**		
		1	2		1	2	3
T	T_best	T_img	T_path	T_path	T_best		
N	N_best	N_img	N_path	N_path	N_best		
M	M_best	M_img	M_path	M_path	Derived pre-treatment M	M_best	Stage_rapid 1-3 = M0 4 = M1

[a] Pre-treatment TNM derived from the RCRD pathway dataset event_type 21
* If date of record within 62 days of diagnosis
[b] Pathological TNM primary source is COSD with TNM_best from the RCRD pathway dataset event_type 21and stage_rapid from RCRD tumour dataset
** 2 days prior to surgery to 62 days after surgery

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

Table 4.2: Patient Characteristics Variables				
Data Item	**Source**			
	England		**Wales**	
	Data field	**Dataset**	**Data field**	**Dataset**
Age at diagnosis	derived from birthmonth and birthyear	RCRD	derived from birthmonth and birthyear	PEDW
Sex	gender	RCRD	gender	Canisc, New informatics
Ethnicity	ethniccategory	RCRD	ethnicgroupcategory	PEDW
Index of multiple deprivation	*imd19_quintile_lsoas*	RCRD	*deprivationquintile*	LSOA dataset

5. Indicator Definitions

The audit uses key indicators to monitor progress against its healthcare improvement goals. These indicators align with national guidelines and standards.. This plan aims to involve all members of the multidisciplinary clinical team managing people with bowel cancer, covering all areas of the treatment pathway, from diagnosis and perioperative care to adjuvant and neo-adjuvant oncological management, stage IV disease and end of life care.

Definitions of how the indicators included in the SotN report were derived from data for England and Wales are described below.

Some indicators are further focused on subgroups of patients as defined by sex and stage of the disease, as these factors are important determinants of whether particular treatments are suitable for patients.

5.1 Performance Indicator 1: Seen by Clinical Nurse Specialist

The percentage of people with bowel cancer seen by a clinical nurse specialist in line with ACPGBI: Guidelines for the Management of Cancer of the Colon, Rectum and Anus (2017) – Surgical Management

"Patients with colorectal cancer should meet and have access to a CNS as 'Key Worker' for advice and support from the time of their initial diagnosis."

Table 5.1: Seen by Clinical Nurse Specialist		
	England	**Wales**
Dates of diagnosis:	01.01.23 to 31.12.23	
Numerator: Number of people with bowel cancer reported to have been seen by a clinical nurse specialist	People with bowel cancer were considered to have seen a CNS if they are recorded as having seen a clinical nurse specialist within 90 days of the RCRD date of diagnosis as obtained from COSD data	Canisc (CNS SEEN), New informatics (HasSeenClinicalNurseSpecialist)
Denominator: Number of people with bowel cancer with recorded clinical nurse specialist status	Final diagnostic cohort as described in patient inclusion / exclusion who have a clinical nurse specialist record.	
Construction notes:	The State of the Nation reports data for all organisations. Quarterly data is suppressed if clinical nurse specialist completeness <70%	
Country reporting:	England and Wales combined	
Organisational Reporting level:	Diagnosing organisation	
Subgroup Reporting:	None	
Risk adjusted:	No	
Outlier reporting:	No	

5.2 Performance Indicator 2: Trust/MDT volume for rectal cancer surgery

The number of major resections for rectal cancer by Trust/MDT in line with NICE guidance "hospitals performing major resection for rectal cancer should perform at least 10 of these operations each year" and "*Offer surgery to people with rectal cancer (cT1-T2, cN1-N2, M0, or cT3-T4, any cN, M0) who have a resectable tumour.*" (Recommendations | Colorectal cancer | Guidance | NICE)

Table 5.2: Trust/MDT volume for rectal cancer surgery		
	England	**Wales**
Dates of treatment:	1/1/2023 - 31/12/2023	
Numerator: Number of people with rectal cancer undergoing major resection	RCRD	Canisc, New informatics
Denominator:	*n/a*	
Construction notes:	Defined as rectal cancer if the allocated ICD-10 was C20. Major resection defined as the presence of an OPCS code listed in Appendix 3	
Country reporting:	England and Wales combined	
Organisational Reporting level:	Organisation performing surgery	
Subgroup Reporting:	None	
Risk adjusted:	No	
Outlier reporting:	No	

5.3 Performance Indicator 3: Adjusted 90-day mortality after major resection

Adjusted 90-day mortality after major resection in line with ACPGBI: Guidelines for the Management of Cancer of the Colon, Rectum and Anus (2017) – Surgical Management

"Colorectal units should expect to achieve an operative mortality of less than 20% for emergency surgery and less than 5% for elective surgery for colorectal cancer."

Table 5.3: Adjusted 90-day mortality after major resection		
	England	**Wales**
Dates of treatment:	01/01/23-31/12/23	
Numerator: Number of people with bowel cancer undergoing major resection who die within 90 days of surgery	ONS mortality data supplied within RCRD data	ONS mortality data supplied by Wales
Denominator: Number of people with bowel cancer undergoing major resection	RCRD	Canisc, New informatics
Construction notes:	Records with invalid date of surgery because the date of surgery is reported to be after date of death, or where the date of surgery/death is missing are excluded. Records with C181 (Appendix) as the tumour site are excluded. Hospitals/MDTs with <20% data completeness overall, or >80% records missing performance status and/or TNM staging only have their unadjusted result published. Days to death calculated by counting the number of days between recorded date of surgery and date of death	
Country reporting:	England and Wales combined	
Organisational Reporting level:	Organisation performing surgery	
Subgroup Reporting :	None	
Risk adjusted: *Yes*	Age(modelled as age plus age-squared), sex, performance status, Charlson co-morbidity score, mode of admission, T-stage (pathological), N-stage (pathological), M-stage (pathological), site of tumour	
Outlier reporting:	Yes	

5.4 Performance Indicator 4: Adjusted 30-day unplanned return to theatre after major resection

Adjusted 30-day unplanned return to theatre after major resection following ACPGBI: Guidelines for the Management of Cancer of the Colon, Rectum and Anus (2017) – Surgical Management

"Colorectal units should audit their leak rate for colorectal cancer surgery."

