CAS-SOP #4.7

Linking treatment tables: chemotherapy, tumour resections, and radiotherapy
About the NDRS

The National Disease Registration Service (NDRS) is part of Public Health England. Its purpose is to collect high-quality, timely data on cancer, rare diseases and congenital anomalies to monitor changes in the health of the population.

The NDRS includes:
- The National Cancer Registration and Analysis Service (NCRAS); and
- The National Congenital Anomaly and Rare Disease Registration Service (NCARDRS).

Healthcare professionals, researchers and policy makers use data to better understand population health and disease. The data is provided by patients and collected by the NHS as part of their care and support. The NDRS uses the data to help:
- understand cancer, rare diseases and congenital anomalies;
- improve diagnosis;
- plan NHS services;
- improve treatment;
- evaluate policy;
- improve genetic counselling.

National Disease Registration Service
Public Health England
Wellington House
133-155 Waterloo Road
London SE1 8UG

For queries relating to this document, please contact:
NDRSengagement@phe.gov.uk
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1. Introduction

This Standard Operating Procedure (SOP) (v4.7) updates the previous version (v4.6). This version improves the definition of skin cancer tumours and now includes all Basal Cell Carcinoma (BCC) and cutaneous Squamous Cell Carcinoma (cSCC) genital tumours. This version also updates the previous SOP (v4.5) to include tumours diagnosed in 2019. The changes to the code are summarised in Appendix 1 of this document. ICD10 codes are included in Appendix 2 and updated resection procedure codes are provided in Appendix 3.

The purpose of this SOP is to describe the method of linking treatment tables to the cancer registration data in the Cancer Analysis System (CAS). This allows basic treatment flags to be created; recording whether there was chemotherapy, tumour resection, or radiotherapy recorded following cancer diagnosis. This method was used for NCRAS publications of treatment work including the workbook ‘Chemotherapy, Radiotherapy and Tumour Resections in England, 2013 – 2015’ (available here).

The cancer sites included are the 30 sites which have pre-defined lists of relevant tumour resection procedures. All other sites are grouped under either ‘other malignant’ or ‘other non-malignant’ tumours. The term ‘tumour resection’ (previously termed ‘major resection’ in other outputs) is used to describe surgical attempts to remove the primary tumour. This SOP replaces the previous method used to count tumour resections (available here).

Cancer site and treatment-specific timeframes have been adopted to strike a balance between including as many treatments as possible carried out as part of the patient’s first course of treatment for that tumour, while minimising the inclusion of treatments for recurrent tumours.

This SOP is to be used where the analyst wishes to extract data on treatments among cancer sites listed in Appendix 2. The cancer sites with a tumour resection flag have been chosen because they are solid tumours (so are potentially resectable); are commonly diagnosed; and input from a site-specific clinician was available. Expansion of this list to include more cancer sites, where resection is a treatment choice, will be considered for future NCRAS work. Chemotherapy and radiotherapy data was available for all cancer sites. This SOP exists to set a standard that can be followed to produce uniform and replicable results and in particular for external requests for treatment data received via the Office for Data Release (ODR). Certain specific uses may
require a different approach and should be discussed with the lead of the therapeutics functional team.

The specific procedure codes used to select tumour resections are listed in Appendix 3. The SQL script which accompanies this SOP is in Appendix 4. The SQL code produces tumour-level data with 3 treatment flags (chemotherapy [CT], tumour resection [SG] and radiotherapy [RT]), with 0 as no treatment and 1 where treatment is present.
2. Method

Cohort definition
Cancer registry data from AT_TUMOUR_ENGLAND is used as the base to identify the cohort of patients. All patients diagnosed with malignant cancer, benign endocrine tumours, and non-malignant brain tumours in England in 2013-2019 were included. Males with gynaecological cancer and females with prostate cancer were excluded. Death certificate only registrations are included (0.8% of the cohort).

Overall approach to identify treatments
The datasets used to collate tumour resection data are AT_TREATMENT_ENGLAND (CAS 2204 snapshot onwards can be used), SACT (Systemic Anti-Cancer Therapy), RTDS (RadioTherapy DataSet), and inpatient (Admitted Patient Care (APC)) HES (Hospital Episode Statistics). The AT_TREATMENT_ENGLAND table is linked at tumour level, based on registration staff linking tumours to recorded treatments. Appendix 5 details the datasets and Snapshots used in this update.

The scope of this SOP is tumours diagnosed from 2013 onwards as it is known that the data quality in AT_TREATMENT_ENGLAND and SACT is lower before this point. However, treatment flags for select groups (e.g. childhood cancers) may be fairly complete in AT_TREATMENT_ENGLAND for earlier years. Cancer Waiting Times (CWT) data is not currently used. This decision was made following an assessment of the coverage of the datasets, and as ≥98% of radiotherapy and ≥94% of chemotherapy were captured by registry, SACT and RTDS in the period October 2012 to March 2013 (with the data completeness believed to be increasing since) it did not justify the complication of including CWT data.

For patients with one tumour diagnosed in 2013-2019, and those patients with multiple tumours diagnosed more than eighteen months apart, data from both the tumour linked table (AT_TREATMENT_ENGLAND) and the patient linked tables (SACT, RTDS and HES) is used. However, for patients with two or more tumours diagnosed within eighteen months of each other, only data from the tumour-linked table (i.e., AT_TREATMENT_ENGLAND) is used. This is because for the patient linked tables, the precise tumour that a treatment relates to is not identified, only the person. The current scope of this SOP is to define a working methodology for counting treatments in the absence of tumour level linked data, but this may be modified as and when further tumour-linked treatment data becomes available.
Tumours which received the same treatment more than once are only counted once.

**Early stage tumour resections**

Previous resections work relied upon lists of procedure codes (OPCS-4 codes) which would be used to remove the primary tumour (available [here](#)). These lists were defined in consultation with experienced clinicians. Lack of data on stage at diagnosis at the time of definition meant that the lists were conservative, and each code would apply across all tumours of that particular site regardless of stage. Now that high quality stage at diagnosis data is available for most sites, the list of OPCS-4 procedure codes used to define tumour resections has been adapted to include tumour resections for early stage tumours. Site-specific clinicians were consulted for the 30 sites included in the original major resection list, and stage-specific rules have now been incorporated for relevant sites (cervical, colon, rectum, bladder, liver, oesophageal and stomach cancers).

In addition to the existing tumour resection list, the following procedures were identified as tumour resections in early stage disease only:
Cervical | Cone biopsies for FIGO stage 1a tumours, and also those with stage 1b & 1b1 disease if the patient also had a lymphadenectomy

Colon and rectum | Endoscopic resections and endoscopic biopsy procedures for TNM stage 1 tumours

Bladder | Endoscopic resections, destructions, and cauterisation of lesion of bladder (TURBT) and other specified endoscopic extirpation of lesion of bladder for T1 (non-muscle invasive) tumours

Liver | Percutaneous radiofrequency and microwave ablation of lesion of liver for TNM stage 1 tumours

Oesophagus | Fibreoptic endoscopic resection of lesions of upper gastrointestinal tract and oesophagus for TNM stage 1a tumours

Stomach | Fibreoptic endoscopic resection of lesion of upper gastrointestinal tract and oesophagus for TNM stage 1a tumours

In addition, after clinical review certain OPCS-4 codes were added to or removed from the previous list for all stages of disease. For more information, see Appendix 3, and Appendix 6 for a sensitivity analysis showing the impact of adding stage-specific tumour resections.

**Timeframe**

European Network of Cancer Registries (ENCR) rules state that date of diagnosis is recorded as the date of most recent pathological confirmation. This means that date of diagnosis can be shortly after a surgical resection. To avoid excluding relevant data, treatments in the one month (-31 days inclusive) prior to diagnosis were included in the analysis.

A data-driven approach with additional input from site-specialist clinicians was used to decide a site- and modality-specific post-diagnosis timeframe. The timeframe was chosen to be long enough to capture as many treatments as possible as part of the patient’s primary course of treatment, while also minimising the inclusion of treatments for recurrence. This SOP counts treatments between one month before, to up to eighteen months after
diagnosis, with the exact timeframe depending on the site and treatment type. For patients who received each treatment for each cancer, the number of days after diagnosis at which 95% of these patients received the treatment was identified. This was rounded up to the nearest three month interval, and this timeframe cut off was applied. Post-diagnosis timeframes were therefore 6, 9, 12, 15 or 18 months. The timeframes were based on 2013 and 2014 data only, because of the length of follow-up data required.

For example, of the pancreatic tumours diagnosed in 2013-14 which received a tumour resection within two years of diagnosis, 95% had their resection within 226 days. Therefore for all pancreatic cancers diagnosed in 2013-2016, a post-diagnosis tumour resection timeframe of 274 days (9 months) was applied. Exceptions to the data driven approach were made for particular treatments for certain cancer sites under recommendation from clinicians. For these sites, clinicians decided the timeframe using a combination of their own experience and the data. See Appendix 2 for details, and Appendix 7 for a sensitivity analysis showing the impact of changing the timeframes.

Relative to other tumour sites, treatment data quality for non-melanoma skin cancers (NMSC) (BCC, cSCC and rare tumours) is poor. A data-driven approach failed to identify 95% of chemotherapy and radiotherapy treatments within an appropriate timeframe. Clinician input was therefore used to decide suitable timeframes for treatment periods, with the view that quantifying the current state of treatment data can be used as a base to improve overall data quality. These figures should therefore be considered provisional and are expected to be incomplete.
SQL rules used to identify treatments

In order to match the output from CancerStats, the cascade_inci_flag (from the registry AT_TUMOUR_ENGLAND base table) must equal 1 (refer to the standard operating procedure “CAS-SOP #1: Counting Cancer Cases” for further information on this, available on request to NCRAS). This SOP applies to CAS 1612 onwards, as it uses the newly categorised treatments implemented in December 2016.

Chemotherapy

A tumour is recorded as treated with chemotherapy if:

- there is a record in AT_TREATMENT_ENGLAND which states that the tumour was treated with chemotherapy (event is either 'Cytotoxic Chemotherapy' (code = 02) or 'CT - Other' (code = CTX) or 'chemoradiotherapy' (code = 04) or 'radioisotope therapy (including radiiodine)' (code = 19) or 'Immunotherapy' (code = 15))
- and the event date (EVENTDATE) occurred in the relevant timeframe (see Appendix 2)

OR

- there is a record in SACT (excluding those null or classified as 'Hormones' or 'Not chemo' or 'Zoledronic acid' or 'Pamidronate' or 'Denosumab')
- and the start date of the regimen (START_DATE_OF_REGIMEN) occurred in the relevant timeframe
- and the patient had no other tumours diagnosed in the 18 months before or after that tumour’s diagnosis date

SACT is linked to cancer registration where NHS numbers are a perfect match. Regimen mappings are based on both those directly confirmed by trusts, and those assigned by the SACT team (for example where trusts haven’t addressed unmapped regimens).

Tumour resections

A tumour is recorded as treated by resection if:

- there is a record in AT_TREATMENT_ENGLAND which states that the tumour was treated with surgery (event is '01a', '01b', '01z', or '01c')
- and the OPCS4_CODE is in the tumour resection list
- or the OPCS4_CODE is identified as a tumour resection in early stage tumours for that specific cancer site (see Appendix 3)
and the operation date (OPERTN) occurred in the relevant timeframe (see Appendix 2)

OR

• there is an inpatient HES episode with a tumour resection OPCS-4 code in one of the operation fields
• or one of the operation fields contains an OPCS-4 code identified as a tumour resection in early stage tumours for that specific cancer site (see Appendix 3)
• and the operation date (OPERTN) occurred in the relevant timeframe
• and the patient had no other tumours diagnosed in the 18 months before or after that tumour’s diagnosis date

HES is linked to the cancer registration using a matching algorithm taking into account NHS number, date of birth, sex and postcode at diagnosis (details available on request to NCRAS).

Radiotherapy

A tumour is recorded as treated with radiotherapy if:

• there is a record in AT_TREATMENT_ENGLAND which states that the tumour was treated with radiotherapy (event is either ‘RT - Teletherapy’ (code = 05) or ‘chemoradiotherapy’ (code = 04) or ‘radiosurgery’ (code = 22) or ‘RT - Other/ NK’ (code = RTX))
• and the event date (EVENTDATE) occurred in the relevant timeframe (see Appendix 2)

OR

• there is a record in RTDS (excluding those classed as Brachytherapy, i.e., with RTTREATMENTMODALITY='06')
• and the appointment date (APPTDATE) occurred in the relevant timeframe
• and the patient had no other tumours diagnosed in the 18 months before or after that tumour’s diagnosis date

RTDS is linked to the cancer registration using a matching algorithm taking into account NHS number, date of birth, sex and postcode at diagnosis (details available on request to NCRAS). Brachytherapy was excluded from the definition of radiotherapy because further investigation into its completeness is needed first. Radiotherapy figures are likely to be an underestimate as there is underreporting of teletherapy in both RTDS datasets, and data may be incomplete for selected NHS Trusts.
From 1 April 2016, PHE took over full responsibility for RTDS, allowing greater integration of the management, collection, quality assurance and analysis of radiotherapy data alongside the other major national cancer data sets in its charge. For patients whose follow up period for radiotherapy extended past April 2016, the RTDS.AT_PRESCRIPTIONS dataset in CAS2204 was used.

**Results breakdowns**

Results are broken down by 30 tumour sites; the ICD-10 codes used to define these can be found in Appendix 2. Definitions for skin cancer can be found in the CAS_SOP_CountingSkinCancer_2.0.

Stage breakdowns in the data release use TNM staging, except for gynaecological cancers which use Figo staging. For cervical cancers, only FIGO staging was used. For ovarian, uterine and vulval cancers, TNM stage was used where Figo stage was unknown. Figo substages were collated into Figo stages 1, 2, 3, 4, and unknown. To remain consistent with published stage data, Breast tumours (C50) with Paget’s disease were excluded. The final recorded stage of a tumour is derived by the registration service using all information available up to 3 months after diagnosis. For this reason, the tumour stage shown in this data may be different to the stage originally available to the clinician when deciding a course of treatment, as it may have been subsequently updated following removal of the tumour and pathology results.

The patient’s age group was based on the age of the patient when they were diagnosed with the tumour.

The patient’s income deprivation quintile was allocated by linking the patient’s postcode to their 2011 ONS census Lower Super Output Area (LSOA). This was then linked to the Ministry of Housing, Communities & Local Government English Indices of Deprivation 2019 deprivation quintile for that LSOA.

The patient’s Charlson comorbidity score was derived from Hospital Episodes Statistics (HES) and Cancer Registry data combined and looks back at the time period between 27 months to 3 months before the patient’s cancer diagnosis.

The patient’s Cancer Alliance was allocated based on their Cancer Alliance of residence at point of diagnosis, not the location(s) where they were treated.
Appendix 1: Code changes in SOP version 4.7 compared to 4.6

Changes have been made to the extraction code in SOP version 4.7 since SOP version 4.6 was published for 2013-2018 diagnoses. These are noted below. Only non-superficial changes are noted; i.e. changes that could potentially impact the results.

Timeframe lookup table

No changes have been made to the timeframe lookup tables since SOP version 4.6.

Tumour cohort table

The definitions for non-melanoma skin cancers (NMSC) have been updated. NMSC are now selected from the AT_TUMOUR_SKIN table. For full details about the definition of NMSC (BCC, cSBCC, rare) please refer to CAS_SOP_CountingSkinCancer_2.0.

- **NMSC: BCC:** Includes all BCC genital tumours and first ever registered non-genital BCC tumours following UKIACR method.
- **NMSC: cSCC:** Includes all cSCC genital tumours and first ever registered non-genital cSCC tumours following UKIACR method.
- **NMSC: Rare:** Includes all registered rare NMSC tumours.
- **Vulval tumours (C51)** are no longer in their own category and are now included within skin tumours.
- The Snapshot used for AT_TUMOUR_ENGLAND and AT_TREATMENT_ENGLAND was updated to AV2019 (CAS2109).

Chemotherapy flag

The Snapshot used for AT_TREATMENT_ENGLAND was updated to AV2019 (CAS2109).

Tumour resection flag

Resection codes were added for small cell and non-small cell lung cancers to align with the 'Lung cancer clinical outcomes publication 2019 (for the audit period 2017)', Additional resection codes were also added for skin cancers. See appendix 3 for a complete list of resection codes used.
Radiotherapy flag

The Snapshots used for AT_TREATMENT_ENGLAND and for the RTDS dataset post April 2016 were updated to AV2019 (CAS2109).

Index of Deprivation

Historically NCRAS have used equal population-weighted income domain quintiles to assess deprivation. This method is limited in that income by itself may not give a full reflection of deprivation. After a recent review NCRAS will now use the ‘index of multiple deprivation’ (IMD) to assess deprivation, which is in line with the rest of the public health world. The IMD looks at six categories:

1. Employment deprivation
2. Education, skills and training deprivation
3. Health deprivation and disability
4. Crime
5. Barriers to housing and services
6. Living environment deprivation

Quintiles in the IMD are equally weighted by Lower Layer Super Output Areas (LSOAs) where 1 is the most deprived quintile and 5 the least.

The deprivation measure (IMD19_QUINTILE_LSOAS) in this version of the treatment flags table therefore uses the IMD equal LSOA weighted deprivation measures where quintile 1 is the most deprived and quintile 5 this least. This replaces the use of equal population-weighted income domain quintiles, where 1 is the least deprived quintile and quintile 5 the most deprived, used in previous versions.
## Appendix 2: Summary of tumour sites & timeframe rules

<table>
<thead>
<tr>
<th>Cancer site</th>
<th>ICD10 codes</th>
<th>Days included as post-diagnostic time period (months)</th>
<th>Chemotherapy</th>
<th>Tumour resections</th>
<th>Radiotherapy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bladder</td>
<td>C67</td>
<td></td>
<td>365 (12)*</td>
<td>274 (9)*</td>
<td>365 (12)*</td>
</tr>
<tr>
<td>Brain: Benign endocrine ^</td>
<td>D35.2-D35.4</td>
<td></td>
<td>547 (18)</td>
<td>365 (12)</td>
<td>547 (18)</td>
</tr>
<tr>
<td>Brain: Malignant brain,</td>
<td>C70-72</td>
<td></td>
<td>547 (18)</td>
<td>183 (6)</td>
<td>365 (12)</td>
</tr>
<tr>
<td>Brain: Non-benign endocrine</td>
<td>C75.1-C75.3 D44.3-D44.5</td>
<td></td>
<td>547 (18)</td>
<td>183 (6)</td>
<td>365 (12)</td>
</tr>
<tr>
<td>Brain: Non-malignant brain ^</td>
<td>D32-D33, D42-D44.5</td>
<td></td>
<td>547 (18)</td>
<td>365 (12)</td>
<td>547 (18)</td>
</tr>
<tr>
<td>Breast</td>
<td>C50</td>
<td></td>
<td>365 (12)*</td>
<td>365 (12)*</td>
<td>365 (12)*</td>
</tr>
<tr>
<td>Cervical</td>
<td>C53</td>
<td></td>
<td>274 (9)*</td>
<td>274 (9)*</td>
<td>274 (9)*</td>
</tr>
<tr>
<td>Colorectal: Colon</td>
<td>C18-19</td>
<td></td>
<td>365 (12)*</td>
<td>183 (6)*</td>
<td>365 (12)*</td>
</tr>
<tr>
<td>Colorectal: Rectum</td>
<td>C20</td>
<td></td>
<td>365 (12)*</td>
<td>365 (12)*</td>
<td>365 (12)*</td>
</tr>
<tr>
<td>Hypopharynx</td>
<td>C12, C13</td>
<td></td>
<td>183 (6)</td>
<td>365 (12)</td>
<td>183 (6)</td>
</tr>
<tr>
<td>Larynx</td>
<td>C32</td>
<td></td>
<td>365 (12)</td>
<td>456 (15)</td>
<td>183 (6)</td>
</tr>
<tr>
<td>Oral cavity</td>
<td>C02, C03, C04, C06</td>
<td></td>
<td>456 (15)</td>
<td>183 (6)</td>
<td>456 (15)</td>
</tr>
<tr>
<td>Oropharynx</td>
<td>C01, C09, C10</td>
<td></td>
<td>183 (6)</td>
<td>365 (12)</td>
<td>183 (6)</td>
</tr>
<tr>
<td>Other head and neck</td>
<td>C05, C11, C14, C30, C31</td>
<td></td>
<td>365 (12)</td>
<td>456 (15)</td>
<td>274 (9)</td>
</tr>
<tr>
<td>Salivary glands</td>
<td>C07, C08</td>
<td></td>
<td>547 (18)</td>
<td>183 (6)</td>
<td>274 (9)</td>
</tr>
<tr>
<td>Kidney</td>
<td>C64-C66, C68</td>
<td></td>
<td>365 (12)*</td>
<td>183 (6)</td>
<td>365 (12)*</td>
</tr>
<tr>
<td>Liver</td>
<td>C22</td>
<td></td>
<td>456 (15)</td>
<td>365 (12)</td>
<td>547 (18)</td>
</tr>
<tr>
<td>SCLC</td>
<td>C33-C34 with ICD-O-2 morphology in list 8041, 8042, 8043, 8044, 8045</td>
<td></td>
<td>183 (6)*</td>
<td>183 (6)*</td>
<td>183 (6)*</td>
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<tr>
<td>NSCLC</td>
<td>C33-C34 with ICD-O-2 morphology not in list 8041, 8042, 8043, 8044, 8045</td>
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<td>183 (6)*</td>
<td>183 (6)*</td>
<td>183 (6)*</td>
</tr>
<tr>
<td>Oesophagus</td>
<td>C15</td>
<td></td>
<td>183 (6)</td>
<td>274 (9)</td>
<td>274 (9)*</td>
</tr>
</tbody>
</table>
The following ICD 10 codes and post-diagnostic treatment time periods were used for the cancer sites presented in this workbook. The time periods were identified using a data driven approach detailed in CAS-SOP #4.4, with exceptions (*) made for particular treatments for certain cancer sites under recommendation from clinicians. These timeframes were chosen by clinicians using their own experience and the data.