Table 5.4: Adjusted 30-day unplanned return to theatre after major resection		
	England	**Wales**
Dates of treatment:	01/01/23-31/12/23	01/01/23-31/12/23
Numerator: Number of people with bowel cancer with any OPCS code for reoperation in HES-APC/PEDW within 30 days of surgery	HES-APC	PEDW
Denominator: Number of people with bowel cancer undergoing major resection	RCRD	Canisc, New informatics
Construction notes:	Records that could not be linked to HES-APC/PEDW are excluded. Records with C181 (Appendix) as the tumour site are excluded. Hospitals/MDTs with <20% data completeness overall, or >80% records missing performance status and/or TNM staging only have their unadjusted result published. The OPCS codes used to define 30-day unplanned re-operation within HES-APC/PEDW are shown in Appendix 4. The majority of listed OPCS codes are only valid on days 1-30 after surgery to avoid classifying procedures which were part of the original major surgery as an unplanned reoperation.	
Country reporting:	England and Wales combined	
Organisational Reporting level:	Organisation performing surgery	
Subgroup Reporting :	None	
Risk adjusted: Yes	Age (modelled as age plus age-squared), sex, performance status, Charlson co-morbidity score, mode of admission, T-stage (pathological), N-stage (pathological), M-stage (pathological), site of tumour	
Outlier reporting:	Yes	

5.5 Performance Indicator 5: Adjusted 30-day unplanned readmission after major resection

Unplanned readmissions are regarded as a quality metric for surgical care.

Table 5.5: Adjusted 30-day unplanned readmission after major resection		
	England	**Wales**
Dates of treatment:	01/01/23-31/12/23	01/01/23-31/12/23
Numerator: Number of people with bowel cancer who had an emergency admission for any cause, to any trust, within 30 days of their major resection	HES-APC	PEDW
Denominator: Number of people with bowel cancer undergoing major resection	RCRD	Canisc, New informatics
Construction notes:	Records that could not be linked to HES-APC/PEDW are excluded. Records with C181 (Appendix) as the tumour site are excluded. Hospitals/MDTs with <20% data completeness overall, or >80% records missing performance status and/or TNM staging only have their unadjusted result published. 30-day unplanned readmission is defined as an emergency admission to any hospital for any cause within 30 days of surgery. Emergency admissions include those via Accident and Emergency, general practitioners, bed bureaus (point of contact for GPs to arrange urgent admission), or consultant outpatient clinics ("admimeth" 21 – 28 including 2A, 2B, 2D). Feedback received during NBOCA annual report outlier analysis highlighted differences in the coding of discharge method in PEDW compared to HES-APC. Patients with multiple episodes for the same admission in PEDW are often coded as "discharged" at the end of each episode, despite remaining in hospital, leading to subsequent episodes within the same admission being incorrectly captured by NBOCA as readmissions. NBOCA methodology was updated in 2022 to ensure that multiple episodes of the same admission in PEDW are not coded as multiple hospital admissions.	
Country reporting:	England and Wales combined	
Organisational Reporting level:	Organisation performing surgery	
Subgroup Reporting :	None	
Risk adjusted: Yes	Age (modelled as age plus age-squared), sex, performance status, Charlson co-morbidity score, mode of admission, T-stage (pathological), N-stage (pathological), M-stage (pathological), site of tumour	
Outlier reporting:	Yes	

5.6 Performance Indicator 6: Adjusted 18-month unclosed ileostomy after anterior resection

In line with ACPGBI: Guidelines for the Management of Cancer of the Colon, Rectum and Anus (2017) – Surgical Management

"After low anterior resection, a temporary defunctioning stoma should be considered."

"The permanent stoma rate following rectal cancer resection of colorectal units should be audited."

Table 5.6: Adjusted 18-month unclosed ileostomy after anterior resection		
	England	**Wales**
Dates of treatment:	01/04/18 -31/03/23	
Numerator: People with rectal cancer without a code for stoma reversal within 18 months of ileostomy	HES-APC	PEDW
Denominator: People with rectal cancer undergoing an anterior resection receiving an ileostomy within 30 days of their procedure	People with rectal cancer undergoing an anterior resection according to NBOCA receiving an ileostomy within 30 days of their procedure, according to HES-APC	People with rectal cancer undergoing an anterior resection according to NBOCA receiving an ileostomy within 30 days of their procedure, according to PEDW
Construction notes:	Records that could not be linked to HES-APC/PEDW are excluded. Hospitals/MDTs with <20% data completeness overall, or >80% records missing performance status and/or TNM staging only have their unadjusted result published.	
Country reporting:	England and Wales combined	
Organisational Reporting level:	Organisation performing surgery	
Subgroup Reporting :	None	
Risk adjusted: Yes	Age (modelled as age plus age-squared), sex, performance status, Charlson co-morbidity score, mode of admission, T-stage (pathological), N-stage (pathological), M-stage (pathological)	
Outlier reporting:	Yes	

5.7 Performance Indicator 7: Stage 3 colon cancer receiving adjuvant chemotherapy

In line with National Institute for Health and Care Excellence. Clinical guideline [NG151] (2020)

"For people with stage III colon cancer (pT1-4, pN1-2, M0) offer adjuvant chemotherapy."

ACPGBI: Guidelines for the Management of Cancer of the Colon, Rectum and Anus (2017) – Surgical Management

"Adjuvant chemotherapy should be considered in older patients with stage III colorectal cancer, with appropriate tailoring of treatment."

Table 5.7: Stage 3 colon cancer receiving adjuvant chemotherapy		
	England	**Wales**
Dates of treatment:	01/04/21-31/10/23	
Numerator: Number of people with stage 3 colon cancer receiving adjuvant chemotherapy	SACT or HES-APC	01/04/21-31/03/22 PEDW alone 01/04/22-31/10/23 PEDW and submitted data
Denominator: People with stage 3 colon cancer undergoing major resection	RCRD	Canisc, New informatics
Construction notes:	People were considered to have received adjuvant chemotherapy if they had a linked SACT record demonstrating receipt of a standard adjuvant colorectal chemotherapy regimen within 4 months after their date of surgery. Alternatively, they could have a chemotherapy code (OPCS-4 procedural code) recorded within the same 4 month period within HES-APC or PEDW. Regimens considered to be standard adjuvant therapy included: 5-fluorouracil alone, 5-fluorouracil and oxaliplatin (FOLFOX), capecitabine alone or capecitabine and oxaliplatin (CAPOX). OPCS-4 and ICD-10 codes used to identify chemotherapy in HES-APC/PEDW shown in Appendix 5.Full details have been published here. Stage 3 is defined as pathological N-stage N1/N2.	
Country reporting:	England and Wales combined	
Organisational Reporting level:	Organisation performing surgery	
Subgroup Reporting :	None	
Risk adjusted: No	None	
Outlier reporting:	No	

5.8 Performance Indicator 8: Adjusted severe acute toxicity after adjuvant chemotherapy for colon cancer

The delivery of adjuvant chemotherapy is a complex process which includes appropriate patient selection and optimisation, tailoring treatment doses, and the monitoring and management of toxicities. NBOCA have developed and evaluated the use of a national performance indicator to assess hospital variation in severe acute toxicity rates in order to stimulate and support quality improvement. Boyle JM, et al. Measuring variation in the quality of systemic anti-cancer therapy delivery across hospitals: A national population-based evaluation. Eur J Cancer. 2023 Jan;178:191-204.

Table 5.8: Adjusted severe acute toxicity after adjuvant chemotherapy for colon cancer		
	England	**Wales**
Dates of treatment:	01/04/21-31/10/23	
Numerator: Number of people with stage 3 colon cancer receiving adjuvant chemotherapy with severe acute toxicity	Number of people with severe acute toxicity in overnight admissions in **HES-APC** from the first cycle of chemotherapy to 8 weeks after the last cycle of chemotherapy	Number of people with severe acute toxicity in overnight admissions in **PEDW** from the first cycle of chemotherapy to 8 weeks after the last cycle of chemotherapy
Denominator: Number of people with stage 3 colon cancer receiving adjuvant chemotherapy	This is the numerator of performance indicator 7	
Construction notes:	This measures the proportion of people who received adjuvant chemotherapy for stage 3 colorectal cancer that required an overnight hospital admission for severe acute toxicity. Severe acute toxicity was determined from International Classification of Diseases, 10th revision (ICD-10) diagnosis codes in HES-APC/PEDW. The methodology for developing and validating the coding framework for identifying severe acute toxicity is described in detail here. Any planned or unplanned admissions requiring an overnight stay, from administration of the first cycle of chemotherapy up until 8 weeks after the last cycle of chemotherapy, were examined to identify ICD-10 diagnosis codes from the severe acute toxicity coding framework. Toxicities corresponded to at least Grade 3 according to the Common Terminology Criteria for Adverse Events (CTCAE) (CTCAE) dictionary. For the small proportion of people undergoing a surgical procedure during this timeframe, the date of this surgery was used as the cut-off for identifying toxicities to ensure that post-operative complications were not captured.	
Country reporting:	England and Wales reported combined	
Organisational Reporting level:	Organisation delivering chemotherapy	
Subgroup Reporting :	None	
Risk adjusted: *Yes*	Age (categorical), sex, performance status, Charlson co-morbidity score, T-stage (pathological), N-stage (pathological)	
Outlier reporting:	Yes	

5.9 Performance Indicator 9: People with rectal cancer receiving neo-adjuvant treatment

In line with guidance National Institute for Health and Care Excellence. Clinical guideline [NG151] (2020)

"Offer preoperative radiotherapy or chemoradiotherapy to people with rectal cancer that is cT1-T2, cN1-N2, M0, or cT3-T4, any cN, M0."

Table 5.9: People with rectal cancer receiving neo-adjuvant treatment		
	England	**Wales**
Dates of diagnosis:	01/01/23-31/12/23	
Numerator: The number of people with rectal cancer undergoing major resection who receive pre-operative radiotherapy	RTDS	Submitted data including direct submission by Velindre
Denominator: Number of people with rectal cancer undergoing major resection	RCRD	Canisc, New informatics
Construction notes:	In general, treatment episodes for rectal cancer were grouped into long-course, short-course and other, based on the number of attendances. The audit date of surgery was used to distinguish between radiotherapy only, pre-operative radiotherapy, and post-operative radiotherapy for rectal cancer. RTDS data and SACT data was used as the basis of the first definitive non-surgical treatment for rectal cancer patients. Records with metastatic disease at diagnosis were excluded (pretreatment M1-stage)	
Country reporting:	England and Wales reported combined	
Organisational Reporting level:	Organisation performing surgery	
Subgroup Reporting :	None	
Risk adjusted: No	None	
Outlier reporting:	No	

5.10 Performance Indicator 10: Adjusted 2-year survival rate after major resection

"2-year all-cause mortality rate after major resection is an important quality metric of cancer care." Shulman LN, et al. Survival As a Quality Metric of Cancer Care: Use of the National Cancer Data Base to Assess Hospital Performance. J Oncol Pract. 2018 Jan;14(1):e59-e72.