^ Please refer to the CAS_SOP_CountingSkinCancer_2.0 SOP for full details on how non-melanoma skin cancers (NMSC) are defined.
### Appendix 3: Site-specific summary of tumour resection rules

<table>
<thead>
<tr>
<th>OPCS-4 code</th>
<th>Procedure name</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Bladder (C67)</strong></td>
<td></td>
</tr>
<tr>
<td>M421</td>
<td>Endoscopic resection of lesion of bladder</td>
<td>Non muscle invasive (T1) tumours only</td>
</tr>
<tr>
<td>M422</td>
<td>Endoscopic cauterisation of lesion of bladder</td>
<td>Non muscle invasive (T1) tumours only.</td>
</tr>
<tr>
<td>M423</td>
<td>Endoscopic destruction of lesion of bladder NEC</td>
<td>Non muscle invasive (T1) tumours only</td>
</tr>
<tr>
<td>M428</td>
<td>Other specified endoscopic extirpation of lesion of bladder</td>
<td>Non muscle invasive (T1) tumours only</td>
</tr>
<tr>
<td>M429</td>
<td>Unspecified endoscopic extirpation of lesion of bladder</td>
<td>Non muscle invasive (T1) tumours only</td>
</tr>
<tr>
<td>M341</td>
<td>Cystoprostatectomy</td>
<td></td>
</tr>
<tr>
<td>M342</td>
<td>Cystourethrectomy</td>
<td></td>
</tr>
<tr>
<td>M343</td>
<td>Cystectomy NEC</td>
<td></td>
</tr>
<tr>
<td>M344</td>
<td>Simple cystectomy</td>
<td></td>
</tr>
<tr>
<td>M348</td>
<td>Other specified total excision of bladder</td>
<td></td>
</tr>
<tr>
<td>M349</td>
<td>Unspecified total excision of bladder</td>
<td></td>
</tr>
<tr>
<td>M359</td>
<td>Unspecified partial excision of bladder</td>
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<tr>
<td>X142</td>
<td>Anterior exenteration of pelvis</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Brain (C70-C72, C75.1-C75.3)</strong></td>
<td></td>
</tr>
<tr>
<td>A011</td>
<td>Hemispherectomy</td>
<td></td>
</tr>
<tr>
<td>A012</td>
<td>Total lobectomy of brain</td>
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<tr>
<td>A013</td>
<td>Partial lobectomy of brain</td>
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</tr>
<tr>
<td>A018</td>
<td>Other specified major excision of tissue of brain</td>
<td></td>
</tr>
<tr>
<td>A019</td>
<td>Unspecified major excision of tissue of brain</td>
<td></td>
</tr>
<tr>
<td>A021</td>
<td>Excision of lesion of tissue of frontal lobe of brain</td>
<td></td>
</tr>
<tr>
<td>Code</td>
<td>Description</td>
<td></td>
</tr>
<tr>
<td>--------</td>
<td>-----------------------------------------------------------</td>
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</tr>
<tr>
<td>A022</td>
<td>Excision of lesion of tissue of temporal lobe of brain</td>
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</tr>
<tr>
<td>A023</td>
<td>Excision of lesion of tissue of parietal lobe of brain</td>
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<tr>
<td>A024</td>
<td>Excision of lesion of tissue of occipital lobe of brain</td>
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<td>A025</td>
<td>Excision of lesion of tissue of cerebellum</td>
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<td>A026</td>
<td>Excision of lesion of tissue of brain stem</td>
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<td>A028</td>
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<tr>
<td>A068</td>
<td>Other specified other excision of lesion of tissue of brain</td>
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<tr>
<td>A069</td>
<td>Unspecified other excision of lesion of tissue of brain</td>
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<td>A171</td>
<td>Endoscopic extirpation of lesion of ventricle of brain</td>
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<td>A291</td>
<td>Excision of lesion of optic nerve (II)</td>
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<td>A292</td>
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<td>Excision of lesion of trigeminal nerve (V)</td>
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<td>Excision of lesion of facial nerve (VII)</td>
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<td>Excision of lesion of acoustic nerve (VIII)</td>
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<td>Excision of lesion of glossopharyngeal nerve (IX)</td>
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<td>Excision of lesion of vagus nerve (X)</td>
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<td>Extirpation of lesion of meninges of cortex of brain</td>
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<td>Extirpation of lesion of meninges of sphenoidal ridge of cranium</td>
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<td>B068</td>
<td>Other specified operations on pineal gland</td>
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CAS-SOP #4.7: Linking treatment tables

C021  Excision of lesion of orbit
V051  Extirpation of lesion of cranium
V074  Excision of lesion of infratemporal fossa
V291  Primary laminectomy excision of cervical intervertebral disc
V312  Primary anterolateral excision of thoracic intervertebral disc NEC
V318  Other specified primary excision of thoracic intervertebral disc
V319  Unspecified primary excision of thoracic intervertebral disc
V331  Primary laminectomy excision of lumbar intervertebral disc
V339  Unspecified primary excision of lumbar intervertebral disc
V351  Primary excision of intervertebral disc NEC
V431  Excision of lesion of cervical vertebra
V432  Excision of lesion of thoracic vertebra
V433  Excision of lesion of lumbar vertebra
V438  Other specified extirpation of lesion of spine
V439  Unspecified extirpation of lesion of spine

Breast (C50)
B271  Total mastectomy and excision of both pectoral muscles and part of chest wall
B272  Total mastectomy and excision of both pectoral muscles NEC
B273  Total mastectomy and excision of pectoralis minor muscle
B274  Total mastectomy NEC
B275  Subcutaneous mastectomy
B276  Skin sparing mastectomy
B278  Other specified total excision of breast
B279  Unspecified total excision of breast
B281  Quadrantectomy of breast
B282  Partial excision of breast NEC
B283  Excision of lesion of breast NEC
B284  Re-excision of breast margins
B285  Wire guided partial excision of breast
B286  Excision of accessory breast tissue
B287  Wire guided excision of lesion of breast
B288  Other specified other excision of breast
B289  Unspecified other excision of breast
B341  Subareolar excision of mammary duct
B342  Excision of lesion of mammary duct
B343  Excision of lesion of mammary duct
B352  Excision of nipple
B353  Extirpation of lesion of nipple
B374  Capsulectomy of breast
B401  Interstitial laser destruction of lesion of breast
B408  Other specified destruction of lesion of breast
B409  Unspecified destruction of lesion of breast

Cervical (C53)

P172  Partial colpectomy
Q011  Amputation of cervix uteri
Q013  Excision of lesion of cervix uteri
Q018  Other specified excision of cervix uteri
Q071  Abdominal hysterocolpectomy and excision of periuterine tissue
Q072  Abdominal hysterectomy and excision of periuterine tissue NEC
### CAS-SOP #4.7: Linking treatment tables

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<td>Abdominal hysterocolpectomy NEC</td>
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<td>Total abdominal hysterectomy NEC</td>
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<td>Posterior exenteration of pelvis</td>
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<tr>
<td>Q014</td>
<td>Large loop excision of transformation zone</td>
<td>Figo stage 1a only, and stage 1b and 1b1 where also present with a lymphadenectomy code (TT856, T859, T865)</td>
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<td>Q031</td>
<td>Knife cone biopsy of cervix uteri</td>
<td>Figo stage 1a only, and stage 1b and 1b1 where also present with a lymphadenectomy code (TT856, T859, T865)</td>
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<tr>
<td>Q032</td>
<td>Laser cone biopsy of cervix uteri</td>
<td>Figo stage 1a only, and stage 1b and 1b1 where also present with a lymphadenectomy code (TT856, T859, T865)</td>
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<td>Q033</td>
<td>Cone biopsy of cervix uteri NEC</td>
<td>Figo stage 1a only, and stage 1b and 1b1 where also present with a lymphadenectomy code (TT856, T859, T865)</td>
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<td>CAS-SOP #4.7: Linking treatment tables</td>
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<td><strong>T856</strong> Block dissection of pelvic lymph nodes</td>
<td>Figo stage 1b and 1b1 where also present with a cone biopsy code (Q014, Q031, Q032, Q033)</td>
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<td><strong>T859</strong> Unspecified block dissection of lymph nodes</td>
<td>Figo stage 1b and 1b1 where also present with a cone biopsy code (Q014, Q031, Q032, Q033)</td>
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<td><strong>T865</strong> Sampling of mediastinal lymph nodes</td>
<td>Figo stage 1b and 1b1 where also present with a cone biopsy code (Q014, Q031, Q032, Q033)</td>
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**Colon and rectum (C18, C19 and C20)**

<p>| H041 | Panproctocolectomy and ileostomy |
| H042 | Panproctocolectomy and anastomosis of ileum to anus and creation of pouch HFQ |
| H043 | Panproctocolectomy and anastomosis of ileum to anus NEC |
| H048 | Other specified total excision of colon and rectum |
| H049 | Unspecified total excision of colon and rectum |
| H051 | Total colectomy and anastomosis of ileum to rectum |
| H052 | Total colectomy and ileostomy and creation of rectal fistula HFQ |
| H053 | Total colectomy and ileostomy NEC |
| H058 | Other specified total excision of colon |
| H059 | Unspecified total excision of colon |
| H061 | Extended right hemicolecetomy and end to end anastomosis |
| H062 | Extended right hemicolecetomy and anastomosis of ileum to colon |
| H063 | Extended right hemicolecetomy and anastomosis NEC |
| H064 | Extended right hemicolecetomy and ileostomy HFQ |</p>
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<td>Extended right hemicolectomy and end to side anastomosis</td>
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<td>Other specified extended excision of right hemicolon</td>
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<td>H069</td>
<td>Unspecified extended excision of right hemicolon</td>
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<tr>
<td>H071</td>
<td>Right hemicolectomy and end to end anastomosis of ileum to colon</td>
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<tr>
<td>H072</td>
<td>Right hemicolectomy and side to side anastomosis of ileum to transverse colon</td>
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<tr>
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<td>Right hemicolectomy and anastomosis NEC</td>
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<tr>
<td>H074</td>
<td>Right hemicolectomy and ileostomy HFQ</td>
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<tr>
<td>H075</td>
<td>Right hemicolectomy and end to side anastomosis</td>
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<td>Unspecified other excision of right hemicolon</td>
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<td>Transverse colectomy and end to end anastomosis</td>
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<td>Transverse colectomy and anastomosis of ileum to colon</td>
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<td>Transverse colectomy and exteriorisation of bowel NEC</td>
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<td>Left hemicolectomy and end to end anastomosis of colon to rectum</td>
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<td>Sigmoid colectomy and end to end anastomosis of ileum to rectum</td>
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<td>Sigmoid colectomy and end to side anastomosis</td>
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<td>Colectomy and end to end anastomosis of colon to colon NEC</td>
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<td>Colectomy and side to side anastomosis of ileum to colon NEC</td>
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<td>H291</td>
<td>Subtotal excision of colon and rectum and creation of colonic pouch and anastomosis of colon to anus</td>
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<td>Subtotal excision of colon and rectum and creation of colonic pouch NEC</td>
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H293  Subtotal excision of colon and creation of colonic pouch and anastomosis of colon to rectum

H294  Subtotal excision of colon and creation of colonic pouch NEC

H298  Other specified subtotal excision of colon

H299  Unspecified subtotal excision of colon

H322  Hartmann procedure (rectosigmoidectomy)

H331  Abdominoperineal excision of rectum and end colostomy

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

H335  Rectosigmoidectomy and closure of rectal stump and exteriorisation of bowel

H336  Anterior resection of rectum and exteriorisation of bowel

H337  Perineal resection of rectum HFQ

H338  Other specified excision of rectum

H339  Unspecified excision of rectum

H404  Trans-sphincteric anastomosis of colon to anus

H408  Other specified operations on rectum through anal sphincter

H409  Unspecified operations on rectum through anal sphincter

X141  Total exenteration of pelvis

X142  Anterior exenteration of pelvis

X143  Posterior exenteration of pelvis
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<td>Fibreoptic endoscopic snare resection of lesion of colon</td>
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<td>Fibreoptic endoscopic cauterisation of lesion of colon</td>
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<td>Fibreoptic endoscopic destruction of lesion of colon NEC</td>
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<td>Fibreoptic endoscopic submucosal resection of lesion of colon</td>
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<td>Diagnostic fibreoptic endoscopic examination of colon and biopsy of lesion of colon</td>
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<td>Undescribed diagnostic endoscopic examination of colon</td>
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<td>Endoscopic snare resection of lesion of lower bowel using fibreoptic sigmoidoscope</td>
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<td>Endoscopic cauterisation of lesion of lower bowel using fibreoptic sigmoidoscope</td>
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Head and neck (C01, C02, C03, C04, C05, C06, C07, C08, C09, C10, C11, C12, C13, C14, C30, C31, C32)

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<tr>
<td>E191</td>
<td>Total pharyngectomy</td>
</tr>
<tr>
<td>E192</td>
<td>Partial pharyngectomy</td>
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<tr>
<td>E214</td>
<td>Plastic repair of pharynx NEC</td>
</tr>
<tr>
<td>E231</td>
<td>Open excision of lesion of pharynx</td>
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<td>E242</td>
<td>Endoscopic extirpation of lesion of pharynx NEC</td>
</tr>
<tr>
<td>E291</td>
<td>Total laryngectomy</td>
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<td>E292</td>
<td>Partial horizontal laryngectomy</td>
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<td>Partial vertical laryngectomy</td>
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<td>Partial laryngectomy NEC</td>
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<tr>
<td>E295</td>
<td>Laryngofissure and chordectomy of vocal chord</td>
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<tr>
<td>E296</td>
<td>Laryngectomy NEC</td>
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<td>E299</td>
<td>Unspecified excision of larynx</td>
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<tr>
<td>E301</td>
<td>Excision of lesion of larynx using thryotomy as approach</td>
</tr>
<tr>
<td>E341</td>
<td>Microtherapeutic endoscopic extirpation of lesion of larynx using laser</td>
</tr>
<tr>
<td>E342</td>
<td>Microtherapeutic endoscopic resection of lesion of larynx NEC</td>
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<td>Microtherapeutic endoscopic destruction of lesion of larynx NEC</td>
</tr>
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<td>Endoscopic resection of lesion of pharynx NEC</td>
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<td>E414</td>
<td>Tracheo-oesophageal puncture with insertion of speech prothesis</td>
</tr>
<tr>
<td>F011</td>
<td>Excision of vermilion border of lip and advancement of mucosa of lip</td>
</tr>
<tr>
<td>F018</td>
<td>Other specified partial excision of lip</td>
</tr>
<tr>
<td>F021</td>
<td>Excision of lesion of lip</td>
</tr>
</tbody>
</table>
F042  Reconstruction of lip using skin flap
F202  Excision of lesion of gingiva
F221  Total glossectomy
F222  Partial glossectomy
F231  Excision of lesion of tongue
F281  Excision of lesion of palate
F301  Plastic repair of palate using flap of palate
F303  Plastic repair of palate using flap of tongue
F304  Plastic repair of palate using graft of skin
F305  Plastic repair of palate using flap of mucosa
F324  Operations on uvula NEC
F328  Other specified other operations on palate
F341  Bilateral dissection tonsillectomy  Tonsil tumours (C09) only
F349  Unspecified excision of tonsil
F381  Excision of lesion of floor of mouth
F382  Excision of lesion of mouth NEC
F391  Reconstruction of mouth using flap NEC
F392  Reconstruction of mouth using graft NEC
F441  Total excision of parotid gland
F442  Partial excision of parotid gland
F443  Excision of parotid gland NEC
F444  Excision of submandibular gland
F451  Excision of lesion of parotid gland
G021  Total oesophagectomy and anastomosis of pharynx to stomach
G032  Partial oesophagectomy and interposition of microvascularly attached jejunum
S171  Distant myocutaneous subcutaneous pedicle flap to head or neck
S208  Other specified other distant flap of skin
### CAS-SOP #4.7: Linking treatment tables

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<tr>
<th>Code</th>
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<tr>
<td>S248</td>
<td>Other specified local flap of skin and muscle</td>
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<td>Other specified flap of mucosa</td>
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<td>S353</td>
<td>Split autograft of skin to head or neck NEC</td>
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<tr>
<td>T851</td>
<td>Block dissection of cervical lymph nodes</td>
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<td>V061</td>
<td>Medial maxillectomy</td>
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<td>V068</td>
<td>Other specified excision of maxilla</td>
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<td>V141</td>
<td>Hemimandibulectomy</td>
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<td>V142</td>
<td>Extensive excision of mandible NEC</td>
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<td>Partial excision of mandible NEC</td>
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<td>V144</td>
<td>Excision of lesion of mandible</td>
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<td>Other specified division of mandible</td>
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<td>Reconstruction of mandible</td>
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<tr>
<td>Y051</td>
<td>Total excision of organ NOC</td>
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<tr>
<td>Y592</td>
<td>Harvest of radial artery flap of skin and fascia</td>
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<tr>
<td>Y598</td>
<td>Other specified harvest of flap of skin and fascia</td>
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<tr>
<td>Y612</td>
<td>Harvest of flap of skin and pectoralis major muscle</td>
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<td>Y631</td>
<td>Harvest of flap of latissimus dorsi muscle NEC</td>
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<td>Y638</td>
<td>Other specified harvest of flap of muscle of trunk</td>
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<tr>
<td>Y662</td>
<td>Harvest of bone from rib</td>
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Kidney (C64-C66, C68)

- M021  | Nephrectomy and excision of perirenal tissue     |
- M022  | Nephroureterectomy NEC                           |
CAS-SOP #4.7: Linking treatment tables

M023  Bilateral nephrectomy
M024  Excision of half of horseshoe kidney
M025  Nephrectomy NEC
M028  Other specified total excision of kidney
M029  Unspecified total excision of kidney
M038  Other specified partial excision of kidney
M039  Unspecified partial excision of kidney
M042  Open excision of lesion of kidney NEC
M104  Endoscopic cryoablation of lesion of kidney
M137  Percutaneous radiofrequency ablation of lesion of kidney
M181  Total ureterectomy
M182  Excision of segment of ureter
M183  Secondary ureterectomy
M252  Open excision of lesion of ureter NEC
M291  Endoscopic extirpation of lesion of ureter

Liver (C22)

J011  Orthotopic transplantation of liver NEC
J015  Orthotopic transplantation of whole liver
J019  Unspecified transplantation of liver
J021  Right hemihepatectomy NEC
J022  Left hemihepatectomy NEC
J023  Resection of segment of liver
J024  Wedge excision of liver
J026  Extended right hemihepatectomy
J027  Extended left hemihepatectomy
J028  Other specified partial excision of liver
J029  Unspecified partial excision of liver

Tumours of ureter (C66) & pelvis (C65) only
**CAS-SOP #4.7: Linking treatment tables**

**J031**  Excision of lesion of liver NEC

**J053**  Open wedge biopsy of lesion of liver

**J101**  Percutaneous transluminal embolisation of hepatic artery

**J124**  Percutaneous radiofrequency ablation of lesion of liver  Stage 1 only

**J127**  Percutaneous microwave ablation of lesion of liver  Stage 1 only

---

**Small cell lung cancer (SCLC) and Non small cell lung cancer (NSCLC) (C33-C34)**

**E391**  Open excision of lesion of trachea

**E398**  Other specified partial excision of trachea

**E399**  Unspecified partial excision of trachea

**E438**  Other specified other open operations on trachea

**E441**  Excision of carina

**E461**  Sleeve resection of bronchus and anastomosis HFQ

**E463**  Excision of lesion of bronchus NEC

**E468**  Other specified partial extirpation of bronchus

**E541**  Total pneumonectomy

**E542**  Bilobectomy of lung

**E543**  Lobectomy of lung

**E544**  Excision of segment of lung

**E545**  Partial lobectomy of lung NEC

**E548**  Other specified excision of lung

**E549**  Unspecified excision of lung

**E552**  Open excision of lesion of lung

**E554**  Open destruction of lesion of lung NEC

**E559**  Unspecified open extirpation of lesion of lung

**T011**  Thoracoplasty

**T012**  Removal of plombage material from chest wall
<table>
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<tr>
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<tbody>
<tr>
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<td>Excision of lesion of chest wall</td>
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<td>T018</td>
<td>Other specified partial excision of chest wall</td>
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<tr>
<td>T019</td>
<td>Unspecified partial excision of chest wall</td>
</tr>
<tr>
<td>T023</td>
<td>Insertion of prosthesis into chest wall NEC</td>
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</table>

**Oesophagus (C15)**

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<tr>
<td>G011</td>
<td>Oesophagogastric resection and anastomosis of oesophagus to stomach</td>
</tr>
<tr>
<td>G013</td>
<td>Oesophagogastric resection and anastomosis of oesophagus to jejunum NEC</td>
</tr>
<tr>
<td>G018</td>
<td>Other specified excision of oesophagus and stomach</td>
</tr>
<tr>
<td>G019</td>
<td>Unspecified excision of oesophagus and stomach</td>
</tr>
<tr>
<td>G021</td>
<td>Total oesophagectomy and anastomosis of pharynx to stomach</td>
</tr>
<tr>
<td>G022</td>
<td>Total oesophagectomy and interposition of microvasculally attached jejunum</td>
</tr>
<tr>
<td>G023</td>
<td>Total oesophagectomy and interposition of jejunum NEC</td>
</tr>
<tr>
<td>G024</td>
<td>Total oesophagectomy and interposition of microvasculally attached colon</td>
</tr>
<tr>
<td>G025</td>
<td>Total oesophagectomy and interposition of colon NEC</td>
</tr>
<tr>
<td>G028</td>
<td>Other specified total excision of oesophagus</td>
</tr>
<tr>
<td>G029</td>
<td>Unspecified total excision of oesophagus</td>
</tr>
<tr>
<td>G031</td>
<td>Partial oesophagectomy and end to end anastomosis of oesophagus</td>
</tr>
<tr>
<td>G032</td>
<td>Partial oesophagectomy and interposition of microvasculally attached jejunum</td>
</tr>
<tr>
<td>G033</td>
<td>Partial oesophagectomy and anastomosis of oesophagus to transposed jejunum</td>
</tr>
</tbody>
</table>
### G034
- Partial oesophagectomy and anastomosis of oesophagus to jejunum NEC

### G035
- Partial oesophagectomy and interposition of microvascularly attached colon

### G036
- Partial oesophagectomy and interposition of colon NEC

### G038
- Other specified partial excision of oesophagus

### G039
- Unspecified partial excision of oesophagus

### G146
- Fibreoptic endoscopic submucosal resection of lesion of oesophagus
  - Stage 1a disease only

### G171
- Endoscopic snare resection of lesion of oesophagus using rigid oesophagoscope
  - Stage 1a disease only

### G271
- Total gastrectomy and excision of surrounding tissue

### G274
- Total gastrectomy and anastomosis of oesophagus to transposed jejunum

### G275
- Total gastrectomy and anastomosis of oesophagus to jejunum NEC

### G279
- Unspecified total excision of stomach

### G421
- Fibreoptic endoscopic submucosal resection of lesion of upper gastrointestinal tract
  - Stage 1a disease only

### G431
- Fibreoptic endoscopic snare resection of lesion of upper gastrointestinal tract
  - Stage 1a disease only

### G438
- Other specified fibreoptic endoscopic extirpation of lesion of upper gastrointestinal tract
  - Stage 1a disease only

---

**Ovarian (C56-C57, and selected C48 tumours)**

### H331
- Abdominoperineal excision of rectum and end colostomy

### 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
<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
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<tbody>
<tr>
<td>H335</td>
<td>Rectosigmoidectomy and closure of rectal stump and exteriorisation of bowel</td>
</tr>
<tr>
<td>H336</td>
<td>Anterior resection of rectum and exteriorisation of bowel</td>
</tr>
<tr>
<td>H337</td>
<td>Perineal resection of rectum HFQ</td>
</tr>
<tr>
<td>H338</td>
<td>Other specified excision of rectum</td>
</tr>
<tr>
<td>H339</td>
<td>Unspecified excision of rectum</td>
</tr>
<tr>
<td>Q071</td>
<td>Abdominal hysterocolpectomy and excision of periuterine tissue</td>
</tr>
<tr>
<td>Q072</td>
<td>Abdominal hysterectomy and excision of periuterine tissue NEC</td>
</tr>
<tr>
<td>Q073</td>
<td>Abdominal hysterocolpectomy NEC</td>
</tr>
<tr>
<td>Q074</td>
<td>Total abdominal hysterectomy NEC</td>
</tr>
<tr>
<td>Q075</td>
<td>Subtotal abdominal hysterectomy</td>
</tr>
<tr>
<td>Q078</td>
<td>Other specified abdominal excision of uterus</td>
</tr>
<tr>
<td>Q079</td>
<td>Unspecified abdominal excision of uterus</td>
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<tr>
<td>Q081</td>
<td>Vaginal hysterocolpectomy and excision of periuterine tissue</td>
</tr>
<tr>
<td>Q082</td>
<td>Vaginal hysterectomy and excision of periuterine tissue NEC</td>
</tr>
<tr>
<td>Q083</td>
<td>Vaginal hysterocolpectomy NEC</td>
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<tr>
<td>Q088</td>
<td>Other specified vaginal excision of uterus</td>
</tr>
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<td>Q089</td>
<td>Unspecified vaginal excision of uterus</td>
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<tr>
<td>Q221</td>
<td>Bilateral salpingoophorectomy</td>
</tr>
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<td>Q223</td>
<td>Bilateral oophorectomy NEC</td>
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<tr>
<td>Q231</td>
<td>Unilateral salpingoophorectomy NEC</td>
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<tr>
<td>Q232</td>
<td>Salpingoophorectomy of remaining solitary fallopian tube and ovary</td>
</tr>
<tr>
<td>Q235</td>
<td>Unilateral oophorectomy NEC</td>
</tr>
<tr>
<td>Q236</td>
<td>Oophorectomy of remaining solitary ovary NEC</td>
</tr>
<tr>
<td>Q241</td>
<td>Salpingoophorectomy NEC</td>
</tr>
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<td>Q243</td>
<td>Oophorectomy NEC</td>
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<tr>
<td>Q438</td>
<td>Other specified partial excision of ovary</td>
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<td>Q439</td>
<td>Unspecified partial excision of ovary</td>
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<td>Q473</td>
<td>Open biopsy of lesion of ovary</td>
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<td>Q478</td>
<td>Other specified other open operations on ovary</td>
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<tr>
<td>Q491</td>
<td>Endoscopic extirpation of lesion of ovary NEC</td>
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<td>T331</td>
<td>Open excision of lesion of peritoneum</td>
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<td>T332</td>
<td>Open destruction of lesion of peritoneum</td>
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<tr>
<td>T338</td>
<td>Other specified open extirpation of lesion of peritoneum</td>
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<td>T339</td>
<td>Unspecified open extirpation of lesion of peritoneum</td>
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<td>T361</td>
<td>Omentectomy</td>
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<td>Excision of lesion of omentum</td>
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<tr>
<td>X141</td>
<td>Total exenteration of pelvis</td>
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<tr>
<td>X142</td>
<td>Anterior exenteration of pelvis</td>
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<td>X143</td>
<td>Posterior exenteration of pelvis</td>
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<tr>
<td>X148</td>
<td>Other specified clearance of pelvis</td>
</tr>
<tr>
<td>X149</td>
<td>Unspecified clearance of pelvis</td>
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**Pancreas (C25)**

<table>
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<tbody>
<tr>
<td>J551</td>
<td>Total pancreatectomy and excision of surrounding tissue</td>
</tr>
<tr>
<td>J552</td>
<td>Total pancreatectomy NEC</td>
</tr>
<tr>
<td>J558</td>
<td>Other specified total excision of pancreas</td>
</tr>
<tr>
<td>J559</td>
<td>Unspecified total excision of pancreas</td>
</tr>
<tr>
<td>J561</td>
<td>Pancreaticoduodenectomy and excision of surrounding tissue</td>
</tr>
<tr>
<td>J562</td>
<td>Pancreaticoduodenectomy and resection of antrum of stomach</td>
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<tr>
<td>J563</td>
<td>Pancreaticoduodenectomy NEC</td>
</tr>
<tr>
<td>J568</td>
<td>Other specified excision of head of pancreas</td>
</tr>
<tr>
<td>J569</td>
<td>Unspecified excision of head of pancreas</td>
</tr>
<tr>
<td>J571</td>
<td>Subtotal pancreatectomy</td>
</tr>
<tr>
<td>J573</td>
<td>Left pancreatectomy NEC</td>
</tr>
<tr>
<td>J574</td>
<td>Excision of tail of pancreas and drainage of pancreatic duct</td>
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<tr>
<td>J575</td>
<td>Excision of tail of pancreas NEC</td>
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<tr>
<td>J578</td>
<td>Other specified other partial excision of pancreas</td>
</tr>
<tr>
<td>J579</td>
<td>Unspecified other partial excision of pancreas</td>
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</table>
### Prostate (C61)

- **M341** Cystoprostatectomy
- **M611** Total excision of prostate and capsule of prostate
- **M614** Perineal prostatectomy
- **M618** Other specified open excision of prostate
- **M619** Unspecified open excision of prostate
- **M671** Endoscopic cryotherapy to lesion of prostate
- **M711** High intensity focused ultrasound of prostate
- **X141** Total exenteration of pelvis

### Skin (Melanoma and Non-Melanoma Skin Cancers (BCC, cSCC, Rare))

- **B279** Unspecified total excision of breast
- **B283** Excision of lesion of breast NEC
- **B284** Re-excision of breast margins
- **C011** Exenteration of orbit
- **C012** Enucleation of eye
- **C013** Evisceration of eye
- **C018** Other specified excision of eye
- **C019** Unspecified excision of eye
- **C021** Excision of lesion of orbit
- **C022** Destruction of lesion of orbit
- **C028** Other specified extirpation of lesion of orbit
- **C029** Unspecified extirpation of lesion of orbit
- **C101** Excision of lesion of eyebrow
- **C102** Hair bearing flap to eyebrow
- **C103** Hair bearing graft to eyebrow
- **C111** Excision of lesion of canthus
- **C115** Graft of skin to canthus

**J582** Excision of lesion of pancreas NEC
<table>
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<tr>
<td>C121</td>
<td>Excision of lesion of eyelid NEC</td>
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<tr>
<td>C124</td>
<td>Curettage of lesion of eyelid</td>
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<tr>
<td>C124</td>
<td>Curettage of lesion of eyelid BCC and cSCC tumours only</td>
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<tr>
<td>C126</td>
<td>Wedge excision of lesion of eyelid</td>
</tr>
<tr>
<td>C141</td>
<td>Flap of skin to eyelid</td>
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<tr>
<td>C142</td>
<td>Graft of skin to eyelid</td>
</tr>
<tr>
<td>C143</td>
<td>Graft of cartilage to eyelid</td>
</tr>
<tr>
<td>C144</td>
<td>Graft of skin and fat to eyelid</td>
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<tr>
<td>C145</td>
<td>Graft of fascia to eyelid</td>
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<tr>
<td>C148</td>
<td>Other specified reconstruction of eyelid</td>
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<td>Unspecified reconstruction of eyelid</td>
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<td>Lateral tarsorrhaphy</td>
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<td>Tarsorrhaphy NEC</td>
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<td>Excision of preauricular abnormality</td>
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<td>D031</td>
<td>Reconstruction of external ear using graft</td>
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<td>Reconstruction of external ear NEC</td>
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<td>Repair of external ear NEC</td>
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<td>Graft of skin to external ear</td>
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<td>Flap of skin to external ear</td>
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<td>D191</td>
<td>Excision of lesion of middle ear</td>
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<tr>
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<td>E021</td>
<td>Total reconstruction of nose</td>
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<td>Reconstruction of nose NEC</td>
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<td>Septorhinoplasty using implant</td>
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<td>Septorhinoplasty using graft</td>
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<td>Reduction rhinoplasty</td>
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X129  Unspecified operations on amputation stump
Y551  Harvest of random pattern flap of skin from limb
Y552  Harvest of random pattern flap of skin from limb
Y553  Harvest of random pattern flap of skin from limb
Y554  Harvest of random pattern flap of skin from limb
Y555  Harvest of random pattern flap of skin from limb
Y556  Harvest of random pattern flap of skin from limb
Y558  Harvest of random pattern flap of skin from limb
Y559  Harvest of random pattern flap of skin from limb
Y561  Harvest of random pattern flap of skin from other site
Y562  Harvest of random pattern flap of skin from other site
Y563  Harvest of random pattern flap of skin from other site
Y564  Harvest of random pattern flap of skin from other site
Y568  Harvest of random pattern flap of skin from other site
Y569  Harvest of random pattern flap of skin from other site
Y571  Harvest of axial pattern flap of skin
Y572  Harvest of axial pattern flap of skin
Y573  Harvest of axial pattern flap of skin
Y574  Harvest of axial pattern flap of skin
Y575  Harvest of axial pattern flap of skin
Y576  Harvest of axial pattern flap of skin
Y578  Harvest of axial pattern flap of skin
Y579  Harvest of axial pattern flap of skin
Y581  Harvest of skin for graft
Y588  Harvest of skin for graft
Y589  Harvest of skin for graft
Y591  Harvest of flap of skin and fascia
Y592  Harvest of flap of skin and fascia
Y593  Harvest of flap of skin and fascia
Y594  Harvest of flap of skin and fascia
Y595  Harvest of flap of skin and fascia
Y596  Harvest of flap of skin and fascia
Y598  Harvest of flap of skin and fascia
Y599  Harvest of flap of skin and fascia
Y601  Other harvest of fascia
Y602  Other harvest of fascia
Y604  Other harvest of fascia
Y608  Other harvest of fascia
Y609  Other harvest of fascia
Y611  Harvest of flap of skin and muscle of trunk
Y612  Harvest of flap of skin and muscle of trunk
Y613  Harvest of flap of skin and muscle of trunk
Y614  Harvest of flap of skin and muscle of trunk
Y615  Harvest of flap of skin and muscle of trunk
Y618  Harvest of flap of skin and muscle of trunk
Y619  Harvest of flap of skin and muscle of trunk
<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y621</td>
<td>Harvest of flap of skin and muscle of other site</td>
</tr>
<tr>
<td>Y622</td>
<td>Harvest of flap of skin and muscle of other site</td>
</tr>
<tr>
<td>Y623</td>
<td>Harvest of flap of skin and muscle of other site</td>
</tr>
<tr>
<td>Y628</td>
<td>Harvest of flap of skin and muscle of other site</td>
</tr>
<tr>
<td>Y629</td>
<td>Harvest of flap of skin and muscle of other site</td>
</tr>
<tr>
<td>Y671</td>
<td>Harvest of other multiple tissue</td>
</tr>
<tr>
<td>Y672</td>
<td>Harvest of other multiple tissue</td>
</tr>
<tr>
<td>Y678</td>
<td>Harvest of other multiple tissue</td>
</tr>
<tr>
<td>Y679</td>
<td>Harvest of other multiple tissue</td>
</tr>
<tr>
<td>Y692</td>
<td>Harvest of other tissue</td>
</tr>
</tbody>
</table>

**Stomach (C16)**

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>G011</td>
<td>Oesophagogastrectomy and anastomosis of oesophagus to stomach</td>
</tr>
<tr>
<td>G012</td>
<td>Oesophagogastrectomy and anastomosis of oesophagus to transposed jejunum</td>
</tr>
<tr>
<td>G013</td>
<td>Oesophagogastrectomy and anastomosis of oesophagus to jejunum NEC</td>
</tr>
<tr>
<td>G039</td>
<td>Unspecified partial excision of oesophagus</td>
</tr>
<tr>
<td>G271</td>
<td>Total gastrectomy and excision of surrounding tissue</td>
</tr>
<tr>
<td>G272</td>
<td>Total gastrectomy and anastomosis of oesophagus to duodenum</td>
</tr>
<tr>
<td>G273</td>
<td>Total gastrectomy and interposition of jejunum</td>
</tr>
<tr>
<td>G274</td>
<td>Total gastrectomy and anastomosis of oesophagus to transposed jejunum</td>
</tr>
<tr>
<td></td>
<td>Description</td>
</tr>
<tr>
<td>---</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>G275</td>
<td>Total gastrectomy and anastomosis of oesophagus to jejunum NEC</td>
</tr>
<tr>
<td>G278</td>
<td>Other specified total excision of stomach</td>
</tr>
<tr>
<td>G279</td>
<td>Unspecified total excision of stomach</td>
</tr>
<tr>
<td>G281</td>
<td>Partial gastrectomy and anastomosis of stomach to duodenum</td>
</tr>
<tr>
<td>G282</td>
<td>Partial gastrectomy and anastomosis of stomach to transposed jejunum</td>
</tr>
<tr>
<td>G283</td>
<td>Partial gastrectomy and anastomosis of stomach to jejunum NEC</td>
</tr>
<tr>
<td>G288</td>
<td>Other specified partial excision of stomach</td>
</tr>
<tr>
<td>G289</td>
<td>Unspecified partial excision of stomach</td>
</tr>
<tr>
<td>G421</td>
<td>Fibreoptic endoscopic submucosal resection of lesion of upper gastrointestinal tract</td>
</tr>
<tr>
<td>G146</td>
<td>Fibreoptic endoscopic submucosal resection of lesion of oesophagus</td>
</tr>
<tr>
<td>G449</td>
<td>Unspecified other therapeutic fibreoptic endoscopic operations on upper gastrointestinal tract</td>
</tr>
</tbody>
</table>

**Stage 1a disease only**

---

**Testis (C62, D292)**

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>N051</td>
<td>Bilateral Subcapsular Orchidectomy</td>
</tr>
<tr>
<td>N052</td>
<td>Bilateral Orchidectomy NEC, Ablation of Testes</td>
</tr>
<tr>
<td>N053</td>
<td>Bilateral Inguinal Orchidectomy</td>
</tr>
<tr>
<td>N061</td>
<td>Subcapsular Orchidectomy NEC</td>
</tr>
<tr>
<td>N063</td>
<td>Orchidectomy NEC</td>
</tr>
<tr>
<td>N066</td>
<td>Inguinal Orchidectomy NEC</td>
</tr>
<tr>
<td>N068</td>
<td>Other Specified Other Excision of Testis</td>
</tr>
<tr>
<td>N069</td>
<td>Unspecified Other Excision of Testis</td>
</tr>
<tr>
<td>N072</td>
<td>Destruction Of Lesion of Testis</td>
</tr>
<tr>
<td>N078</td>
<td>Other Specified Exirpation of Lesion of Testis</td>
</tr>
<tr>
<td>N079</td>
<td>Unspecified Exirpation of Lesion of Testis</td>
</tr>
<tr>
<td>Code</td>
<td>Description</td>
</tr>
<tr>
<td>------</td>
<td>-------------</td>
</tr>
<tr>
<td>X163</td>
<td>Excision of Gonad from Abdomen</td>
</tr>
<tr>
<td>X164</td>
<td>Excision of Gonad from Pelvis</td>
</tr>
<tr>
<td>X165</td>
<td>Excision of Gonad from Inguinal Canal</td>
</tr>
<tr>
<td>X166</td>
<td>Excision of Gonad NEC</td>
</tr>
</tbody>
</table>