Table 5.10: Adjusted 2-year survival rate after major resection		
	England	**Wales**
Dates of surgery:	1/4/2021- 31/3/2022	
Numerator: Number of people with bowel cancer undergoing major resection who are alive 2 years after surgery	ONS mortality data supplied within NCRD data	ONS mortality data supplied by Wales
The sum of the time each person was followed up for in the two years following their major resection	Difference between date of death in ONS mortality data and date of major resection	
Construction notes:	A Poisson model was fitted to estimate risk-adjusted two-year all-cause survival after major surgery. Unlike the other outcomes, two-year all-cause survival rate accounts for the length of time each patient was followed up for. The observed two-year survival is the number of people with bowel cancer who died within two years divided by the sum of the amount of time each person is followed for. For example, in two trusts/MDTs with the same proportion of people with bowel cancer dying within two years, the site in which people die earlier will have a lower two-year survival rate. The model for two-year survival additionally included interactions between epoch (0-3 months after surgery vs. 3-24 months after surgery) and all of the risk factors, to allow each risk factor to have a different effect dependent on time from surgery. For example, the effect of performance status is much larger peri-operatively than in the longer-term, whilst cancer stage has a bigger influence on mortality long-term. Records with invalid date of surgery because the date of surgery is reported to be after date of death, or where the date of surgery/death is missing are excluded. Records with C181 (Appendix) as the tumour site are excluded. Hospitals/MDTs with <20% data completeness overall, or >80% records missing performance status and/or TNM staging only have their unadjusted result published.	
Country reporting:	England and Wales reported combined	
Organisational Reporting level:	Organisation performing surgery	
Subgroup Reporting :	None	
Risk adjusted: *Yes*	Age (modelled as age plus age-squared), sex, performance status, Charlson co-morbidity score, mode of admission, T-stage (pathological), N-stage (pathological), M-stage (pathological), site of tumour	
Outlier reporting:	Yes	

Contextual Measures: In addition to the performance indicators, indictors that provide context (contextual measures) are also reported. The contextual measures are described in Appendix 6.

6. NHS organisations

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

Where this information is not provided for a patient or where the organisation assigned does not fulfil the pre-specified inclusion criteria[1] for including the patient in the audit, the following steps are followed to assign a diagnosing NHS organisation:

1. Use the surgery provider code (as provided within HES/PEDW) which fulfils the audit pre-specified inclusion criteria; use the provider code associated with the earliest record of primary surgery.
2. Use the MDT provider code for English patients, which fulfils the audit pre-specified inclusion criteria; use the provider associated with the earliest MDT discussion date.

Results are typically grouped by cancer alliance/Wales and/or trust/MDT. England's 20 cancer alliances were used in the analyses and compared to Wales as a nation. The results for Wales are reported according to the multidisciplinary team who discussed the patients' management were located, rather than by trust/hospital.

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 Suppression

- Data quality and completeness results have not been supressed.
- Organisations with indicator denominator values less than 10 have been suppressed.

7.2 Risk-adjustment of indicators

The tables of performance indicators state whether risk adjustment has been performed and for English patients which dataset has been used as the source of tumour information. Table 7.1 below provides details on the datasets and variables used to compile the variable used for risk adjustment

Table 7: Risk Adjustment Variables		
Data Item	**Source**	
	England	**Wales**
Age at diagnosis	age (NCRD/RCRD) used as a continuous variable modelled as age and age squared*	age (Cohort data) used as a continuous variable modelled as age and age squared*
Sex	NCRD/RCRD	Canisc, New informatics
Performance status	NCRD/RCRD	Canisc, New informatics
Charlson comorbidity index	The CCI 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 7). The CCI was calculated using information on secondary diagnoses (ICD-10 codes) recorded in HES APC (England) / PEDW (Wales) within the 12-month period prior to a patient's diagnosis. For the purpose of analysis, the CCI is grouped into three categories: • **0** none of the 14 pre-specified comorbidities. • **1** only 1 of the 14 pre-specified comorbidities. • **2+** 2 or more of the 14 pre-specified comorbidities	
Mode of admission	HES-APC	PEDW
T-stage (pathological)	NCRD/RCRD constructed as per section 4 tables 4.1a and 4.1b	Canisc, New informatics as per section 4 table 4
N-stage (pathological)		
M-stage (pathological)**		
Site of tumour**	NCRD/RCRD	Canisc, New informatics

* Except for performance indicator 8 (toxicity) where age is modelled as categorical as <50, 50-59, 60-74, 75-84, >=85

** Where the indicator is restricted by staging or tumour site, these variables will not be included in the model

In addition to the overall value stated for the reporting year in the SotN report, the data completeness of risk-adjustment variables is calculated for each risk adjusted indicator using the data source for that indicator. Reporting organisations with <20% completeness either overall or for an individual data item do not have a risk adjusted indicator value reported.

A Poisson model was fitted to estimate risk-adjusted two-year all-cause survival after major surgery. Unlike the other outcomes, two-year all-cause survival rate accounts for the length of time each patient was followed up for. The observed two-year survival is the number of people with bowel cancer who died within two years divided by the sum of the amount of time each person is followed for. For example, in two trusts/MDTs with the same proportion of people with bowel cancer dying within two years, the site in which people die earlier will have a lower two-year survival rate.

The model for two-year survival additionally included interactions between epoch (0-3 months after surgery vs. 3-24 months after surgery) and all of the risk factors, to allow each risk factor to have a different effect dependent on time from surgery. For example, the effect of performance status is much larger peri-operatively than in the longer-term, whilst cancer stage has a bigger influence on mortality long-term.