### Uterine (C54-C55)

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q071</td>
<td>Abdominal hysterocolpectomy and excision of periuterine tissue</td>
</tr>
<tr>
<td>Q072</td>
<td>Abdominal hysterectomy and excision of periuterine tissue NEC</td>
</tr>
<tr>
<td>Q073</td>
<td>Abdominal hysterocolpectomy NEC</td>
</tr>
<tr>
<td>Q074</td>
<td>Total abdominal hysterectomy NEC</td>
</tr>
<tr>
<td>Q075</td>
<td>Subtotal abdominal hysterectomy</td>
</tr>
<tr>
<td>Q078</td>
<td>Other specified abdominal excision of uterus</td>
</tr>
<tr>
<td>Q079</td>
<td>Unspecified abdominal excision of uterus</td>
</tr>
<tr>
<td>Q081</td>
<td>Vaginal hysterocolpectomy and excision of periuterine tissue</td>
</tr>
<tr>
<td>Q082</td>
<td>Vaginal hysterectomy and excision of periuterine tissue NEC</td>
</tr>
<tr>
<td>Q083</td>
<td>Vaginal hysterocolpectomy NEC</td>
</tr>
<tr>
<td>Q088</td>
<td>Other specified vaginal excision of uterus</td>
</tr>
<tr>
<td>Q089</td>
<td>Unspecified vaginal excision of uterus</td>
</tr>
<tr>
<td>Q093</td>
<td>Open excision of lesion of uterus NEC</td>
</tr>
<tr>
<td>Q161</td>
<td>Vaginal excision of lesion of uterus</td>
</tr>
<tr>
<td>Q221</td>
<td>Bilateral salpingoophorectomy</td>
</tr>
<tr>
<td>Q222</td>
<td>Bilateral salpingectomy NEC</td>
</tr>
<tr>
<td>Q223</td>
<td>Bilateral oophorectomy NEC</td>
</tr>
<tr>
<td>Q228</td>
<td>Other specified bilateral excision of adnexa of uterus</td>
</tr>
<tr>
<td>Q229</td>
<td>Unspecified bilateral excision of adnexa of uterus</td>
</tr>
<tr>
<td>Q231</td>
<td>Unilateral salpingoophorectomy NEC</td>
</tr>
<tr>
<td>Q232</td>
<td>Salpingoophorectomy of remaining solitary fallopian tube and ovary</td>
</tr>
<tr>
<td>Q235</td>
<td>Unilateral oophorectomy NEC</td>
</tr>
<tr>
<td>Q236</td>
<td>Oophorectomy of remaining solitary ovary NEC</td>
</tr>
</tbody>
</table>
Q238  Other specified unilateral excision of adnexa of uterus
Q239  Unspecified unilateral excision of adnexa of uterus
Q521  Excision of lesion of broad ligament of uterus
X141  Total exenteration of pelvis
X142  Anterior exenteration of pelvis
X143  Posterior exenteration of pelvis
X148  Other specified clearance of pelvis
X149  Unspecified clearance of pelvis
Appendix 4: Example code

--The code presented below was used to generate the ***analysislouisereynolds.av_treatment_table_1319_4p7@casref01*** table AND should be used to identify treatments for cancers diagnosed in 2013-2019.
--There are also minor corrections to the code, so it supersedes the code published in SOP version 4.6 for 2013-2018 diagnoses

-------------------------------------User notes:------------------
-- This is the SQL to generate treatment flags (resection, chemo, radio) for 2013-19 diagnoses, including demographic & geographies breakdown
--It uses these tables in casref01:
--analysislouisereynolds.opcs4resection_lookup_13_19@casref01
--analysislouisereynolds.timeframe_lookup_13_19@casref01

--1. Set your connection to casref01
--2. Create each table in turn in the SQL, starting with your cohort of interest.
--If limiting the cohort, do this in the first table (tr_tumour_cohort_d)
--3. Then the last table brings all the previous ones together into your final export.
--4. After you run each new table, you need to index it and create database stats - this optimises performance.
--This is included throughout using the create index and execute commands
--You only need to create the database stats if you are creating and using that table the same day (otherwise they are automatically generated overnight)
--You will need to change analysislouisereynolds to your username
--If, after creating and indexing the tables, you need to rerun any, it may be more efficient to truncate the table than drop and create it again, e.g.:--Truncate table tr_tumour_cohort;
--insert into tr_tumour_cohort_d (--5. Alternatively you can use the final table we have already created here:--***analysislouisereynolds.av_treatment_table_1319_4p7@casref01***
--6. If analysing in stata, you can use the code below to collapse the data down so it’s not identifiable (example below groups by stage, cancer type & diagnosis year)--collapse (count) tumourid, by (cancergroup stage_group rt_flag ct_flag SG_flag diagnosisyear)

------------------------------------------------------------------------------
------------------------------------------------------------------------------
-------- CREATE TUMOUR COHORT TABLE -------------------------------
------------------------------------------------------------------------------
------------------------------------------------------------------------------
CREATE TABLE tr_tumour_cohort AS

--Skin cancer have been defined in the at_tumour_skin table and so the skin cohort needs
to be selected separately to the cohort for other tumours and joined together
WITH skin_cohort AS
--Create cohort of non-keratinocyte skin cancers
(SELECT ats.patientid, ats.tumourid, ats.diagnosisdatebest, ats.diagnosisyear, avt.nhsnumber, avt.figo, avt.sex, avt.ethnicity, avt.morph_icd10_3char, avt.fiveyearageband, avt.age, avt.dedup_flag, avt.site_icd10_3char, avt.ctry_code, avt.statusofregistration
CASE WHEN tumour_type_2 = 'Melanoma' THEN 'NON-KC_MELANOMA'
     WHEN tumour_type_2 = 'Rare' THEN 'NON-KC_RARE'
END AS tumour_code
FROM analysisbirgittavanbodegraven.at_tumour_skin@casref01 ats
LEFT JOIN av2019.at_tumour_england@casref01 avt ON ats.tumourid=avt.tumourid
WHERE ats.diagnosisyear BETWEEN 2013 AND 2019
AND ats.tumour_type_2 IN ('Melanoma', 'Rare')
AND avt.ctry_code = 'E'
AND avt.statusofregistration = 'F'
AND avt.dedup_flag = '1'
AND avt.age BETWEEN 0 AND 200
AND avt.sex IN (1,2)
UNION

CREATE TABLE tr_tumour_cohort AS

--Create cohort of keratinocyte skin cancers following the first ever registration of BCC
and first ever registration of cSCC tumours in addition to all genital BCC tumours and all

SELECT ats.patientid, ats.tumourid, ats.diagnosisdatebest, ats.diagnosisyear, avt.nhsnumber, avt.figo, avt.sex, avt.ethnicity, avt.morph_icd10_3char, avt.fiveyearageband, avt.age, avt.dedup_flag, avt.site_icd10_3char, avt.ctry_code, avt.statusofregistration
CASE WHEN tumour_type_3 = 'BCC' THEN 'KC_BCC'
     WHEN tumour_type_3 = 'cSCC' THEN 'KC_CSCC'
END AS tumour_code
FROM analysisbirgittavanbodegraven.at_tumour_skin@casref01 ats
LEFT JOIN av2019.at_tumour_england@casref01 avt ON ats.tumourid=avt.tumourid
WHERE ats.diagnosisyear BETWEEN 2013 AND 2019
AND (ats.tumour_type_4 IN ('Genital BCC', 'Genital cSCC')
     OR ats.tumour_type_5 IN ('First BCC', 'First cSCC'))
AND avt.ctry_code = 'E'
AND avt.statusofregistration = 'F'
AND avt.dedup_flag = '1'
AND avt.age BETWEEN 0 AND 200
AND avt.sex IN (1,2)),

-- Create tumour cohort for all other (non skin) tumours
non_skin AS
(SELECT tumourid, patientid, nhsnumber, diagnosisdatebest, site_icd10_o2, figo, sex,
ethnicity, morph_icd10_o2, fiveyearageband, age

-- Create amended tumour_code variable to differentiate between ovarian and non-
-- ovarian C48 tumours, changes also for brain and testes.
,CASE
WHEN avt.site_icd10_o2_3char IN ('C48')
AND (avt.morph_icd10_o2 NOT IN (8693, 8800, 8801, 8802, 8803, 8804, 8805, 8806,
8963, 8990, 9040, 9041, 9042, 9043, 9044, 8810, 9490, 9500)
AND (avt.morph_icd10_o2 NOT BETWEEN 8811 AND 8921)
AND (avt.morph_icd10_o2 NOT BETWEEN 9120 AND 9373)
AND (avt.morph_icd10_o2 NOT BETWEEN 9530 AND 9582)
AND avt.sex=2)
THEN 'C48OVARY'
WHEN avt.site_icd10_o2_3char IN ('C48') THEN 'C48OTHER'
WHEN avt.site_icd10_o2_3char IN ('D391') THEN 'D39OVARY'
WHEN avt.site_icd10_o2_3char = 'D39' AND avt.site_icd10_o2 NOT IN ('D391') THEN
'D39OTHER'
WHEN avt.site_icd10_o2_3char IN ('D292') THEN 'D29TESTES'
WHEN avt.site_icd10_o2_3char = 'D29' AND avt.site_icd10_o2 NOT IN ('D292') THEN
'D29OTHER'
WHEN avt.site_icd10_o2_3char IN ('C751','C752','C753') THEN 'C75BRAIN'
WHEN avt.site_icd10_o2_3char = 'C75' AND avt.site_icd10_o2 NOT IN ('C751','C752','C753') THEN 'C75OTHER'
WHEN avt.site_icd10_o2_3char = 'D329' AND avt.site_icd10_o2 NOT IN ('D320','D321','D329') THEN 'D32BRAIN'
WHEN avt.site_icd10_o2_3char IN ('D330','D331','D332','D333','D334','D337','D339') THEN
'D33BRAIN'
WHEN avt.site_icd10_o2_3char IN ('D420','D421','D429') THEN 'D42BRAIN'
WHEN avt.site_icd10_o2_3char = 'D42' AND avt.site_icd10_o2 NOT IN ('D420','D421','D429') THEN
'D42BRAIN'
WHEN avt.site_icd10_o2_3char = 'D430','D431','D432','D433','D434','D437','D439') THEN
'D43BRAIN'
WHEN avt.site_icd10_o2_3char IN ('D443','D444','D445') THEN 'D44BRAIN'
ELSE avt.site_icd10_o2_3char
END AS tumour_code

FROM av2019.at_tumour_english@casref01 AVT
--Define cohort of interest here
WHERE avt.diagnosisyear BETWEEN 2013 AND 2019
AND avt.site_icd10_o2_3char NOT IN ('D01','D03','D04','D06','D07','D11','D13','D15','D16','D18','D25','D27','D36','D40','D48','C44')
AND avt.cascade_inci_flag = 1
AND avt.ctry_code = 'E'
AND avt.status_of_registration = 'F'
AND avt.dedup_flag = '1'
AND avt.age BETWEEN 0 AND 200
AND avt.sex IN (1,2)),

--Remove any tumours from the all tumours cohort that also appear in the skin cohort to avoid duplication
non_skin_cohort AS
(SELECT nsk.tumourid, nsk.patientid, nhsnumber, diagnosisdatebest, site_icd10_o2, figo, sex, ethnicity, morph_icd10_o2, fiveyearageband, age, tumour_code
FROM non_skin nsk
LEFT JOIN skin_cohort skn ON nsk.tumourid=skn.tumourid
WHERE skn.tumourid IS NULL),

--Now union together the skin and non-skin cancer cohorts to create the full cohort
tumour_cohort AS
(SELECT tumourid, patientid, nhsnumber, diagnosisdatebest, site_icd10_o2, figo, sex, ethnicity, morph_icd10_o2, fiveyearageband, age, tumour_code
FROM skin_cohort
UNION
SELECT tumourid, patientid, nhsnumber, diagnosisdatebest, site_icd10_o2, figo, sex, ethnicity, morph_icd10_o2, fiveyearageband, age, tumour_code
FROM non_skin_cohort)

--Identify patients with multiple tumours within an 18th month period with tumour_flag
SELECT tumourid, patientid, nhsnumber, diagnosisdatebest, site_icd10_o2, figo, sex, ethnicity, morph_icd10_o2, fiveyearageband, age, tumour_code, tumour_flag
FROM
(SELECT avt.tumourid, avt.patientid, avt.nhsnumber, avt.diagnosisdatebest, avt.site_icd10_o2, avt.figo, avt.sex, avt.ethnicity, avt.morph_icd10_o2, avt.fiveyearageband, avt.age, avt.tumour_code
FROM skin_cohort
UNION
SELECT avt.tumourid, avt.patientid, avt.nhsnumber, avt.diagnosisdatebest, avt.site_icd10_o2, avt.figo, avt.sex, avt.ethnicity, avt.morph_icd10_o2, avt.fiveyearageband, avt.age, avt.tumour_code
FROM non_skin_cohort)
-- This join flags any tumours diagnosed in 2013-19 that belong to a patient who had another tumour in the 18 months before or after that diagnosis
-- (so that later, patient level datasets (hes, sact, rtds) are only used for patients with 1 tumour)
-- Tumour_flag = 1; the tumour belonged to a patient who had another tumour within 18 months

CASE WHEN ABS(avt.diagnosisdatebest-avt2.diagnosisdatebest)<548 THEN 1 ELSE 0 END AS tumour_flag

-- In the process of joining AVT2 to AVT to identify multiple tumours, duplicate rows are generated
-- The difference between diagnosis date for tumours in AVT AND AVT2 ranks multiple tumours where more than one exists AND drops all but the closest tumour to the original tumour.
-- Where rk = 1; this is the tumour record to keep

RANK() OVER (PARTITION BY avt.tumourid ORDER BY ABS(avt.diagnosisdatebest-avt2.diagnosisdatebest) ASC, avt2.tumourid) AS rk
FROM tumour_cohort AVT

-- Multiple tumours join:
-- For tumours diagnosed from 2013-2019, identify any other tumour IDs that occurred between 2011-2021
-- A second copy of the tumour cohort (AVT2) is joined to the original tumour cohort of 2013-19 diagnoses (TC)
-- Records from AVT2 are only joined if the patient ID is the same but the tumour ID is different

LEFT JOIN av2019.at_tumour_england@casref01 AVT2 ON avt.patientid=avt2.patientid
AND NOT(avt.tumourid=avt2.tumourid)
-- AND avt2.cascade_inci_flag = 1
AND avt2.site_icd10_o2_3char NOT IN ('D01','D03','D04','D06','D07','D11','D13','D15','D16','D18','D25','D27','D36','D40','D48','C44')
AND avt2.diagnosisyear BETWEEN 2011 AND 2021

-- Removes duplicate tumour rows that had been added to identify patients with multiple tumours
WHERE rk=1;

-- Create table indexes for tumour cohort table
CREATE UNIQUE INDEX analysislouisereynolds.tr_tumcohort_tumourid_uq ON analysislouisereynolds.tr_tumour_cohort ( tumourid ) NOLOGGING TABLESPACE analysisdata_IX;
CREATE INDEX analysislouisereynolds.tr_tumcohort_patientid_ix ON analysislouisereynolds.tr_tumour_cohort ( patientid ) NOLOGGING TABLESPACE analysisdata_IX;
CREATE INDEX analysislouisereynolds.tr_tumcohort_nhsnumber_ix ON analysislouisereynolds.tr_tumour_cohort ( nhsnumber ) NOLOGGING TABLESPACE analysisdata_IX;
EXECUTE dbms_stats.gather_table_stats('analysislouisereynolds', 'tr_tumour_cohort')
EXECUTE dbms_stats.gather_index_stats('analysislouisereynolds', 'tr_tumcohort_tumourid_uq')

CREATE SURGERY FLAG TABLES - ALL SITES

-- Create a surgery flag for the tumour if:
-- there is a record in AT_TREATMENT_ENGLAND which states that the tumour was treated with surgery (event is '01a', '01b', '01z', or '01c')
-- and the opcs4_code is in the tumour resection list
-- and the operation date (opertn) occurred in the relevant timeframe (see SOP)

CREATE TABLE tr_av_sg AS(
SELECT DISTINCT tumourid,
CASE WHEN datediff IS NULL THEN 0 ELSE 1 END AS avsg_flag,
   eventdate AS avsg_date,
   avsg_trust_code
FROM (SELECT tumourid, datediff, rk , eventdate, avsg_trust_code
      FROM (SELECT tc.tumourid, (avtreat.eventdate - tc.diagnosisdatebest) AS datediff,
                 RANK() OVER (PARTITION BY tc.tumourid ORDER BY avtreat.eventdate,
                           avtreat.eventid) AS rk
                 , avtreat.eventdate
                 , avtreat.trust_code AS avsg_trust_code
      FROM tr_tumour_cohort tc


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INNER JOIN analysislouisereynolds.timeframe_lookup_13_19@casref01 tim ON tim.tumouricdsite3code = tc.tumour_code
INNER JOIN av2019.at_treatment_england@casref01 avtreat ON avtreat.tumourid=tc.tumourid AND eventcode IN ('01a','01b','01z', '01c') AND (avtreat.eventdate-tc.diagnosisdateBEST BETWEEN -31 AND tim.resect_time)
INNER JOIN analysislouisereynolds.opcs4resection_lookup_13_19@casref01 opcs ON opcs.tumouricdsite3code = tc.tumour_code AND TRIM(opcs.opcsresectioncode) = avtreat.opcs4_code
WHERE rk=1
);

--2)------------------ ALL SITES - SURGERY FROM HES ------------------
-- Create a surgery flag for the tumour if:
-- There is an inpatient hes episode with a tumour resection opcs-4 code in one of the operation fields
-- and the operation date (opertn) occurred in the relevant timeframe create table
CREATE TABLE tr_hes_sg AS(
SELECT DISTINCT tumourid, CASE WHEN datediff IS NULL THEN 0 ELSE 1 END AS hessg_flag, opdate AS hessg_date, hessg_trust_code FROM (SELECT tumourid, datediff, rk , opdate, hessg_trust_code FROM (SELECT tc.tumourid, ho.opdate- tc.diagnosisdateBEST AS datediff, RANK() OVER (PARTITION BY tc.tumourid ORDER BY ho.opdate, hl.datayear,hl.epikeyanon,POS) AS rk, ho.opdate, procode3 AS hessg_trust_code FROM tr_tumour_cohort tc INNER JOIN analysislouisereynolds.timeframe_lookup_13_19@casref01 tim ON tim.tumouricdsite3code = tc.tumour_code INNER JOIN heslive.hes_linkage_av_apc@casref01 hl ON tc.patientid = hl.patientid INNER JOIN heslive.hesapc_opertn@casref01 ho ON ho.datayear = hl.datayear AND ho.epikeyanon = hl.epikeyanon AND ho.opdate-tc.diagnosisdateBEST BETWEEN -31 AND tim.resect_time INNER JOIN heslive.hesapc@casref01 ha ON ha.datayear = hl.datayear AND ha.epikeyanon = hl.epikeyanon
WHERE rk=1
));
INNER JOIN analysislouisereynolds.opcs4resection_lookup_13_19@casref01 opcs ON opcs.tumouricdsite3code = tc.tumour_code AND TRIM(opcs.opscresectioncode) = ho.opertn
WHERE rk=1
));

CREATE TABLE tr_av_liver as ( SELECT DISTINCT tumourid, CASE WHEN datediff IS NULL THEN 0 ELSE 1 END AS liver_avtreat , eventdate AS avsg_date , avsg_trust_code FROM ( SELECT tumourid, datediff, rk, eventdate, avsg_trust_code FROM ( SELECT tc.tumourid, avtreat.eventdate - tc.diagnosisdatebest AS datediff, RANK() OVER (PARTITION BY tc.tumourid ORDER BY avtreat.eventdate, avtreat.eventid) AS rk, avtreat.eventdate , avtreat.trust_code AS avsg_trust_code FROM tr_tumour_cohort tc INNER JOIN analysislouisereynolds.timeframe_lookup_13_19@casref01 tim ON tim.tumouricdsite3code = tc.tumour_code INNER JOIN av2019.at_treatment_england@casref01 avtreat ON avtreat.tumourid=tc.tumourid AND eventcode IN ('01a','01b','01z','01c') AND (avtreat.eventdate-tc.diagnosisdatebest BETWEEN -31 AND tim.resect_time) AND avtreat.ops4_code IN ('J124','J127') AND tc.tumour_code IN ('C22')) WHERE rk=1));
--4)---------------- LIVER C22 - HES-----------------------

-- Create a surgery flag for the tumour if:
-- There is an inpatient hes episode with a tumour resection opcs-4 code in one of the
operation fields
-- and the opcs4_code is a percutaneous radiofrequency AND microwave ablation of
lesion of liver (see SOP Appendices for list of opcs4 codes)
-- and the operation date (opern) occurred in the relevant timeframe (see SOP)
-- and the tumour is TNM stage 1 (a stage-specific tumour resection flag will incorporate
this stage criteria in the final table)
-- and the patient only had one tumour in the time period of interest (this is also
incorporated in the final table)

CREATE TABLE tr_hes_liver AS(
SELECT DISTINCT
tumourid,
CASE WHEN datediff IS NULL THEN 0 ELSE 1 END AS liver_hes
, opdate AS hessg_date
, hessg_trust_code
FROM (SELECT tumourid, datediff, rk, opdate, hessg_trust_code FROM (SELECT tc.tumourid,
ho.opdate - tc.diagnosisdatebest AS datediff,
RANK() OVER (PARTITION BY tc.tumourid ORDER BY ho.opdate,
hl.datayear,hl.epikeyanon,pos) AS rk
, ho.opdate
, procode3 AS hessg_trust_code
FROM tr_tumour_cohort tc
INNER JOIN analysislouisereynolds.timeframe_lookup_13_19@casref01 tim ON
tim.tumouricdsite3code = tc.tumour_code
INNER JOIN heslive.hes_linkage_av_apc@casref01 hl ON tc.patientid = hl.patientid
INNER JOIN heslive.hesapc@casref01 ha ON ha.datayear = hl.datayear AND
ha.epikeyanon = hl.epikeyanon
INNER JOIN heslive.hesapc_opertn@casref01 ho ON ho.datayear = hl.datayear AND
ho.epikeyanon = hl.epikeyanon
AND ho.opdate-tc.diagnosisdatebest BETWEEN -31 AND tim.resect_time
AND ho.opertn IN ('J124','J127') AND tc.tumour_code in ('C22'))
WHERE rk=1));

--------------------------------------------------------------------------------

--5)---------------- OESOPHAGUS C15 - AT_TREATMENT_ENGLAND ------------------------
-- Create a surgery flag for the tumour if:
-- there is a record in AT_TREATMENT_ENGLAND which states that the tumour was treated with surgery (event is '01a', '01b', '01z', or '01c')
-- and the opcs4_code is a fibreoptic endoscopic resection of lesions of upper gastrointestinal tract AND oesophagus (see SOP Appendices for list of opcs4 codes)
-- and the operation date (opertn) occurred in the relevant timeframe (see SOP)
-- and the tumour is TNM stage 1a (a stage-specific tumour resection flag will incorporate this stage criteria in the final table)

CREATE TABLE tr_av_oesoph AS(
SELECT DISTINCT
tumourid,
CASE WHEN datediff IS NULL THEN 0 ELSE 1 END AS oesoph_avtreat,
, eventdate AS avsg_date,
, avsg_trust_code
FROM (SELECT tumourid, datediff, rk, eventdate, avsg_trust_code
FROM (SELECT tc.tumourid, avtreat.eventdate - tc.diagnosisdate as datediff,
RANK() OVER (PARTITION BY tc.tumourid ORDER BY avtreat.eventdate, avtreat.eventid) AS rk, avtreat.eventdate,
, avtreat.trust_code AS avsg_trust_code
FROM tr_tumour_cohort tc
INNER JOIN analysislouiserenylons.timeframe_lookup_13_19@casref01 tim ON tim.tumouricdsite3code = tc.tumour_code
INNER JOIN av2019.at_treatment_england@casref01 avtreat ON avtreat.tumourid=tc.tumourid
AND eventcode IN ('01a','01b','01z','01c') AND (avtreat.eventdate-tc.diagnosisdate BETWEEN -31 AND tim.resect_time)
AND avtreat.opcs4_code IN ('G421','G431','G146','G171','G438') AND tc.tumour_code IN ('C15'))
WHERE rk=1));

--6)----------------- OESOPHAGUS C15 - HES ------------------
-- Create a surgery flag for the tumour if:
-- There is an inpatient hes episode with a tumour resection opcs-4 code in one of the operation fields
-- and the opcs4_code is a fibreoptic endoscopic resection of lesions of upper gastrointestinal tract AND oesophagus (see SOP Appendices for list of opcs4 codes)
-- and the operation date (opertn) occurred in the relevant timeframe (see SOP)
-- and the tumour is TNM stage 1a (a stage-specific tumour resection flag will incorporate this stage criteria in the final table)
-- and the patient only had one tumour in the time period of interest (this is also incorporated in the final table)

CREATE TABLE tr_hes_oesoph AS
SELECT DISTINCT tumourid,
CASE WHEN datediff IS NULL THEN 0 ELSE 1 END AS oesoph_hes
, opdate AS hessg_date
, hessg_trust_code
FROM (SELECT tumourid, datediff, rk, opdate, hessg_trust_code FROM (SELECT tumourid, datediff, rk, opdate, hessg_trust_code FROM (SELECT tc.tumourid, ho.opdate - tc.diagnosisdatebest AS datediff,
RANK() OVER (PARTITION BY tc.tumourid ORDER BY ho.opdate, hl.datayear, hl.epikeyanon,POS) AS rk
, ho.opdate
, procode3 AS hessg_trust_code
FROM tr_tumour_cohort tc
INNER JOIN analysislouisereynolds.timeframe_lookup_13_19@casref01 tim ON tim.tumouricdsite3code = tc.tumour_code
INNER JOIN heslive.hes_linkage_av_apc@casref01 hl ON tc.patientid = hl.patientid
INNER JOIN heslive.hesapc@casref01 ha ON ha.datayear = hl.datayear AND ha.epikeyanon = hl.epikeyanon
INNER JOIN heslive.hesapc_opertn@casref01 ho ON ho.datayear = hl.datayear AND ho.epikeyanon = hl.epikeyanon
AND ho.opdate-tc.diagnosisdatebest BETWEEN -31 AND tim.resect_time
AND ho.opertn IN ('G421','G431','G146','G171','G438') AND tc.tumour_code IN ('C15'))
WHERE rk=1));

---7)----------------- STOMACH C16 - AT_TREATMENT_ENGLAND ------------------
-- Create a surgery flag for the tumour if:
-- there is a record in AT_TREATMENT_ENGLAND which states that the tumour was treated with surgery (event is '01a', '01b', '01z', or '01c')
-- and the opcs4_code is a fibreoptic endoscopic resection of lesions of upper gastrointestinal tract AND oesophagus (see SOP Appendices for list of opcs4 codes)
-- and the operation date (opertn) occurred in the relevant timeframe (see SOP)
-- and the tumour is TNM stage 1a (a stage-specific tumour resection flag will incorporate this stage criteria in the final table)
CREATE TABLE tr_av_stomach AS(  SELECT DISTINCT tumourid,  CASE WHEN datediff IS NULL THEN 0 ELSE 1 END AS stomach_avtreat,  eventdate AS avsg_date,  avsg_trust_code  FROM (  SELECT tumourid, datediff, rk, eventdate, avsg_trust_code  FROM (  SELECT tc.tumourid, avtreat.eventdate - tc.diagnosisdatebest AS datediff,  RANK() OVER (PARTITION BY tc.tumourid ORDER BY avtreat.eventdate,  avtreat.eventid) AS rk, avtreat.eventdate, avtreat.trust_code AS avsg_trust_code  FROM tr_tumour_cohort tc  INNER JOIN analysislouisereynolds.timeframe_lookup_13_19@casref01 tim ON tim.tumouricdsite3code = tc.tumour_code  INNER JOIN av2019.at_treatment_england@casref01 avtreat ON avtreat.tumourid=tc.tumourid  AND eventcode IN ('01a','01b','01z','01c') AND (avtreat.eventdate - tc.diagnosisdatebest BETWEEN -31 AND tim.resect_time)  AND avtreat.opcs4_code IN ('G421','G146','G449') AND tc.tumour_code IN ('C16'))  WHERE rk=1));

--8)---------------- STOMACH C16 - HES ------------------
-- Create a surgery flag for the tumour if:
-- There is an inpatient hes episode with a tumour resection opcs-4 code in one of the operation fields
-- and the opcs4_code is a fibreoptic endoscopic resection of lesions of upper gastrointestinal tract AND oesophagus (see SOP Appendices for list of opcs4 codes)
-- and the operation date (opertn) occurred in the relevant timeframe (see SOP)
-- and the tumour is TNM stage 1a (a stage-specific tumour resection flag will incorporate this stage criteria in the final table)
-- and the patient only had one tumour in the time period of interest (this is also incorporated in the final table)

CREATE TABLE tr_hes_stomach AS(  SELECT DISTINCT tumourid,  CASE WHEN datediff IS NULL THEN 0 ELSE 1 END AS stomach_hes,  opdate AS hessg_date,  hessg_trust_code  FROM (  SELECT tumourid, datediff, rk, eventdate, avsg_trust_code  FROM (  SELECT tc.tumourid, avtreat.eventdate-tc.diagnosisdatebest AS datediff,  RANK() OVER (PARTITION BY tc.tumourid ORDER BY avtreat.eventdate,  avtreat.eventid) AS rk, avtreat.eventdate, avtreat.trust_code AS avsg_trust_code  FROM tr_tumour_cohort tc  INNER JOIN analysislouisereynolds.timeframe_lookup_13_19@casref01 tim ON tim.tumouricdsite3code = tc.tumour_code  INNER JOIN av2019.at_treatment_england@casref01 avtreat ON avtreat.tumourid=tc.tumourid  AND eventcode IN ('01a','01b','01z','01c') AND (avtreat.eventdate-tc.diagnosisdatebest BETWEEN -31 AND tim.resect_time)  AND avtreat.opcs4_code IN ('G421','G146','G449') AND tc.tumour_code IN ('C16'))  WHERE rk=1));
FROM ( 
SELECT tumourid, datediff, rk, opdate, hessg_trust_code FROM ( 
SELECT tc.tumourid, 
ho.opdate-tc.diagnosisdatebest AS datediff, 
RANK() OVER (PARTITION BY tc.tumourid ORDER BY ho.opdate, 
hl.datayear,hl.epikeyanon,POS) AS rk 
, ho.opdate 
, procode3 AS hessg_trust_code 
FROM tr_tumour_cohort tc 
INNER JOIN analysislouisereynolds.timeframe_lookup_13_19@casref01 tim ON 
tim.tumouricdsite3code = tc.tumour_code 
INNER JOIN heslive.hes_linkage_av_apc@casref01 hl ON tc.patientid = hl.patientid 
INNER JOIN heslive.hesapc@casref01 ha ON ha.datayear = hl.datayear AND 
ha.epikeyanon = hl.epikeyanon 
INNER JOIN heslive.hesapc_opertn@casref01 ho ON ho.datayear = hl.datayear AND 
ho.epikeyanon = hl.epikeyanon 
AND ho.opdate-tc.diagnosisdatebest BETWEEN -31 AND tim.resect_time 
AND ho.opertn IN ('G421','G146','G449') AND tc.tumour_code IN ('C16')) 
WHERE rk=1));

----------------------------------------
9)-----------------
BLADDER CANCERS (C67) - AT_TREATMENT_ENGLAND--------------
-- Create a surgery flag for the tumour if:
-- there is a record in AT_TREATMENT_ENGLAND which states that the tumour was 
treated with surgery (event is '01a', '01b', '01z', or '01c')
-- and the opcs4_code is a endoscopic resections of lesion of bladder (TURBT) (see SOP 
Appendices for list of opcs4 codes)
-- and the operation date (opertn) occurred in the relevant timeframe (see SOP)
-- and the tumour is T1 (non-muscle invasive) (a stage-specific tumour resection flag will 
incorporate this stage criteria in the final table)

CREATE TABLE tr_av_bladder AS ( 
SELECT DISTINCT 
tumourid, 
CASE WHEN datediff IS NULL THEN 0 ELSE 1 END AS bladder1_avtreat 
, eventdate AS avsg_date 
, avsg_trust_code 
FROM ( 
SELECT tumourid, datediff, rk, eventdate, avsg_trust_code 
FROM ( 
SELECT tc.tumourid, 
avtreat.eventdate-tc.diagnosisdatebest AS datediff,
RANK() OVER (PARTITION BY tc.tumourid ORDER BY avtreat.eventdate, avtreat.eventid) AS rk, avtreat.eventdate, avtreat.trust_code AS avsg_trust_code
FROM tr_tumour_cohort tc
INNER JOIN analysislouisereynolds.timeframe_lookup_13_19@casref01 tim ON tim.tumouricdsite3code = tc.tumour_code
INNER JOIN av2019.at_treatment_england@casref01 avtreat ON avtreat.tumourid=tc.tumourid AND eventcode IN ('01a','01b','01z','01c') AND (avtreat.eventdate-tc.diagnosisdatebest BETWEEN -31 AND tim.resect_time) AND avtreat.opcs4_code IN ('M421', 'M422', 'M423', 'M428', 'M429') AND tc.tumour_code IN ('C67'))
WHERE rk=1));

--10)----------------- BLADDER CANCERS (C67) - HES -------------------
-- Create a surgery flag for the tumour if:
-- There is an inpatient hes episode with a tumour resection opcs-4 code in one of the operation fields
-- and the opcs4_code is an endoscopic resections of lesion of bladder (TURBT) (see SOP Appendices for list of opcs4 codes)
-- and the operation date (opertn) occurred in the relevant timeframe (see SOP)
-- and the tumour is T1 (non-muscle invasive) (a stage-specific tumour resection flag will incorporate this stage criteria in the final table)
-- and the patient only had one tumour in the time period of interest (this is also incorporated in the final table)

CREATE TABLE tr_hes_bladder AS(
SELECT DISTINCT tumourid, CASE WHEN datediff IS NULL THEN 0 ELSE 1 END AS bladder1_hes, opdate AS hessg_date, hessg_trust_code
FROM (SELECT tumourid, datediff, rk, opdate, hessg_trust_code FROM (SELECT tc.tumourid, ho.opdate - tc.diagnosisdatebest AS datediff, RANK() OVER (PARTITION BY tc.tumourid ORDER BY ho.opdate, hl.datayear,hl.epikeyanon,POS) AS rk, ho.opdate, procode3 AS hessg_trust_code FROM tr_tumour_cohort tc
INNER JOIN analysislouisereynolds.timeframe_lookup_13_19@casref01 tim ON tim.tumouricdsite3code = tc.tumour_code
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INNER JOIN heslive.hes_linkage_av_apc@casref01 hl ON tc.patientid = hl.patientid
INNER JOIN heslive.hesapc@casref01 ha ON ha.datayear = hl.datayear AND ha.epikeyanon = hl.epikeyanon
INNER JOIN heslive.hesapc_opertn@casref01 ho ON ho.datayear = hl.datayear AND ho.epikeyanon = hl.epikeyanon
AND ho.opdate-tc.diagnosisdatebest BETWEEN -31 AND tim.resect_time
AND ho.opertn IN ('M421', 'M422', 'M423', 'M428', 'M429') AND tc.tumour_code IN ('C67'))
WHERE rk=1));

--11)---------------------------------- CERVICAL CANCERS; CONE BIOPSIES - AT_TREATMENT_ENGLAND ------------------
--The final treatment table will create a surgery flag for the tumour if:
--The tumour received a cone biopsy and was FIGO stage 1a (see SOP Appendices for list of opcs4 codes)
--Or the tumour received a cone biopsy and was FIGO stage 1b & 1b1 disease, if the tumour also received a lymphadenectomy
--Tables 11-14 flag the cone biopsies and lymphadenectomies, AND a cervical tumour resection flag will bring this together in the final table
-- Create a cone biopsy flag for the tumour if:
-- there is a record in at_treatment_england which states that the tumour was treated with surgery (event is '01a', '01b', '01z', or '01c')
-- and the opcs4 code is a cone biopsy
-- and the operation date (opertn) occurred in the relevant timeframe (see SOP)

CREATE TABLE tr_av_conebiops AS(
SELECT DISTINCT tumourid,
CASE WHEN datediff IS NULL THEN 0 ELSE 1 END AS coneops_avtreat
, eventdate AS avsg_date
, avsg_trust_code
FROM (SELECT tumourid, datediff, rk, eventdate, avsg_trust_code
FROM (SELECT tc.tumourid, avtreat.eventdate - tc.diagnosisdatebest AS datediff,
RANK() OVER (PARTITION BY tc.tumourid ORDER BY avtreat.eventdate, avtreat.eventid) AS rk, avtreat.eventdate
, avtreat.trust_code AS avsg_trust_code
FROM tr_tumour_cohort tc
INNER JOIN analysislouisereynolds.timeframe_lookup_13_19@casref01 tim ON tim.tumouricdsite3code = tc.tumour_code

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INNER JOIN av2019.at_treatment_england@casref01 avtreat ON avtreat.tumourid=tc.tumourid
AND eventcode IN ('01a','01b','01z','01c') AND (avtreat.eventdate-tc.diagnosisdatebest BETWEEN -31 AND tim.resect_time)
AND avtreat.opcs4_code IN ('Q014','Q033','Q031','Q032') AND tc.tumour_code='C53')
WHERE rk=1));

--12)---------------------- CERVICAL CANCERS; CONE BIOPSIES - HES ----------------------
-- Create a cone biopsy flag for the tumour if:
-- There is an inpatient hes episode with a tumour resection opcs-4 code in one of the
-- operation fields
-- and the opcs4_code is a cone biopsy (see SOP Appendices for list of opcs4 codes)
-- and the operation date (opertn) occurred in the relevant timeframe (see SOP)
-- and the patient only had one tumour in the time period of interest (this is incorporated
-- in the final table)

CREATE TABLE tr_hes_conebiops AS(
SELECT DISTINCT
  tumourid,
  CASE WHEN datediff IS NULL THEN 0 ELSE 1 END AS conebiops_hes,
  opdate AS hessg_date,
  hessg_trust_code
FROM (SELECT tumourid, datediff, rk, opdate, hessg_trust_code FROM (SELECT tc.tumourid,
    ho.opdate - tc.diagnosisdatebest AS datediff,
    RANK() OVER (PARTITION BY tc.tumourid ORDER BY ho.opdate,
    hl.datayear,hl.epikeyanon,POS) AS rk
    , ho.opdate
    , procode3 AS hessg_trust_code
FROM tr_tumour_cohort tc
INNER JOIN analysislouisereynolds.timeframe_lookup_13_19@casref01 tim ON tim.tumouricdsite3code = tc.tumour_code
INNER JOIN heslive.hes_linkage_av_apc@casref01 hl ON tc.patientid = hl.patientid
INNER JOIN heslive.hesapc@casref01 ha ON ha.datayear = hl.datayear AND ha.epikeyanon = hl.epikeyanon
INNER JOIN heslive.hesapc_opertn@casref01 ho ON ho.datayear = hl.datayear AND ho.epikeyanon = hl.epikeyanon
AND ho.opdate-tc.diagnosisdatebest BETWEEN -31 AND tim.resect_time
AND ho.opertn IN ('Q014','Q033','Q031','Q032') AND tc.tumour_code='C53')
WHERE rk=1));
13) CERVICAL CANCERS; LYMPHADENECTOMIES - AT_TREATMENT_ENGLAND

-- Create a lymphadenectomy flag for the tumour if:
-- there is a record in at_treatment_england which states that the tumour was treated with surgery (event is '01a', '01b', '01z', or '01c')
-- and the opcs4_code is a lymphadenectomy (see SOP Appendices for list of opcs4 codes)
-- and the operation date (opertn) occurred in the relevant timeframe (see SOP)

CREATE TABLE tr_av_lymph AS(
    SELECT DISTINCT
        tumourid,
        CASE WHEN datediff IS NULL THEN 0 ELSE 1 END AS lymph_avtreat,
        eventdate AS avsg_date,
        avsg_trust_code
    FROM (
        SELECT tumourid, datediff, rk, eventdate, avsg_trust_code
        FROM (
            SELECT tc.tumourid, avtreat.eventdate - tc.diagnosisdatebest AS datediff,
                    RANK() OVER (PARTITION BY tc.tumourid ORDER BY avtreat.eventdate, avtreat.eventid) AS rk, avtreat.eventdate, avtreat.trust_code AS avsg_trust_code
            FROM tr_tumour_cohort tc
            INNER JOIN analysislouisereynolds.timeframe_lookup_13_19@casref01 tim ON tim.tumouricdsite3code = tc.tumour_code
            INNER JOIN av2019.at_treatment_england@casref01 avtreat ON avtreat.tumourid=tc.tumourid
            AND eventcode IN ('01a','01b','01z','01c') AND (avtreat.eventdate - tc.diagnosisdatebest BETWEEN -31 AND tim.resect_time)
            AND avtreat.opcs4_code IN ('T856','T859','T865') AND tc.tumour_code='C53')
        WHERE rk=1)));

14) CERVICAL CANCERS; LYMPHADENECTOMIES - HES

-- Create a lymphadenectomy flag for the tumour if:
-- There is an inpatient hes episode with a tumour resection opcs-4 code in one of the operation fields
-- And the opcs4_code is a lymphadenectomy (see SOP Appendices for list of opcs4 codes)
-- And the operation date (opertn) occurred in the relevant timeframe (see SOP)
--- And the patient only had one tumour in the time period of interest (this is incorporated in the final table)

```sql
CREATE TABLE tr_hes_lymph AS(
    SELECT DISTINCT tumourid, CASE WHEN datediff IS NULL THEN 0 ELSE 1 END AS lymph_hes, opdate AS hessg_date, hessg_trust_code
    FROM (SELECT tumourid, datediff, rk, opdate, hessg_trust_code FROM (SELECT tc.tumourid, ho.opdate - tc.diagnosisdatebest AS datediff, RANK() OVER (PARTITION BY tc.tumourid ORDER BY ho.opdate, hl.datayear, hl.epikeyanon, pos) AS rk, ho.opdate, procode3 AS hessg_trust_code FROM tr_tumour_cohort tc INNER JOIN analysislouisereynolds.timeframe_lookup_13_19@casref01 tim ON tim.tumouricdsite3code = tc.tumour_code INNER JOIN heslive.hes_linkage_av_apc@casref01 hl ON tc.patientid = hl.patientid INNER JOIN heslive.hesapc@casref01 ha ON ha.datayear = hl.datayear AND ha.epikeyanon = hl.epikeyanon INNER JOIN heslive.hesapc_opertn@casref01 ho ON ho.datayear = hl.datayear AND ho.epikeyanon = hl.epikeyanon AND ho.opdate-tc.diagnosisdatebest BETWEEN -31 AND tim.resect_time AND ho.opertn IN ('T856', 'T859', 'T865') AND tc.tumour_code='C53') WHERE rk=1));
```