The model for 18-month stoma rate did not include cancer site as it includes only people with rectal cancer.

Records with missing date of surgery were excluded, and multiple imputation was used to fill in any missing information on the risk factors (see Section 7.3).

7.3 Handling of missing data

For the risk-adjustment, missing values were imputed using multiple imputation by chained equations to create an estimated value to ensure all included people contributed to the statistical models.

In addition to the variables in the risk-adjustment model and the outcomes, the following variables were included in the imputation model: pre-treatment staging, surgical procedure, number of lymph nodes extracted, number of positive lymph nodes extracted, quintile of deprivation (based on the relevant Index of Multiple Deprivation (national ranking of residential area measuring its relative deprivation across seven domains for England and eight domains for Wales), length of hospital stay, time from diagnosis to surgery, and source of data (England/Wales).

Organisations were excluded from the analyses if overall data completeness was less than 20%, or performance status and/or TNM stage was missing in more than 80% of records included in the analyses. A list of these organisations is available here.

8. Outlier Process

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

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 Servives 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-APC	Hospital Episode Statistics Admitted Patient Care (HES-APC) is the administrative database of all NHS hospital admissions in England; records were supplied by NHS Digital to NCRAS.
Wales	CaNISC	Cancer Network Information System Cymru (Canisc) contains data on all aspects of the cancer registration including investigations. (OLD SYSTEM)
Wales	CDF	Clinical 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.
England & Wales	ONS	Office for National Statistics (ONS) death data including date of death and cause of death.

Appendix 2: Excluded Morphology Codes

Appendix 2 lists the morphology codes that have been excluded from both NCRD and RCRD. For the majority of these, the first three characters were extracted from the full variable and this was used to identify records for exclusion. Some of these are not related to bowel cancer, but were present in the data. The following variables were used for exclusion: TUMOUR_MORPHOLOGY (RCRD) and HISTOLOGY_CODED (NCRD).

Histology code	3 character histology code	Histology description
	872	NEVI & MELANOMAS
	873	AMELANOTIC MELANOMA
	874	MAL. MEL. IN JUNCT. NEVUS
	877	EPITHELIOID CELL MELANOMA
	824	CARCINOID TUMOR, MALIGNANT
	815	ENDOCRINOMAS
	880	SARCOMA, NOS
	881	FIBROMATOUS NEOPLASMS
	882	SARCOMA, NOS
	893	STROMAL SARCOMA
	885	LIPOSARCOMA NEOPLASMS
	889	MYOMATOUS NEOPLASMS
	898	CARCINOSARCOMA, NOS
	804	SMALL CELL CARCINOMA, NOS
	808	LYMPHOEPITHELIAL CARCINOMA
	812	TRANSITIONAL CELL CARCINOMA, NOS
	831	CLEAR CELL ADENOCARCINOMA, NOS
	832	GRANULAR CELL CARCINOMA
	838	ENDOMETRIOID ADENOCARCINOMA
	895	MULLERIAN MIXED TUMOR
	896	CLEAR CELL SARC/NEPHROBLASTOMA
80133		Large cell neuroendocrine carcinoma
80333		Pseudosarcomatous carcinoma
85743		Adenocarcinoma with neuroendocrine differentiation
>=90000		

Appendix 3: Surgical OPCS codes

Procedures classified as Major Resections

Procedure group	OPCS code	Description
Right Hemi-colectomy	H06	Extended excision of right hemicolon
	H07	Other excision of right hemicolon
	H112	Colectomy and side to side anastomosis of ileum to colon NEC
	H116	Colectomy and end to side anastomosis NEC
	H118	Other specified other excision of colon
	H119	Unspecified other excision of colon
Transverse colectomy	H08	Excision of transverse colon
Left Hemi-colectomy	H09	Excision of left hemicolon
	H111	Colectomy and end to end anastomosis of colon to colon NEC
Sigmoid colectomy	H10	Excision of sigmoid colon
Total/Subtotal colectony	H04	Total excision of colon and rectum
	H05	Total excision of colon
	H29	Subtotal excision of colon
	H113	Colectomy and anastomosis NEC
	H114	Colectomy and ileostomy NEC
	H414	Peranal mucosal proctectomy and endoanal anastomosis
Anterior Resection	H115	Colectomy and exteriorisation of bowel NEC
	H332	Proctectomy and anastomosis of colon to anus
	H333	Anterior resection of rectum and anastomosis of colon to rectum using staples
	H334	Anterior resection of rectum and anastomosis NEC
	H336	Anterior resection of rectum and exteriorisation of bowel
	H338	Other specified excision of rectum
	H339	Unspecified excision of rectum
	H404	Trans-sphincteric anastomosis of colon to anus
	H411	Rectosigmoidectomy and peranal anastomosis
Hartmanns	H335	Rectosigmoidectomy and closure of rectal stump and exteriorisation of bowel
APER*	H331	Abdominoperineal excision of rectum and end colostomy
	H337	Perineal resection of rectum HFQ
Pelvic Exenteration	X14	Clearance of pelvis

*APER: Abdomino Perineal Excision of Rectum

Procedures classified as Stoma Only

OPCS code	Description
G74	Creation of artificial opening into ileum
H151	Loop colostomy
H152	End colostomy

Procedures classified as Stent insertion

OPCS code	Description
H214	Fibreoptic endoscopic insertion of expanding metal stent into colon
H243	Endoscopic insertion of tubal prosthesis into lower bowel using fibreoptic sigmoidoscope
H244	Endoscopic insertion of expanding metal stent into lower bowel using fibreoptic sigmoidoscope
H273	Endoscopic insertion of tubal prosthesis into sigmoid colon using rigid sigmoidoscope
H274	Endoscopic insertion of expanding metal stent into sigmoid colon using rigid sigmoidoscope
H314	Image guided insertion of colorectal stent