---

```
CREATE TABLE tr_av_colorec AS(  
```
SELECT DISTINCT
    tumourid,
CASE WHEN datediff IS NULL THEN 0 ELSE 1 END AS colorec_avtreat,
    eventdate AS avsg_date,
    avsg_trust_code
FROM (SELECT tumourid, datediff, rk, eventdate, avsg_trust_code
FROM (SELECT tumourid, datediff, rk, eventdate, avsg_trust_code
FROM (SELECT tc.tumourid,
    avtreat.eventdate - tc.diagnosisdatebest AS datediff,
    RANK() OVER (PARTITION BY tc.tumourid ORDER BY avtreat.eventdate,
    avtreat.eventid) AS rk, avtreat.eventdate
    , avtreat.trust_code AS avsg_trust_code
    FROM tr_tumour_cohort tc
    INNER JOIN analysislouisereynolds.timeframe_lookup_13_19@casref01 tim ON
    tim.tumourcode = tc.tumour_code
    INNER JOIN av2019.at_treatment_england@casref01 avtreat ON
    avtreat.tumourid = tc.tumourid
    AND eventcode IN ('01a','01b','01z','01c') AND (avtreat.eventdate
    - tc.diagnosisdatebest BETWEEN -31 AND tim.resect_time)
    AND avtreat.opcs4_code IN ('H201','H412','H206','H231','H236','H205','H202','H122','H235','H239','H402','H232','H261','H208','H341','H418','H209','H248','H238','H204','H419','H221','H251','H259','H229','H181','H281','H191','H561')
    AND tc.tumour_code in ('C18', 'C19', 'C20'))
WHERE rk=1));

-- Create a surgery flag for the tumour if:  
-- There is an inpatient hes episode with a tumour resection opcs-4 code in one of the  
-- operation fields  
-- and the opcs4_code is an endoscopic resection or endoscopic biopsy procedure (see  
-- SOP Appendices for list of opcs4 codes)  
-- and the operation date (operntn) occurred in the relevant timeframe (see SOP)  
-- and the tumour is TNM stage 1 (a stage-specific tumour resection flag will incorporate  
-- this stage criteria in the final table)  
-- and the patient only had one tumour in the time period of interest (this is also  
-- incorporated in the final table)  

CREATE TABLE tr_hes_colorec AS(
    SELECT DISTINCT
tumourid,
CASE WHEN datediff IS NULL THEN 0 ELSE 1 END AS colorec_hes
, opdate AS hessg_date
, hessg_trust_code
FROM (SELECT tumourid, datediff, rk, opdate, hessg_trust_code FROM (SELECT tumourid, datediff, rk, opdate, hessg_trust_code FROM (SELECT tc.tumourid, ho.opdate - tc.diagnosisdatebest AS datediff,
RANK() OVER (PARTITION BY tc.tumourid ORDER BY ho.opdate, hl.datayear, hl.epikeyanon, POS) AS rk
, ho.opdate
, procode3 AS hessg_trust_code
FROM tr_tumour_cohort tc
INNER JOIN analysislouisereynolds.timeframe_lookup_13_19@casref01 tim ON tim.tumouricdsite3code = tc.tumour_code
INNER JOIN heslive.hes_linkage_av_apc@casref01 hl ON tc.patientid = hl.patientid
INNER JOIN heslive.hesapc@casref01 ha ON ha.datayear = hl.datayear AND ha.epikeyanon = hl.epikeyanon
INNER JOIN heslive.hesapc_opertn@casref01 ho ON ho.datayear = hl.datayear AND ho.epikeyanon = hl.epikeyanon
AND ho.opdate - tc.diagnosisdatebest BETWEEN -31 AND tim.resect_time
AND tc.tumour_code in ('C18', 'C19', 'C20'))
WHERE rk = 1));

-- 17)------------------ COLORECTAL CANCERS; APPENDECTOMIES FOR APPENDIX TUMOURS ONLY C18.1 - AT_TREATMENT_ENGLAND ------------------
-- Create a surgery flag for the tumour if:
-- there is a record in AT_TREATMENT_ENGLAND which states that the tumour was treated with surgery (event is '01a', '01b', '01z', or '01c')
-- And the opcs4_code is an appendectomy procedure (see SOP Appendices for list of opcs4 codes)
-- And the operation date (opertn) occurred in the relevant timeframe (see SOP)
-- And the tumour is an appendix tumour (C18.1)

CREATE TABLE tr_av_coloappen AS
(SELECT DISTINCT tumourid,
CASE WHEN datediff IS NULL THEN 0 ELSE 1 END AS colorec_avtreat_appen
, eventdate AS avsg_date
, avsg_trust_code
FROM (SELECT tumourid, datediff, rk, eventdate, avsg_trust_code
FROM (SELECT tc.tumourid,
avtreat.eventdate
- tc.diagnosisdatebest AS datediff,
RANK() OVER (PARTITION BY tc.tumourid ORDER BY avtreat.eventdate,
avtreat.eventid) AS rk, avtreat.eventdate
, avtreat.trust_code AS avsg_trust_code
FROM tr_tumour_cohort tc
INNER JOIN analysislouisereynolds.timeframe_lookup_13_19@casref01 tim ON
tim.tumouricdsite3code = tc.tumour_code
INNER JOIN av2019.at_treatment_england@casref01 avtreat ON
avtreat.tumourid=tc.tumourid
AND eventcode IN ('01a','01b','01z','01c') AND (avtreat.eventdate
- tc.diagnosisdatebest BETWEEN -31 AND tim.resect_time)
AND avtreat.opcs4_code IN ('H024','H019','H011') AND tc.site_icd10_o2 in ('C181'))
WHERE rk=1));

--18)------------------ COLORECTAL CANCERS; APPENDECTOMIES FOR APPENDIX TUMOURS ONLY C18.1 - HES ------------------
-- Create a surgery flag for the tumour if:
-- There is an inpatient hes episode with a tumour resection opcs-4 code in one of the operation fields
-- and the opcs4_code is an appendectomy procedure (see SOP Appendices for list of opcs4 codes)
-- and the operation date (opertn) occurred in the relevant timeframe (see SOP)
-- and the tumour is an appendix tumour (C18.1)
-- and the patient only had one tumour in the time period of interest (this is also incorporated in the final table)

CREATE TABLE tr_hes_coloappen AS (SELECT DISTINCT tumourid,
CASE WHEN datediff IS NULL THEN 0 ELSE 1 END AS colorec_hes_appen
, opdate AS hessg_date
, hessg_trust_code
FROM (SELECT tumourid, datediff, rk, opdate, hessg_trust_code FROM (
SELECT tc.tumourid,  
ho.opdate-tc.diagnosisdatebest AS datediff,  
RANK() OVER (PARTITION BY tc.tumourid ORDER BY ho.opdate,  
hl.datayear,hl.epikeyanon,POS) AS rk  
, ho.opdate  
, procode3 AS hessg_trust_code  
FROM tr_tumour_cohort tc  
INNER JOIN analysislouisereynolds.timeframe_lookup_13_19@casref01 tim ON  
tim.tumouricdsite3code = tc.tumour_code  
INNER JOIN heslive.hes_linkage_av_apc@casref01 hl ON tc.patientid = hl.patientid  
INNER JOIN heslive.hesapc@casref01 ha ON ha.datayear = hl.datayear AND  
ha.epikeyanon = hl.epikeyanon  
INNER JOIN heslive.hesapc_opertn@casref01 ho ON ho.datayear = hl.datayear AND  
ho.epikeyanon = hl.epikeyanon  
AND ho.opdate-tc.diagnosisdatebest BETWEEN -31 AND tim.resect_time  
AND ho.opertn IN ('H024', 'H019', 'H011') AND tc.site_icd10_o2 in ('C181')  
WHERE rk=1));

-----------------------------------------------
CREATE CHEMO FLAG TABLES -------------------------
-----------------------------------------------
--19)------------------ ALL SITES - AVCT TABLE -------------------------------
-- Create a chemo flag for the tumour if:  
-- There is a record in AT_TREATMENT_ENGLAND which states that the tumour was  
treated with chemotherapy (event is either 'Cytotoxic Chemotherapy' (code = 02) or 'CT  
- Other' (code = CTX) or 'chemoradiotherapy' (code = 04) or 'radioisotope therapy  
(including radioiodine)' (code = 19) or 'Immunotherapy' (code = 15))  
-- AND the event date (eventdate) occurred in the relevant timeframe (see SOP)  
CREATE TABLE tr_av_ct AS(  
SELECT DISTINCT  
tumourid,  
CASE WHEN datediff IS NULL THEN 0 ELSE 1 END AS avct_flag  
, eventdate AS avct_date  
, avct_trust_code  
FROM (  
SELECT tumourid, datediff, rk ,eventdate, avct_trust_code FROM (  
SELECT tc.tumourid,  
avtreat.eventdate-tc.diagnosisdatebest AS datediff,  
RANK() OVER (PARTITION BY tc.tumourid ORDER BY avtreat.eventdate,  
avtreat.eventid) AS rk  
, avtreat.eventdate  
, avtreat.trust_code AS avct_trust_code  
FROM tr_tumour_cohort tc

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INNER JOIN analysislouisereynolds.timeframe_lookup_13_19@casref01 tim ON
tim.tumouricdsite3code = tc.tumour_code
INNER JOIN av2019.at_treatment_england@casref01 avtreat ON
avtreat.tumourid=tc.tumourid
AND eventcode IN ('02','04','15','19','CTX') AND (avtreat.eventdate-TCXdate BETWEEN -31 AND tim.CHEMO_TIME)
WHERE rk=1));

--20)---------------------ALL SITES - SACT LEGACY -- UP TO 30th JUNE 2017 ---------------------

-- Create a chemo flag for the tumour if:
-- there is a record in SACT LEGACY (excluding those null or classified as 'hormones' or
'Not chemo' or 'Zoledronic acid' or 'Pamidronate' or 'Denosumab')
-- AND the start date of the regimen (start_date_of_regimen) occurred in the relevant timeframe
-- AND the patient only had one tumour in the time period of interest (this is also incorporated in the final table)
-- AND the start date of the regimen is up to 30th June 2017
CREATE TABLE tr_sact AS (
  SELECT DISTINCT tumourid,
  CASE WHEN datediff IS NULL THEN 0 ELSE 1 END AS sact_flag,
  start_date_of_regimen AS sact_date,
  sact_trust_code
  FROM ( SELECT tumourid, datediff, rk,
  start_date_of_regimen, sact_trust_code
  FROM ( SELECT tc.tumourid, sr.start_date_of_regimen
  - tc.diagnosisdatebest AS datediff,
  RANK() OVER (PARTITION BY tc.tumourid ORDER BY sr.start_date_of_regimen,
  sr.merged_regimen_id, st.merged_tumour_id) AS rk
  , sr.start_date_of_regimen
  , SUBSTR(st.organisation_code_of_provider,1,3) AS sact_trust_code
  FROM tr_tumour_cohort tc
  INNER JOIN
  analysislouisereynolds.timeframe_lookup_13_19@casref01 tim ON
tim.tumouricdsite3code = tc.tumour_code
  INNER JOIN sact_legacy.patient@casref01 sp ON tc.nhsnumber=sp.nhs_number
  INNER JOIN sact_legacy.tumour@casref01 st ON
  sp.merged_patient_id=st.merged_patient_id
  INNER JOIN sact_legacy.regimen@casref01 SR on
  st.merged_tumour_id=sr.merged_tumour_id
  AND (NOT (benchmark_group IN ('NOT CHEMO','HORMONES','ZOLEDRONIC ACID','PAMIDRONATE','DENOSUMAB') OR benchmark_group IS NULL))
  AND sr.start_date_of_regimen-TCXdate BETWEEN -31 AND tim.CHEMO_TIME)
AND sr.start_date_of_regimen<=TO_DATE('2017-06-30','YYYY-MM-DD')
) WHERE rk=1
});

--21)-----------ALL SITES - SACT ENCORE -- FROM 1 JULY 2017 ------------------------
-- Create a chemo flag for the tumour if:
-- there is a record in SACT ENCORE (excluding those null or classified as 'hormones' or 'Not chemo' or 'Zoledronic acid' or 'Pamidronate' or 'Denosumab')
-- AND the start date of the regimen (start_date_of_regimen) occurred in the relevant timeframe
-- AND the patient only had one tumour in the time period of interest (this is also incorporated in the final table)
-- AND the start date of the regimen is from 1 July 2017 onwards
CREATE TABLE tr_sact_2 AS
(SELECT
DISTINCT tumourid,
CASE WHEN datediff IS NULL THEN 0 ELSE 1 END AS sact2_flag,
start_date_of_regimen AS sact2_date,
sact2_trust_code
FROM (SELECT /*+ USE_HASH(tc tim) USE_HASH(tim sp) USE_HASH(sp st) USE_HASH(st sr)*/
tumourid, datediff ,rk,
start_date_of_regimen, sact2_trust_code
FROM (SELECT tc.tumourid,
sr.start_date_of_regimen
- tc.diagnosisdatebest AS datediff, RANK() OVER (PARTITION BY tc.tumourid ORDER BY sr.start_date_of_regimen, sr.merged_regimen_id, st.sact_tumour_id) AS rk,
sr.start_date_of_regimen, SUBSTR(st.organisation_code_of_provider,1,3) AS sact2_trust_code
FROM tr_tumour_cohort tc
INNER JOIN analysislouisereynolds.timeframe_lookup_13_19@casref01 TIM ON TIM.tumouricdsite3code = tc.tumour_code
INNER JOIN sact.at_patient_england@cas2204 sp ON tc.nhsnumber=sp.nhs_number
INNER JOIN sact.at_tumour_england@cas2204 st ON sp.encore_patient_id = st.encore_patient_id
INNER JOIN sact.at_regimen_england@cas2204 sr ON st.sact_tumour_id=sr.sact_tumour_id
AND (NOT (benchmark_group IN ('NOT CHEMO','HORMONES','ZOLEDRONIC ACID','PAMIDRONATE','DENOSUMAB') OR benchmark_group IS NULL))
AND sr.start_date_of_regimen-tc.diagnosisdatebest BETWEEN -31 AND TIM.chemo_time
AND sr.start_date_of_regimen<=TO_DATE('2017-06-30','YYYY-MM-DD')
) WHERE rk=1
});
AND sr.start_date_of_regimen>=TO_DATE('2017-07-01','YYYY-MM-DD')
)
WHERE rk=1
));

---------------------------------------------------------------
--------------------- CREATE RADIOTHERAPY FLAG TABLES ---------------------
------------------------------------------------------------------------
--22)------------------- ALL SITES - AT_TREATMENT_ENGLAND -------------------
-- Create a radiotherapy flag for the tumour if:
-- There is a record in AT_TREATMENT_ENGLAND which states that the tumour was
treated with radiotherapy
--(event is either 'RT - Teletherapy' (code = 05) or 'chemoradiotherapy' (code = 04) or
'radiosurgery' (code = 22) or 'RT - Other/ NK' (code = RTX))
-- AND the event date (eventdate) occurred in the relevant timeframe (see SOP)

CREATE TABLE tr_av_rt AS (SELECT DISTINCT tumourid, CASE WHEN datediff IS NULL THEN 0 ELSE 1 END AS avrt_flag, eventdate AS avrt_date, avrt_trust_code FROM (SELECT tumourid, datediff, rk, eventdate, avrt_trust_code FROM (SELECT tc.tumourid, avtreat.eventdate - tc.diagnosisdatebest AS datediff, RANK() OVER (PARTITION BY tc.tumourid ORDER BY avtreat.eventdate, avtreat.eventid) AS rk, avtreat.eventdate, avtreat.trust_code AS avrt_trust_code FROM tr_tumour_cohort tc INNER JOIN analysislouisereynolds.timeframe_lookup_13_19@casref01 tim ON tim.tumouricdsite3code = tc.tumour_code INNER JOIN av2019.at_treatment_england@casref01 avtreat ON avtreat.tumourid=tc.tumourid AND eventcode IN ('04','05','22','RTX') AND (avtreat.eventdate-tc.diagnosisdatebest BETWEEN -31 AND tim.RADIO_TIME) ) WHERE rk=1 ));
--23)-----------------ALL SITES - RTDS PRE APRIL 2016 (COLLECTED BY NATCANSAT)------------------
-- Create a radiotherapy flag for the tumour if:
-- There is a record in rtds (excluding those classed as Brachytherapy, i.e., with RTTREATMENTMODALITY='06')
-- AND the appointment date (APPTDATE) occurred in the relevant timeframe
-- AND the patient only had one tumour in the time period of interest (this is also incorporated in the final table)
CREATE TABLE tr_rtds
AS(
SELECT DISTINCT
tumourid,
CASE WHEN datediff IS NULL THEN 0 ELSE 1 END AS rtds_flag
, apptdate AS rtds_date
, rtds_trust_code
FROM (SELECT tumourid,datediff,rk , apptdate, rtds_trust_code FROM (SELECT tc.tumourid,
rl.apptdate
- tc.diagnosisdatebest AS datediff,
RANK() OVER (PARTITION BY tc.tumourid ORDER BY
rl.apptdate,rl.attendid,rl.orgcodeprovider,pr.radiotherapyepisodeid,pr.prescriptionid) AS rk
, rl.apptdate
, CAST(SUBSTR(pr.orgcodeprovider,1,3) AS VARCHAR(3)) AS rtds_trust_code
FROM tr_tumour_cohort tc
INNER JOIN analysislouisereynolds.timeframe_lookup_13_19@casref01 tim ON
tim.tumouricdsite3code = tc.tumour_code
INNER JOIN rtds2016.opcds_cas1712_linkage rl ON tc.patientid=rl.patientid AND rl.apptdate-rl.diagnosisdatebest BETWEEN -31 AND tim.radio_time
INNER JOIN rtds2016.rtds_prescriptions pr ON pr.orgcodeprovider = rl.orgcodeprovider AND pr.attendid = rl.attendid
AND pr.apptdate = rl.apptdate AND pr.rttreatmentmodality NOT IN ('06')
) WHERE rk=1
)
);

--24)----------------- ALL SITES - RTDS POST APRIL 2016 (COLLECTED BY NCRAS; PROCESSED BY ENCORE)-------------------
-- Create a radiotherapy flag for the tumour if:
-- There is a record in rtds (excluding those classed as Brachytherapy, i.e., with RTTREATMENTMODALITY='06')
-- AND the appointment date (APPTDATE) occurred in the relevant timeframe
-- AND the patient only had one tumour in the time period of interest (this is also incorporated in the final table)
-- Do not flag the patient as receiving radiotherapy if the appointment date was before 1st April 2016

CREATE TABLE
tr_rtds_2 AS (
SELECT DISTINCT
  tumourid,
  CASE WHEN datediff IS NULL THEN 0 ELSE 1 END AS rtds2_flag,
  TO_DATE(apptdate) AS rtds2_date,
  rtds2_trust_code
FROM (SELECT tumourid,datediff,rk, apptdate, rtds2_trust_code FROM (SELECT tc.tumourid, TO_DATE(pr.apptdate) - tc.diagnosisdatebest AS datediff,
  TO_DATE(pr.apptdate) AS apptdate,
  RANK() OVER (PARTITION BY tc.tumourid ORDER BY TO_DATE(pr.apptdate),pr.attendid,pr.orgcodeprovider,pr.radiotherapyepisodeid,pr.prescriptionid) AS rk,
  pr.orgcodeprovider AS rtds2_trust_code
FROM tr_tumour_cohort tc
INNER JOIN analysislouisereynolds.timeframe_lookup_13_19@casref01 tim ON tim.tumouricdsite3code = tc.tumour_code
INNER JOIN rtds.at_prescriptions_england@cas2204 pr ON pr.patientid=tc.patientid AND pr.rttreatmentmodality NOT IN ('06') AND pr.orgcodeprovider <> '7A3'
AND TO_DATE(pr.apptdate)-tc.diagnosisdatebest BETWEEN -31 AND tim.radio_time
AND TO_DATE(pr.apptdate) BETWEEN TO_DATE('01-APR-16', 'dd-mm-yy') AND TO_DATE('31-DEC-20 23:59:00', 'DD/MM/YY HH24:MI:SS')
WHERE rk=1)
)
);------------------------------------------ Index the tables from above------------------------------------------
------------------------------------------
CREATE UNIQUE INDEX analysislouisereynolds.tr_AVCT_tumourid_uq ON analysislouisereynolds.tr_av_CT ( tumourid ) NOLOGGING TABLESPACE analysisdata_IX;
CREATE UNIQUE INDEX analysislouisereynolds.tr_AVRT_tumourid_uq ON analysislouisereynolds.tr_av_RT ( tumourid ) NOLOGGING TABLESPACE analysisdata_IX;
CREATE UNIQUE INDEX analysislouisereynolds.tr_AVSG_tumourid_uq ON analysislouisereynolds.tr_av_sg ( tumourid ) NOLOGGING TABLESPACE analysisdata_IX;
CREATE UNIQUE INDEX analysislouisereynolds.tr_av_bladder1_tumourid_uq ON analysislouisereynolds.tr_av_bladder ( tumourid ) NOLOGGING TABLESPACE analysisdata_IX;
CREATE UNIQUE INDEX analysislouisereynolds.tr_av_coloappen_tumourid_uq ON analysislouisereynolds.tr_av_coloappend ( tumourid ) NOLOGGING TABLESPACE analysisdata_IX;
CREATE UNIQUE INDEX analysislouisereynolds.tr_av_colorec_tumourid_uq ON analysislouisereynolds.tr_av_colorec ( tumourid ) NOLOGGING TABLESPACE analysisdata_IX;
CREATE UNIQUE INDEX analysislouisereynolds.tr_av_conebiops_tumourid_uq ON analysislouisereynolds.tr_av_conebiops ( tumourid ) NOLOGGING TABLESPACE analysisdata_IX;
CREATE UNIQUE INDEX analysislouisereynolds.tr_av_liver_tumourid_uq ON analysislouisereynolds.tr_av_liver ( tumourid ) NOLOGGING TABLESPACE analysisdata_IX;
CREATE UNIQUE INDEX analysislouisereynolds.tr_av_lymph_tumourid_uq ON analysislouisereynolds.tr_av_lymph ( tumourid ) NOLOGGING TABLESPACE analysisdata_IX;
CREATE UNIQUE INDEX analysislouisereynolds.tr_av_oesoph_tumourid_uq ON analysislouisereynolds.tr_av_oesoph ( tumourid ) NOLOGGING TABLESPACE analysisdata_IX;
CREATE UNIQUE INDEX analysislouisereynolds.tr_av_stomach_tumourid_uq ON analysislouisereynolds.tr_av_stomach ( tumourid ) NOLOGGING TABLESPACE analysisdata_IX;
EXECUTE dbms_stats.gather_table_stats('analysislouisereynolds', 'tr_av_CT')
EXECUTE dbms_stats.gather_index_stats('analysislouisereynolds', 'tr_AVCT_tumourid_uq')
EXECUTE dbms_stats.gather_table_stats('analysislouisereynolds', 'tr_av_RT')
EXECUTE dbms_stats.gather_index_stats('analysislouisereynolds', 'tr_AVRT_tumourid_uq')
EXECUTE dbms_stats.gather_table_stats('analysislouisereynolds', 'tr_av_sg')
EXECUTE dbms_stats.gather_index_stats('analysislouisereynolds', 'tr_AVSG_tumourid_uq')
EXECUTE dbms_stats.gather_table_stats('analysislouisereynolds', 'tr_av_bladder')
EXECUTE dbms_stats.gather_index_stats('analysislouisereynolds', 'tr_av_bladder1_tumourid_uq')
EXECUTE dbms_stats.gather_table_stats('analysislouisereynolds', 'tr_av_coloappen')
EXECUTE dbms_stats.gather_index_stats('analysislouisereynolds', 'tr_av_coloappen_tumourid_uq')
EXECUTE dbms_stats.gather_table_stats('analysislouisereynolds', 'tr_av_colorec')
EXECUTE dbms_stats.gather_index_stats('analysislouisereynolds', 'tr_av_colorec_tumourid_uq')
EXECUTE dbms_stats.gather_table_stats('analysislouisereynolds', 'tr_av_conebiops')
EXECUTE dbms_stats.gather_index_stats('analysislouisereynolds', 'tr_av_conebiops_tumid_uq')
EXECUTE dbms_stats.gather_table_stats('analysislouisereynolds', 'tr_av_liver')
EXECUTE dbms_stats.gather_index_stats('analysislouisereynolds', 'tr_av_liver_tumourid_uq')
EXECUTE dbms_stats.gather_table_stats('analysislouisereynolds', 'tr_av_lymph')
EXECUTE dbms_stats.gather_index_stats('analysislouisereynolds', 'tr_av_lymph_tumourid_uq')
EXECUTE dbms_stats.gather_table_stats('analysislouisereynolds', 'tr_av_oesoph')
EXECUTE dbms_stats.gather_index_stats('analysislouisereynolds', 'tr_av_oesoph_tumourid_uq')
EXECUTE dbms_stats.gather_table_stats('analysislouisereynolds', 'tr_av_stomach')
EXECUTE dbms_stats.gather_index_stats('analysislouisereynolds', 'tr_av_stomach_tumourid_uq')

CREATE UNIQUE INDEX analysislouisereynolds.tr_hes_sg_tumourid_uq ON analysislouisereynolds.tr_hes_sg (tumourid) NOLOGGING TABLESPACE analysisdata_IX;
CREATE UNIQUE INDEX analysislouisereynolds.tr_hes_bladder1_tumid_uq ON analysislouisereynolds.tr_hes_bladder (tumourid) NOLOGGING TABLESPACE analysisdata_IX;
CREATE UNIQUE INDEX analysislouisereynolds.tr_hes_coloappen_tumid_uq ON analysislouisereynolds.tr_hes_coloappen (tumourid) NOLOGGING TABLESPACE analysisdata_IX;
CREATE UNIQUE INDEX analysislouisereynolds.tr_hes_colorec_tumourid_uq ON analysislouisereynolds.tr_hes_colorec (tumourid) NOLOGGING TABLESPACE analysisdata_IX;
CREATE UNIQUE INDEX analysislouisereynolds.tr_hes_conebiops_tumid_uq ON analysislouisereynolds.tr_hes_conebiops (tumourid) NOLOGGING TABLESPACE analysisdata_IX;
CREATE UNIQUE INDEX analysislouisereynolds.tr_hes_liver_tumourid_uq ON analysislouisereynolds.tr_hes_liver (tumourid) NOLOGGING TABLESPACE analysisdata_IX;
CREATE UNIQUE INDEX analysislouisereynolds.tr_hes_lymph_tumourid_uq ON analysislouisereynolds.tr_hes_lymph (tumourid) NOLOGGING TABLESPACE analysisdata_IX;
CREATE UNIQUE INDEX analysislouisereynolds.tr_hes_oesoph_tumourid_uq ON analysislouisereynolds.tr_hes_oesoph (tumourid) NOLOGGING TABLESPACE analysisdata_IX;
CREATE UNIQUE INDEX analysislouisereynolds.tr_hes_stomach_tumourid_uq ON analysislouisereynolds.tr_hes_stomach (tumourid) NOLOGGING TABLESPACE analysisdata_IX;
CREATE UNIQUE INDEX analysislouisereynolds.tr_rtds_tumourid_uq ON analysislouisereynolds.tr_rtds (tumourid) NOLOGGING TABLESPACE analysisdata_IX;
CREATE UNIQUE INDEX analysislouisereynolds.tr_rtds_2_tumourid_uq ON analysislouisereynolds.tr_rtds_2 (tumourid) NOLOGGING TABLESPACE analysisdata_IX;
CREATE UNIQUE INDEX analysislouisereynolds.tr_sact_tumourid_uq ON analysislouisereynolds.tr_sact (tumourid) NOLOGGING TABLESPACE analysisdata_IX;
CREATE UNIQUE INDEX analysislouisereynolds.tr_sact_2_tumourid_uq ON analysislouisereynolds.tr_sact_2 (tumourid) NOLOGGING TABLESPACE analysisdata_IX;
EXECUTE dbms_stats.gather_table_stats('analysislouisereynolds', 'tr_hes_sg')
EXECUTE dbms_stats.gather_table_stats('analysislouisereynolds', 'tr_hes_bladder')
EXECUTE dbms_stats.gather_table_stats('analysislouisereynolds', 'tr_hes_coloapp')
EXECUTE dbms_stats.gather_table_stats('analysislouisereynolds', 'tr_hes_colorec')
EXECUTE dbms_stats.gather_table_stats('analysislouisereynolds', 'tr_hes_conebiops')
EXECUTE dbms_stats.gather_table_stats('analysislouisereynolds', 'tr_hes_liver')
EXECUTE dbms_stats.gather_table_stats('analysislouisereynolds', 'tr_hes_lymph')
EXECUTE dbms_stats.gather_table_stats('analysislouisereynolds', 'tr_hes_oesoph')
EXECUTE dbms_stats.gather_index_stats('analysislouisereynolds', 'tr_rtds_tumourid_uq')
EXECUTE dbms_stats.gather_table_stats('analysislouisereynolds', 'tr_rtds_2')
EXECUTE dbms_stats.gather_index_stats('analysislouisereynolds', 'tr_rtds_2_tumourid_uq')
EXECUTE dbms_stats.gather_table_stats('analysislouisereynolds', 'tr_sact')
EXECUTE dbms_stats.gather_index_stats('analysislouisereynolds', 'tr_sact_tumourid_uq')
EXECUTE dbms_stats.gather_table_stats('analysislouisereynolds', 'tr_sact_2')
EXECUTE dbms_stats.gather_index_stats('analysislouisereynolds', 'tr_sact_2_tumourid_uq')

CREATE TABLE av_treatment_1319_4p7 NOLOGGING COMPRESS AS
SELECT
CASE
WHEN avrt_flag=1 THEN 1
WHEN rtds_flag=1 AND tc.tumour_flag=0 THEN 1
WHEN rtds2_flag=1 AND tc.tumour_flag=0 THEN 1
ELSE 0
END AS rt_flag

CASE
WHEN avct_flag=1 THEN 1
WHEN sact_flag=1 AND tc.tumour_flag=0 THEN 1
WHEN sact2_flag=1 AND tc.tumour_flag=0 THEN 1
ELSE 0
END AS ct_flag

CASE
WHEN avct_flag=1 THEN 1
WHEN sact_flag=1 AND tc.tumour_flag=0 THEN 1
WHEN sact2_flag=1 AND tc.tumour_flag=0 THEN 1
ELSE 0
END AS ct_flag

CREATE TABLE av_treatment_1319_4p7 NOLOGGING COMPRESS AS
SELECT
CASE
WHEN avrt_flag=1 THEN 1
WHEN rtds_flag=1 AND tc.tumour_flag=0 THEN 1
WHEN rtds2_flag=1 AND tc.tumour_flag=0 THEN 1
ELSE 0
END AS rt_flag

CASE
WHEN avct_flag=1 THEN 1
WHEN sact_flag=1 AND tc.tumour_flag=0 THEN 1
WHEN sact2_flag=1 AND tc.tumour_flag=0 THEN 1
ELSE 0
END AS ct_flag

CREATE TABLE av_treatment_1319_4p7 NOLOGGING COMPRESS AS
SELECT
CASE
WHEN avrt_flag=1 THEN 1
WHEN rtds_flag=1 AND tc.tumour_flag=0 THEN 1
WHEN rtds2_flag=1 AND tc.tumour_flag=0 THEN 1
ELSE 0
END AS rt_flag
Only use the patient level datasets (hes) if the patient had no other tumours recorded in the 18 months before or after this tumour diagnosis.

Firstly, incorporate non-stage specific resection flag using opcs4 resection lookup table

\[
\text{WHEN AVSG\_flag}=1 \text{ THEN } 1 \\
\text{WHEN hessg\_flag}=1 \text{ AND tc.tumour\_flag}=0 \text{ THEN } 1
\]

Secondly, incorporate stage specific rules for particular cancer sites

**Cervical**

\[
\begin{align*}
\text{WHEN avt.site\_icd10\_o2\_3char='C53' AND (upper(STR(tc.figo,1,2))) IN ('1A','1A')} \\
\text{AND conebiops\_avtreat=1 THEN 1} \\
\text{WHEN avt.site\_icd10\_o2\_3char='C53' AND (upper(STR(tc.figo,1,2))) IN ('1A','1A')} \\
\text{AND conebiops\_hes=1 AND tc.tumour\_flag=0 THEN 1} \\
\text{WHEN avt.site\_icd10\_o2\_3char='C53' AND (upper(tc.figo) IN ('1B','1B')} \\
\text{AND (upper(STR(tc.figo,1,3)) IN ('1B1','1B1')) AND (conebiops\_avtreat=1) AND} \\
\text{(lymph\_avtreat=1) THEN 1} \\
\text{WHEN avt.site\_icd10\_o2\_3char='C53' AND (upper(tc.figo) IN ('1B','1B')} \\
\text{AND (upper(STR(tc.figo,1,3)) IN ('1B1','1B1')) AND (conebiops\_hes=1 AND} \\
\text{tc.tumour\_flag=0 AND} \\
\text{tc.tumour\_flag=0) THEN 1}
\end{align*}
\]

**Colorectal**

\[
\begin{align*}
\text{WHEN avt.site\_icd10\_o2\_3char IN ('C18','C19','C20') AND} \\
\text{SUBSTR(avt.stage\_best,1,1)='1' AND colorec\_avtreat=1 THEN 1} \\
\text{WHEN avt.site\_icd10\_o2\_3char IN ('C18','C19','C20') AND} \\
\text{SUBSTR(avt.stage\_best,1,1)='1' AND colorec\_hes=1 AND tc.tumour\_flag=0 THEN 1}
\end{align*}
\]

Sub rule for appendectomies for colorectal:

\[
\text{WHEN avt.site\_icd10\_o2 IN ('C181') AND colorec\_avtreat\_appen=1 THEN 1} \\
\text{WHEN avt.site\_icd10\_o2 IN ('C181') AND colorec\_hes\_appen=1 AND tc.tumour\_flag=0 THEN 1}
\]

**Bladder**

\[
\begin{align*}
\text{WHEN avt.site\_icd10\_o2\_3char IN ('C67') AND SUBSTR(avt.t\_best, 1,1) = '1' AND} \\
\text{bladder\_avtreat=1 THEN 1} \\
\text{WHEN avt.site\_icd10\_o2\_3char IN ('C67') AND SUBSTR(avt.t\_best, 1,1) = '1' AND} \\
\text{bladder\_hes=1 AND tc.tumour\_flag=0 THEN 1}
\end{align*}
\]
-- liver
WHEN avt.site_icd10_o2_3char IN ('C22') AND SUBSTR(avt.stage_best,1,1)=’1’ AND liver_avtreat=1 THEN 1
WHEN avt.site_icd10_o2_3char IN ('C22') AND SUBSTR(avt.stage_best,1,1)=’1’ AND liver_hes=1 AND tc.tumour_flag=0 THEN 1

-- oesophagus
WHEN avt.site_icd10_o2_3char IN ('C15') AND SUBSTR(avt.stage_best,1,2)=’1A’ AND oesoph_avtreat=1 THEN 1
WHEN avt.site_icd10_o2_3char IN ('C15') AND SUBSTR(avt.stage_best,1,2)=’1A’ AND oesoph_hes=1 AND tc.tumour_flag=0 THEN 1

-- stomach
WHEN avt.site_icd10_o2_3char IN ('C16') AND SUBSTR(avt.stage_best,1,2)=’1A’ AND stomach_avtreat=1 THEN 1
WHEN avt.site_icd10_o2_3char IN ('C16') AND SUBSTR(avt.stage_best,1,2)=’1A’ AND stomach_hes=1 AND tc.tumour_flag=0 THEN 1
ELSE 0
END AS sg_flag

-------------------------------------------------------------------------------
-- Create cancer site names
,CASE WHEN tumour_code IN ('C67') THEN 'BLADDER'
WHEN tumour_code IN ('C50') THEN 'BREAST'
WHEN tumour_code IN ('C53') THEN 'CERVICAL'
WHEN tumour_code IN ('C18','C19') THEN 'COLON'
WHEN tumour_code IN ('C20') THEN 'RECTUM'
WHEN tumour_code IN ('C01', 'C09', 'C10') THEN 'OROPHARYNX'
WHEN tumour_code IN ('C02', 'C03', 'C04', 'C06') THEN 'ORAL_CAVITY'
WHEN tumour_code IN ('C07', 'C08') THEN 'SALIVARY_GLANDS'
WHEN tumour_code IN ('C12', 'C13') THEN 'HYPOPHARYNX'
WHEN tumour_code IN ('C32') THEN 'LARYNX'
WHEN tumour_code IN ('C05', 'C11', 'C14', 'C30', 'C31') THEN 'OTHER_HEAD_AND_NECK'
WHEN tumour_code IN ('C64', 'C65', 'C66', 'C68') THEN 'KIDNEY'
WHEN tumour_code IN ('C22') THEN 'LIVER'
WHEN tumour_code IN ('C33', 'C34') AND tc.morph_icd10_o2 IN ('8041';'8042';'8043';'8044';'8045') THEN 'SCLC'
WHEN tumour_code IN ('C33', 'C34') AND tc.morph_icd10_o2 NOT IN ('8041';'8042';'8043';'8044';'8045') THEN 'NSCLC'
WHEN tumour_code IN ('C25') THEN 'PANCREAS'
WHEN tumour_code IN ('C61') THEN 'PROSTATE'
WHEN tumour_code IN ('C15') THEN 'OESOPHAGUS'
WHEN tumour_code IN ('C56', 'C57', 'C48OVARY', 'D39OVARY') THEN 'OVARY'
WHEN tumour_code IN ('C16') THEN 'STOMACH'
WHEN tumour_code IN ('C54', 'C55') THEN 'UTERINE'
WHEN tumour_code IN ('C51') THEN 'VULVA'
WHEN tumour_code IN ('C70', 'C71', 'C72') THEN 'MALIGNANT BRAIN'
WHEN tumour_code IN ('D32BRAIN', 'D33BRAIN', 'D42BRAIN', 'D43BRAIN') THEN 'NON-MALIGNANT BRAIN'
WHEN tumour_code IN ('D35BRAIN') THEN 'BENIGN ENDOCRINE'
WHEN tumour_code IN ('C75BRAIN', 'D44BRAIN') THEN 'NON-BENIGN ENDOCRINE'
WHEN tumour_code IN ('C62', 'D29TESTES') THEN 'TESTES'
WHEN tumour_code IN ('NON-KC_MELANOMA') THEN 'SKIN:NON-KERATINOCYTE, MELANOMA'
WHEN tumour_code IN ('NON-KC_RARE') THEN 'SKIN:NON-KERATINOCYTE, RARE'
WHEN tumour_code IN ('KC_BCC') THEN 'SKIN:KERATINOCYTE SKIN, BCC'
WHEN tumour_code IN ('KC_CSICC') THEN 'SKIN:KERATINOCYTE, CSCC'
ELSE 'OTHER MALIGNANT'
END AS cancergroup

CASE
WHEN ncr.cal19nm = 'National Cancer Vanguard: Greater Manchester' THEN 'Greater Manchester'
WHEN ncr.cal19nm = 'National Cancer Vanguard: North Central AND North East London' THEN 'North Central AND North East London'
WHEN ncr.cal19nm = 'National Cancer Vanguard: North West AND South West London' THEN 'North West AND South West London'
WHEN ncr.cal19nm = 'West Yorkshire' THEN 'West Yorkshire AND Harrogate'
ELSE ncr.cal19nm
END AS cal19nm

-- Select all other variables
,avt.tumourid
,avt.diagnosisyear
,avt.age
,avt.sex
,avt.dco
,avt.basisofdiagnosis
,atg.ccg_2021_code

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,atg.gor_code
,avt.fiveyearageband
,avt.ethnicity
,chrchr.chr1tot_27_03
,imd.imd19_quintile_lsoas
,ncr.cal19cd
--For checking
,avt.morph_icd10_o2
,tc.figo
,avt.t_best
,avt.stage_best
,tc.site_icd10_o2
,site_icd10_o2_3char
,tc.tumour_flag

--Select dates of treatment from at_treatment_england
,avt.diagnosisdatebest
,avt.deathdatebest
,avct.avct_date
,avrt.avrt_date
,avsg.avsg_date

--Select dates of treatment from patient-level datasets where only 1 tumour was diagnosed in 18 months before or after that tumour
,CASE WHEN tc.tumour_flag=0 THEN sact.sact_date END AS sact_date
,CASE WHEN tc.tumour_flag=0 THEN sact2.sact2_date END AS sact2_date
,CASE WHEN tc.tumour_flag=0 THEN rtds.rtds_date END AS rtds_date
,CASE WHEN tc.tumour_flag=0 THEN hessg.hessg_date END AS hessg_date
,CASE WHEN tc.tumour_flag=0 THEN rtds2.rtds2_date END AS rtds2_date

--Select date of surgery where there were additional site-specific resections flagged:
-- CERVICAL
-- Take date of cone biopsy in at_treatment_england if:
-- The tumour received a cone biopsy and was FIGO stage 1a
-- Or the tumour received a cone biopsy and was FIGO stage 1b & 1b1 disease, if the tumour also received a lymphadenectomy