Procedures classified as Local Excision

OPCS code	Description
H201	Fibreoptic endoscopic snare resection of lesion of colon
H205	Fibreoptic endoscopic submucosal resection of lesion of colon
H206	Fibreoptic endoscopic resection of lesion of colon NEC
H207	Fibreoptic endoscopic mucosal resection of lesion of colon
H208	Other specified endoscopic extirpation of lesion of colon
H209	Unspecified endoscopic extirpation of lesion of colon
H231	Endoscopic snare resection of lesion of lower bowel using fibreoptic sigmoidoscope
H235	Endoscopic submucosal resection of lesion of lower bowel using fibreoptic sigmoidoscope
H236	Endoscopic resection of lesion of lower bowel using fibreoptic sigmoidoscope NEC
H237	Endoscopic mucosal resection of lesion of lower bowel using fibreoptic sigmoidoscope
H238	Other specified endoscopic extirpation of lesion of lower bowel using fibreoptic sigmoidoscope
H239	Unspecified endoscopic extirpation of lesion of lower bowel using fibreoptic sigmoidoscope
H261	Endoscopic snare resection of lesion of sigmoid colon using rigid sigmoidoscope
H266	Endoscopic submucosal resection of lesion of sigmoid colon using rigid sigmoidoscope
H267	Endoscopic resection of lesion of sigmoid colon using rigid sigmoidoscope NEC
H268	Other specified endoscopic extirpation of lesion of sigmoid colon using rigid sigmoidoscope
H269	Unspecified endoscopic extirpation of lesion of sigmoid colon using rigid sigmoidoscope
H371	Endoscopic mucosal resection of lesion of sigmoid colon using rigid sigmoidoscope
H378	Other specified other endoscopic extirpation of lesion of sigmoid colon using rigid sigmoidoscope
H379	Unspecified other endoscopic extirpation of lesion of sigmoid colon using rigid sigmoidoscope
H401	Trans-sphincteric excision of mucosa of rectum
H402	Trans-sphincteric excision of lesion of rectum
H408	Other specified operations on rectum through anal sphincter
H409	Unspecified operations on rectum through anal sphincter
H412	Peranal excision of lesion of rectum
H418	Other specified other operations on rectum through anus
H419	Unspecified other operations on rectum through anus

Appendix 4: OPCS codes considered to represent an unplanned return to theatre

	OPCS code											
Codes valid on day 0	G731	S572	S571	S608	T301	G731						
	S068	S424	S573	T283	T302	S068						
					T303							
Codes valid on days 1-30	G35	G711	G76	H17	H531	J72	M258	N249	S472	T282	T343	T419
	G36	G712	G78	H19	H541	L703	M264	P111	S474	T283	T348	T423
	G52	G713	G822	H29	H558	M021	M274	P131	S476	T288	T349	T428
	G53	G714	G824	H303	H568	M025	M292	P134	S478	T289	T361	T431
	G584	G715	G828	H304	H581	M062	M359	P138	S571	T301	T362	T432
	G588	G718	H04	H305	H582	M136	M37	P253	S572	T302	T365	T463
	G589	G72	H05	H308	H583	M151	M624	P258	S573	T303	T368	T468
	G591	G731	H06	H311	H588	M162	M651	Q552	S577	T304	T369	T469
	G601	G733	H07	H312	H589	M168	M733	S068	S608	T308	T374	T488
	G602	G734	H08	H33	H62	M191	M734	S242	S628	T309	T384	T554
	G608	G738	H09	H412	H662	M193	M735	S352	T252	T312	T388	T571
	G61	G74	H10	H418	J021	M202	M736	S358	T253	T313	T398	T77
	G63	G751	H11	H444	J04	M212	M737	S359	T259	T315	T411	T963
	G674	G752	H122	H448	J18	M218	M738	S422	T262	T316	T412	
	G69	G753	H13	H464	J212	M221	M763	S423	T272	T318	T413	
	G702	G754	H14	H468	J241	M223	M764	S424	T273	T331	T414	
		G755	H15	H469	J69	M228	N242	S428	T278	T341	T415	
		G758	H16	H47	J701	M229	N248	S438	T279	T342	T418	

Appendix 5: OPCS-4 and ICD-10 codes to identify chemotherapy in HES-APC/PEDW

OPCS-4 code	Classification
X701	Procurement of drugs for chemotherapy for neoplasm for regimens in Band 1
X702	Procurement of drugs for chemotherapy for neoplasm for regimens in Band 2
X703	Procurement of drugs for chemotherapy for neoplasm for regimens in Band 3
X704	Procurement of drugs for chemotherapy for neoplasm for regimens in Band 4
X705	Procurement of drugs for chemotherapy for neoplasm for regimens in Band 5
X708	Other specified procurement of drugs for chemotherapy for neoplasm in Bands 1-5
X709	Unspecified procurement of drugs for chemotherapy for neoplasm in Bands 1-5
X711	Procurement of drugs for chemotherapy for neoplasm for regimens in Band 6
X712	Procurement of drugs for chemotherapy for neoplasm for regimens in Band 7
X713	Procurement of drugs for chemotherapy for neoplasm for regimens in Band 8
X714	Procurement of drugs for chemotherapy for neoplasm for regimens in Band 9
X715	Procurement of drugs for chemotherapy for neoplasm for regimens in Band 10
X718	Other specified procurement of drugs for chemotherapy for neoplasm in Bands 6-10
X719	Unspecified procurement of drugs for chemotherapy for neoplasm in Bands 6-10
X721	Delivery of complex chemotherapy for neoplasm including prolonged infusional treatment at first attendance
X722	Delivery of complex parenteral chemotherapy for neoplasm at first attendance
X723	Delivery of simple parenteral chemotherapy for neoplasm at first attendance
X724	Delivery of subsequent element of cycle of chemotherapy for neoplasm
X728	Other specified delivery of chemotherapy for neoplasm
X729	Unspecified delivery of chemotherapy for neoplasm
X731	Delivery of exclusively oral chemotherapy for neoplasm
X738	Other specified delivery of oral chemotherapy for neoplasm
X739	Unspecified delivery of oral chemotherapy for neoplasm
X748	Other specified other chemotherapy drugs
X749	Unspecified other chemotherapy drugs
X352	Intravenous chemotherapy
X373	Intramuscular chemotherapy
X384	Subcutaneous chemotherapy

ICD-10 code	Classification
Z082	Follow-up exam after chemotherapy for malignant neoplasm
Z292	Other prophylactic chemotherapy
Z511	Chemotherapy session for neoplasm
Z512	Other chemotherapy
Z542	Convalescence following chemotherapy

Appendix 6: Contextual Measures

Title	**Data completeness of seven items for risk-adjustment in those undergoing major surgery**	
Type of indicator / patient group	Data quality	
Indicator	The proportion of people with bowel cancer with complete data for the variables required for risk-adjustment: age, sex, performance status, pathological TNM stage (tumour, node, metastasis staging) and site of cancer	
Specification	**Numerator**	Number of people with bowel cancer with completion of 7 data items for risk-adjustment
	Denominator	Number of people with bowel cancer undergoing major resection
	Further Information	Date of diagnosis between 01 January 2023 and 31 December 2023.
	QI aim	N/A
	Risk adjusted	No
	Outlier reporting	No
	Guideline	ACPGBI: Guidelines for the Management of Cancer of the Colon, Rectum and Anus (2017) – Audit and Outcome Reporting *"Surgeons and trusts must make provisions for the prospective collection of accurate clinical data for submission to the NBOCA."*

Title	**Data completeness of staging data**	
Type of indicator / patient group	Data quality	
Indicator	The proportion of people with bowel cancer with stage recorded (stage 1-4)	
Specification	**Numerator**	Number of people with bowel cancer with stage 1-4 recorded
	Denominator	Number of people diagnosed with bowel cancer
	Further Information	Date of diagnosis between 01 January 2023 and 31 December 2023. Reported by diagnosing organisation.
	QI aim	N/A
	Risk adjusted	No
	Outlier reporting	No
	Guideline	ACPGBI: Guidelines for the Management of Cancer of the Colon, Rectum and Anus (2017) – Audit and Outcome Reporting *"Surgeons and trusts must make provisions for the prospective collection of accurate clinical data for submission to the NBOCA."*

Title	**Data completeness of performance status**	
Type of indicator / patient group	Data quality	
Indicator	The proportion of people with bowel cancer with recorded performance status	
Specification	**Numerator**	Number of people with bowel cancer with recorded performance status
	Denominator	Number of people diagnosed with bowel cancer
	Further Information	Date of diagnosis between 01 January 2023 and 31 December 2023. Reported by diagnosing organisation.
	QI aim	N/A
	Risk adjusted	No
	Outlier reporting	No
	Guideline	ACPGBI: Guidelines for the Management of Cancer of the Colon, Rectum and Anus (2017) – Audit and Outcome Reporting *"Surgeons and trusts must make provisions for the prospective collection of accurate clinical data for submission to the NBOCA."*

Title	**Distant metastases at time of surgery**	
Type of indicator / patient group	Management of patients having major resection	
Indicator	Proportion of people with bowel cancer undergoing major resection who have distant metastases at the time of surgery	
Specifications	**Numerator**	Number of people with bowel cancer undergoing major resection recorded as M1 on pathological staging, or with missing pathological M-stage and M1 on pre-treatment staging
	Denominator	Number of people with bowel cancer undergoing major resection
	Further Information	Date of diagnosis between 01 January 2023 and 31 December 2023. M-stage recorded as Mx or M9 are recorded as missing. Those missing pre- and post- treatment staging are included in the denominator.
	QI aim	N/A
	Risk adjusted	No
	Outlier reporting	No
	Guideline	National Institute for Health and Care Excellence. Clinical guideline [NG151] (2020) *"Consider resection, either simultaneous or sequential, after discussion by a multidisciplinary team with expertise in resection of disease in all involved sites."* ACPGBI: Guidelines for the Management of Cancer of the Colon, Rectum and Anus (2017) – Surgical Management *"Synchronous and metachronous liver or lung metastases should be considered for potentially curative treatments."*

Title	**Minimally invasive surgery**	
Type of indicator / patient group	Management of patients having major resection	
Indicator	The proportion of people with bowel cancer undergoing major resection who are reported to have undergone minimally invasive surgery	
Specifications	**Numerator**	Number of people with bowel cancer who underwent minimally invasive surgery according to HES-APC (England) or PEDW/submitted data (Wales)
	Denominator	Number of people with bowel cancer undergoing major resection
	Further Information	Date of diagnosis between 01 January 2023 and 31 December 2023. Records that could not be linked to HES-APC/PEDW or that were missing surgical access data for major resection are included in the denominator.
	QI aim	N/A
	Risk adjusted	No
	Outlier reporting	No
	Guideline	Laparoscopic surgery for colorectal cancer (NICE technology appraisal guidance TA105) (2006) *"Laparoscopic (including laparoscopically assisted) resection is recommended as an alternative to open resection for individuals with colorectal cancer in whom both laparoscopic and open surgery are considered suitable."* ACPGBI: Guidelines for the Management of Cancer of the Colon, Rectum and Anus (2017) – Surgical Management *"Laparoscopic resection should be considered in all patients with colon cancer. This should be performed by suitably trained, experienced surgeons who should audit outcomes and submit results to the NBOCA database."*

The COSD variable SURGICAL ACCESS TYPE was poorly completed, therefore HES-APC was used to obtain information about surgical access for those undergoing surgery in England.

The following OPCS codes were considered to represent minimally invasive surgery: Y71.4, Y75.1, Y75.2, Y75.3, Y75.4, Y75.8, Y75.9, and Y76.5, when present on the date of major resection in HES-APC/ PEDW.

Compared to the proportion of people reported to have undergone minimally invasive surgery within the data submitted by Wales, there was undercapture within PEDW, especially of laparoscopic procedures converted to open. Therefore, records in the Welsh data that did not have an OPCS code record of minimally invasive surgery were updated to minimally invasive if this was reported in the submitted data.

Title	**Lymph node yield**	
Type of indicator / patient group	Management of patients having major resection	
Indicator	Proportion of people with bowel cancer undergoing major resection where ≥12 lymph nodes are pathologically examined	
Specifications	**Numerator**	Number of people with bowel cancer undergoing major resection where ≥12 lymph nodes are pathologically examined
	Denominator	Number of people with bowel cancer undergoing major resection
	Further Information	Records with no lymph yield recorded are included in the denominator
	QI aim	N/A
	Risk adjusted	No
	Outlier reporting	No
	Guideline	ACPGBI: Guidelines for the Management of Cancer of the Colon, Rectum and Anus (2017) – Multidisciplinary Management *"Known high-risk features in stage II cancers include pT4 stage, obstructed tumours, poor or mucinous differentiation, EMVI and fewer than 12 lymph nodes assessed histologically."*

Title	**Length of stay**	
Type of indicator / patient group	Management of patients having major resection	
Indicator	Proportion of people with bowel cancer with length of hospital stay after major resection greater than five days	
Specifications	**Numerator**	Number of people with bowel cancer undergoing major resection with length of stay in HES-APC/PEDW greater than five days after major resection
	Denominator	Number of people with bowel cancer undergoing major resection
	Further Information	Date of diagnosis between 01 and 31 December 2023 Records where length of stay could not be determined from HES-APC/PEDW, either because they could not be linked to HES-APC/PEDW or because the date of discharge was recorded as before the date of surgery in HES-APC/PEDW are excluded.
	QI aim	N/A
	Risk adjusted	No
	Outlier reporting	No
	Guideline	ACPGBI: Guidelines for the Management of Cancer of the Colon, Rectum and Anus (2017) – Surgical Management *"Peri-operative care in elective surgery should be based on ERAS principles."*

Length of stay is calculated by counting the number of days between recorded date of surgery and date of discharge in HES-APC/PEDW.

Title	**Abdominoperineal resection (APER)/ Hartmann's**	
Type of indicator / patient group	Management of rectal cancer patients	
Indicator	Proportion of people with rectal cancer undergoing major resection who undergo APER/pelvic exenteration/Hartmann's	
Specifications	**Numerator**	Number of people with rectal cancer undergoing major resection who have an APER/ pelvic exenteration/ Hartmann's
	Denominator	Number of people with rectal cancer undergoing major resection
	Further Information	Major resection performed between 01 April 2018 and 31 March 2023.
	QI aim	N/A
	Risk adjusted	No
	Outlier reporting	No
	Guideline	Not applicable

Title	**Genetic tumour profiling (KRAS, NRAS, BRAF)**	
Type of indicator / patient group	Management of patients with stage 4 bowel cancer	
Indicator	Proportion of people with stage 4 bowel cancer who have genetic tumour profiling (KRAS, NRAS, BRAF)	
Specifications	**Numerator**	Number of people with a histological diagnosis of Stage 4 bowel cancer who have a record of KRAS, NRAS, or BRAF testing
	Denominator	Number of people with a histological diagnosis of Stage 4 bowel cancer
	Further Information	Diagnosis between 01 January 2019 and 31 December 2021
	QI aim	N/A
	Risk adjusted	No
	Outlier reporting	No
	Guideline	NICE Clinical guideline [NG151] (2020) Test for RAS and BRAF V600E mutations in all people with metastatic colorectal cancer suitable for systemic anti-cancer treatment.

This analysis uses data from the NDRS Somatic Molecular Data Set which is linked to the 'Gold standard' cancer registration dataset. Data is currently only available for people diagnosed from January 2019 to December 2021 in England. The NDRS Somatic Molecular Data Set collects data on genetic tests carried out on colorectal tumours. This testing is only possible for people with a histological confirmation of bowel cancer. Genetic testing is calculated by dividing the number of people with a record of KRAS, NRAS or BRAF testing by the total number of people with a histological diagnosis of stage 4 bowel cancer.

Submission of genetic testing to the NDRS Somatic Molecular Data Set is not mandatory resulting in gaps in data completeness. To address this, methodological work was undertaken to identify NHS trusts with incomplete data submission. For patients with histologically confirmed stage 4 bowel cancer initiating targeted therapy (e.g., encorafenib, cetuximab, or panitumumab, as recorded in the SACT dataset), KRAS, NRAS, and BRAF testing is required. To ensure that NHS trusts included in the analysis had reliable data submission, NHS trust were only included if over 70% of patients receiving targeted treatment for stage 4 bowel cancer had a record of KRAS, NRAS or BRAF testing (it would be expected that all patients receiving targeted treatment would have a record of a test).

This contextual measure requires further validation, so results are presented at a national level and not a cancer alliance or local level.

Appendix 7: Charlson Comorbidity Index

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 Comorbidity Index (CCI).

CCI 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

*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.