,CASE
WHEN avt.site_icd10_o2_3char='C53' AND (upper(SUBSTR(tc.figo,1,2)) IN ('1A','1A')) AND conebiops_avtreat=1 THEN cbavt.avsg_date
WHEN avt.site_icd10_o2_3char='C53' AND (upper(tc.figo) IN ('1B','1B') or upper(SUBSTR(tc.figo,1,3)) IN ('1B1','1B1')) AND (conebiops_avtreat=1) AND (lymph_avtreat=1) THEN cbavt.avsg_date
WHEN avt.site_icd10_o2_3char='C53' AND (upper(tc.figo) IN ('1B','1B') or upper(SUBSTR(tc.figo,1,3)) IN ('1B1','1B1')) AND (conebiops_avtreat=1) AND (lymph_hes=1 AND tc.tumour_flag=0) THEN cbavt.avsg_date
END AS cbavsg_date

-- Take date of cone biopsy in hes if:
-- The tumour received a cone biopsy and was FIGO stage 1a
-- Or the tumour received a cone biopsy and was FIGO stage 1b & 1b1 disease, if the tumour also received a lymphadenectomy
-- and only 1 tumour was diagnosed in 18 months before or after that tumour

CASE
WHEN avt.site_icd10_o2_3char='C53' AND (upper(SUBSTR(tc.figo,1,2)) IN ('1A','1A')) AND conebiops_hes=1 AND tc.tumour_flag=0 THEN cbhes.hessg_date
WHEN avt.site_icd10_o2_3char='C53' AND (upper(tc.figo) IN ('1B','1B') or upper(SUBSTR(tc.figo,1,3)) IN ('1B1','1B1')) AND (conebiops_hes=1 AND tc.tumour_flag=0) AND (lymph_avtreat=1) THEN cbhes.hessg_date
WHEN avt.site_icd10_o2_3char='C53' AND (upper(tc.figo) IN ('1B','1B') or upper(SUBSTR(tc.figo,1,3)) IN ('1B1','1B1')) AND (conebiops_hes=1 AND tc.tumour_flag=0) AND (lymph_hes=1 AND tc.tumour_flag=0) THEN cbhes.hessg_date
END AS cbhessg_date

---------------
colorectal---------------------------------
-- As with cervical, select the date of the stage-specific resection for each tumour, according to the rules specified earlier for generating the stage-specific resection flag for that tumour site
CASE WHEN avt.site_icd10_o2_3char IN ('C18','C19','C20') AND colorec_avtreat=1 THEN coloavt.avsg_date
END AS coloavsg_date
CASE WHEN avt.site_icd10_o2_3char IN ('C18','C19','C20') AND colorec_hes=1 AND tc.tumour_flag=0 THEN colohes.hessg_date
END AS colohessg_date
CASE WHEN avt.site_icd10_o2 IN ('C181') AND colorec_avtreat_appen=1 THEN coloavt_appen.avsg_date
END AS appenavsg_date
CASE WHEN avt.site_icd10_o2 IN ('C181') AND colorec_hes_appen=1 AND tc.tumour_flag=0 THEN colohes_appen.hessg_date
END AS appenhessg_date
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---bladder---

, CASE WHEN avt.site_icd10_o2_3char IN ('C67') AND SUBSTR(avt.t_best, 1,1) = '1' AND bladder1_avtreat=1 THEN blad1_avt.avsg_date
END AS bladavsg_date
, CASE WHEN avt.site_icd10_o2_3char IN ('C67') AND SUBSTR(avt.t_best, 1,1) = '1' AND bladder1_hes=1 AND tc.tumour_flag=0 THEN blad1_hes.hessg_date
END AS bladhessg_date

---liver---

, CASE WHEN avt.site_icd10_o2_3char IN ('C22') AND SUBSTR(avt.stage_best,1,1)='1'
AND liver_avtreat=1 THEN livavt.avsg_date
END AS livavsg_date
, CASE WHEN avt.site_icd10_o2_3char IN ('C22') AND SUBSTR(avt.stage_best,1,1)='1'
AND liver_hes=1 AND tc.tumour_flag=0 THEN livhes.hessg_date
END AS livhessg_date

---oesophageal---

, CASE WHEN avt.site_icd10_o2_3char IN ('C15') AND SUBSTR(avt.stage_best,1,2)='1A'
AND oesoph_avtreat=1 THEN oesoavt.avsg_date
END AS oesoavsg_date
, CASE WHEN avt.site_icd10_o2_3char IN ('C15') AND SUBSTR(avt.stage_best,1,2)='1A'
AND oesoph_hes=1 AND tc.tumour_flag=0 THEN oesohes.hessg_date
END AS oesohessg_date

---stomach---

, CASE WHEN avt.site_icd10_o2_3char IN ('C16') AND SUBSTR(avt.stage_best,1,2)='1A'
AND stomach_avtreat=1 THEN stomavt.avsg_date
END AS stomavsg_date
, CASE WHEN avt.site_icd10_o2_3char IN ('C16') AND SUBSTR(avt.stage_best,1,2)='1A'
AND stomach_hes=1 AND tc.tumour_flag=0 THEN stomhes.hessg_date
END AS stomhessg_date

--Select trust codes from at_treatment_england

, avsg.avsg_trust_code
, avct_trust_code
, avrt_trust_code

--Select trust codes of treatment from patient-level datasets where only 1 tumour was diagnosed in 18 months before or after that tumour
CASE WHEN tc.tumour_flag=0 THEN hessg.hessg_trust_code END AS hessg_trust_code  
CASE WHEN tc.tumour_flag=0 THEN sact.sact_trust_code END AS sact_trust_code  
CASE WHEN tc.tumour_flag=0 THEN sact2.sact2_trust_code END AS sact2_trust_code  
CASE WHEN tc.tumour_flag=0 THEN rtds.rtds_trust_code END AS rtds_trust_code  
CASE WHEN tc.tumour_flag=0 THEN rtds2.rtds2_trust_code END AS rtds2_trust_code

---------------------------------------------------
---------------------------------------------------------
--Select trust codes of surgery where there were additional site-specific resections flagged:
-----------CERVICAL---------------
-- Take trust code of cone biopsy in at_treatment_england if:
-- The tumour received a cone biopsy and was FIGO stage 1a
-- Or the tumour received a cone biopsy and was FIGO stage 1b & 1b1 disease, if the tumour also received a lymphadenectomy

 , CASE WHEN avt.site_icd10_o2_3char='C53' AND (upper(SUBSTR(tc.figo,1,2)) IN ('1A','IA')) AND conebiops_avtreat=1 THEN cbavt.avsg_trust_code
WHEN avt.site_icd10_o2_3char='C53' AND (upper(tc.figo) IN ('1B','IB') or upper(SUBSTR(tc.figo,1,3)) IN ('1B1','IB1')) AND (conebiops_avtreat=1) AND (lymph_avtreat=1) THEN cbavt.avsg_trust_code
WHEN avt.site_icd10_o2_3char='C53' AND (upper(tc.figo) IN ('1B','IB') or upper(SUBSTR(tc.figo,1,3)) IN ('1B1','IB1')) AND (conebiops_avtreat=1) AND (lymph_hes=1 AND tc.tumour_flag=0) THEN cbavt.avsg_trust_code
END AS cbavsg_trust_code

-- Take date of cone biopsy in hes if:
--The tumour received a cone biopsy AND was FIGO stage 1a
--Or the tumour received a cone biopsy AND was FIGO stage 1b & 1b1 disease, if the tumour also received a lymphadenectomy
--AND only 1 tumour was diagnosed in 18 months before or after that tumour

 , CASE WHEN avt.site_icd10_o2_3char='C53' AND (upper(SUBSTR(tc.figo,1,2)) IN ('1A','IA')) AND conebiops_hes=1 AND tc.tumour_flag=0 THEN cbhes.hessg_trust_code
WHEN avt.site_icd10_o2_3char='C53' AND (upper(tc.figo) IN ('1B','IB') or upper(SUBSTR(tc.figo,1,3)) IN ('1B1','IB1')) AND (conebiops_hes=1 AND tc.tumour_flag=0) AND (lymph_hes=1 AND tc.tumour_flag=0) THEN cbhes.hessg_trust_code

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END AS cbhessg_trust_code

---------------colorectal---------------------------
-- As with cervical, select the date of the stage-specific resection for each tumour, according to the rules specified earlier for generating the stage-specific resection flag for that tumour site
 CASE WHEN avt.site_icd10_o2_3char IN ('C18','C19','C20') AND SUBSTR(avt.stage_best,1,1)='1' AND colorec_avtreat=1 THEN coloavt.avsg_trust_code
END AS coloavsg_trust_code
CASE WHEN avt.site_icd10_o2_3char IN ('C18','C19','C20') AND SUBSTR(avt.stage_best,1,1)='1' AND colorec_hes=1 AND tc.tumour_flag=0 THEN colohes.hessg_trust_code
END AS colohessg_trust_code
CASE WHEN avt.site_icd10_o2_3char IN ('C181') AND colorec_avtreat_appen=1 THEN coloavt_appen.avsg_trust_code
END AS appenavsg_trust_code
CASE WHEN avt.site_icd10_o2_3char IN ('C181') AND colorec_hes_appen=1 AND tc.tumour_flag=0 THEN colohes_appen.hessg_trust_code
END AS appenhessg_trust_code
---------------bladder-----------------------------
CASE WHEN avt.site_icd10_o2_3char IN ('C67') AND SUBSTR(avt.t_best, 1,1) = '1' AND bladder1_avtreat=1 THEN blad1_avt.avsg_trust_code
END AS bladavsg_trust_code
CASE WHEN avt.site_icd10_o2_3char IN ('C67') AND SUBSTR(avt.t_best, 1,1) = '1' AND bladder1_hes=1 AND tc.tumour_flag=0 THEN blad1_hes.hessg_trust_code
END AS bladhessg_trust_code
---------------liver-----------------------------
CASE WHEN avt.site_icd10_o2_3char IN ('C22') AND SUBSTR(avt.stage_best,1,1)='1' AND liver_avtreat=1 THEN livavt.avsg_trust_code
END AS livavsg_trust_code
CASE WHEN avt.site_icd10_o2_3char IN ('C22') AND SUBSTR(avt.stage_best,1,1)='1' AND liver_hes=1 AND tc.tumour_flag=0 THEN livhes.hessg_trust_code
END AS livhessg_trust_code
---------------oesophageal-----------------------------
CASE WHEN avt.site_icd10_o2_3char IN ('C15') AND SUBSTR(avt.stage_best,1,2)='1A' AND oesoph_avtreat=1 THEN oesoavt.avsg_trust_code
END AS oesoavsg_trust_code
, CASE WHEN avt.site_icd10_o2_3char IN ('C15') AND SUBSTR(avt.stage_best,1,2)='1A' AND oesoph_hes=1 AND tc.tumour_flag=0 THEN oesohes.hessg_trust_code END AS oesohessg_trust_code

---------------
stomach---------------------------------
, CASE WHEN avt.site_icd10_o2_3char IN ('C16') AND SUBSTR(avt.stage_best,1,2)='1A' AND stomach_avtreat=1 THEN stomavt.avsg_trust_code END AS stomavsg_trust_code
, CASE WHEN avt.site_icd10_o2_3char IN ('C16') AND SUBSTR(avt.stage_best,1,2)='1A' AND stomach_hes=1 AND tc.tumour_flag=0 THEN stomhes.hessg_trust_code END AS stomhessg_trust_code

-------------------------------------------------------------------------------

-- final join of tables with flags
-- Treatment flag tables
-- Do not flag surgery for non-ovarian C48 tumour morphologies (these are classified as "other" tumours)

FROM av2019.at_tumour_england@casref01 AVT
INNER JOIN analysislouisereynolds.tr_tumour_cohort@casref01 tc ON avt.tumourid = tc.tumourid
LEFT JOIN analysislouisereynolds.tr_av_ct@casref01 avct ON avt.tumourid=avct.tumourid
LEFT JOIN analysislouisereynolds.tr_sact@casref01 sact ON avt.tumourid=sact.tumourid
LEFT JOIN analysislouisereynolds.tr_sact_2@casref01 sact2 ON avt.tumourid=sact2.tumourid
LEFT JOIN analysislouisereynolds.tr_av_rt@casref01 avrt ON avt.tumourid=avrt.tumourid
LEFT JOIN analysislouisereynolds.tr_av_sg@casref01 avsg ON avt.tumourid=avsg.tumourid AND (tc.tumour_code NOT IN ('C48OTHER'))
LEFT JOIN analysislouisereynolds.tr_rtds@casref01 rtds ON avt.tumourid=rtds.tumourid
LEFT JOIN analysislouisereynolds.tr_hes_sg@casref01 hessg ON avt.tumourid=hessg.tumourid AND (tc.tumour_code NOT IN ('C48OTHER'))
LEFT JOIN analysislouisereynolds.tr_rtds_2@casref01 rtds2 ON avt.tumourid=rtds2.tumourid

-- Add further joins for stage-specific resections:
-- add gynae tables:
LEFT JOIN analysislouisereynolds.tr_av_conebiops@casref01 CBAVT ON avt.tumourid=cbavt.tumourid
LEFT JOIN analysislouisereynolds.tr_hes_conebiops@casref01 CBhes ON avt.tumourid=cbhes.tumourid
LEFT JOIN analysislouisereynolds.tr_av_lymph@casref01 lyavt ON avt.tumourid=lyavt.tumourid
LEFT JOIN analysislouisereynolds.tr_hes_lymph@casref01 lyhes ON avt.tumourid=lyhes.tumourid

-- add colorectal tables:
LEFT JOIN analysislouisereynolds.tr_av_colorec@casref01 coloavt ON avt.tumourid=coloavt.tumourid
LEFT JOIN analysislouisereynolds.tr_hes_colorec@casref01 colohes ON avt.tumourid=colohes.tumourid
LEFT JOIN analysislouisereynolds.tr_av_coloappen@casref01 coloavt_appen ON avt.tumourid=coloavt_appen.tumourid
LEFT JOIN analysislouisereynolds.tr_hes_coloappen@casref01 colohes_appen ON avt.tumourid=colohes_appen.tumourid

-- add urological tables:
LEFT JOIN analysislouisereynolds.tr_av_bladder@casref01 blad1_avt ON avt.tumourid=blad1_avt.tumourid
LEFT JOIN analysislouisereynolds.tr_hes_bladder@casref01 blad1_hes ON avt.tumourid=blad1_hes.tumourid

-- add UGI tables:
LEFT JOIN analysislouisereynolds.tr_av_liver@casref01 livavt ON avt.tumourid=livavt.tumourid
LEFT JOIN analysislouisereynolds.tr_hes_liver@casref01 livhes ON avt.tumourid=livhes.tumourid
LEFT JOIN analysislouisereynolds.tr_av_oesoph@casref01 oesoavt ON avt.tumourid=oesoavt.tumourid
LEFT JOIN analysislouisereynolds.tr_hes_oesoph@casref01 oesothes ON avt.tumourid=oesothes.tumourid
LEFT JOIN analysislouisereynolds.tr_av_stomach@casref01 stomavt ON avt.tumourid=stomavt.tumourid
LEFT JOIN analysislouisereynolds.tr_hes_stomach@casref01 stomhes ON avt.tumourid=stomhes.tumourid

-- Additional demographics
LEFT JOIN av2019.at_geography_england@casref01 atg ON avt.tumourid=atg.tumourid
-- join on tumour id
LEFT JOIN IMD.imd2019_equal_lsoas@casref01 imd ON atg.lsoa11_code=imd.lsoa11_code
LEFT JOIN analysisncr.lsoa_ccg_ca_stp_2019@casref01 ncr ON ncr.lsoa11cd=atg.lsoa11_code
LEFT JOIN av2019.charlson_2006to2019@casref01 chrl ON chrl.tumourid=avt.tumourid

LEFT JOIN (select avtu.tumourid
    , CASE WHEN avtu.stage_best is null THEN 'X'
        WHEN (SUBSTR(avtu.stage_best,1,1) NOT IN ('1','2','3','4'))  THEN  'X'
        ELSE SUBSTR(avtu.stage_best,1,1) END AS stage
    FROM av2019.at_tumour_england@casref01 avtu
    WHERE avtu.diagnosisyear BETWEEN 2012 AND 2019
    AND (NOT (avtu.site_icd10_o2_3char='C50' AND SUBSTR(avtu.stage_best,1,1)='0') or avtu.stage_pi is null)
) stage_nopagets
ON stage_nopagets.tumourid=avt.tumourid
;
## Appendix 5: Datasets used

<table>
<thead>
<tr>
<th>Treatment type</th>
<th>Dataset</th>
<th>Data table version</th>
<th>Follow up period available</th>
<th>Linkage type</th>
<th>Data quality notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemotherapy</td>
<td>Registry data from AT_TREATMENT_ENGLAND</td>
<td>AV2019.AT_TREATMENT_ENGLAND@CASREF01</td>
<td>Historical – September 2021</td>
<td>Tumour level</td>
<td>Corresponds with snapshot CAS2109.</td>
</tr>
<tr>
<td>Chemotherapy</td>
<td>Systemic Anti-Cancer Therapy (SACT) 2018</td>
<td>SACT_LEGACY.PATIENT, SACT_LEGACY.TUMOUR and SACT_LEGACY.REGIMEN @CASREF01</td>
<td>January 2013 – October 2021</td>
<td>Patient and tumour level</td>
<td>Data was not submitted regularly from all NHS Trusts until July 2014 onwards. Regimen start date used to identify date of chemotherapy may be inaccurate for some tumours diagnosed at the start of 2013.</td>
</tr>
<tr>
<td>Tumour resection</td>
<td>Registry data from AT_TREATMENT_ENGLAND</td>
<td>AV2019.AT_TREATMENT_ENGLAND@CASREF01AT_TREATMENT_ENGLAND</td>
<td>Historical – September 2021</td>
<td>Tumour level</td>
<td>Corresponds with snapshot CAS2109.</td>
</tr>
<tr>
<td>Tumour resection</td>
<td>Inpatient Hospital Episodes Statistics (HES) 2018</td>
<td>HESLIVE.HESAPC and HESLIVE.HESAPC_OPERTN @CASREF01</td>
<td>April 2000 – October 2021</td>
<td>Patient level</td>
<td>Where a time period of 18 months has been used, some tumours diagnosed in 2018 will not yet have surgery data recorded in HES, so the percentage receiving a tumour resection may be an underestimate.</td>
</tr>
<tr>
<td>Radiotherapy</td>
<td>Registry data from AT_TREATMENT_ENGLAND</td>
<td>AV2019.AT_TREATMENT_ENGLAND@CASREF01AT_TREATMENT_ENGLAND</td>
<td>Historical – September 2021</td>
<td>Tumour level</td>
<td>Corresponds with snapshot CAS2109.</td>
</tr>
</tbody>
</table>
### Radiotherapy Dataset (RTDS) collected by NATCANSAT, pre April 2016

<table>
<thead>
<tr>
<th>Radiotherapy</th>
<th>Radiotherapy Dataset (RTDS) collected by NATCANSAT, pre April 2016</th>
<th>RTDS2016.RTDS_PREScriptions@CA</th>
<th>April 2009 – April 2016</th>
<th>Patient level</th>
<th>Brachytherapy &amp; teletherapy variable known to be inaccurate (there is over allocation to brachytherapy &amp; underreporting of teletherapy). Data may be incomplete for selected NHS Trusts. There are known to be undercounts in RTDS in the period between mid 2015 and March 2016.</th>
</tr>
</thead>
</table>

### Radiotherapy Dataset (RTDS) collected by PHE, post April 2016

<table>
<thead>
<tr>
<th>Radiotherapy</th>
<th>Radiotherapy Dataset (RTDS) collected by PHE, post April 2016</th>
<th>RTDS.AT_PRESCRIPtions@CAS2204</th>
<th>April 2016 – January 2022</th>
<th>Patient level</th>
<th>As above</th>
</tr>
</thead>
</table>
Appendix 6: Sensitivity analysis – impact of tumour resection code update

The list of relevant tumour resection codes was updated for SOP (v4.4) and previous versions of CAS-SOP#4, from a previous list that did not include stage-specific resections (available here). Please note, this analysis is from SOP (v4.4) and has not been updated for this v4.7 SOP update. Below is a comparison of the previous coding used and the current version, which includes stage-specific resections. The previous code list was applied to the current sites (selected with the same ICD10 codes), and the same timeframes obtained from this SOP.

Findings

- For the 22 cancer sites with defined tumour resections codes, 41% of tumours had a tumour resection using the previous list of codes, and 45% had a tumour resection when using the updated list of codes, plus the site-specific additions (as listed in Appendix 3).
- Statistically significant differences between the proportions are present for all but three of the 22 sites (non-small lung cancer, small cell lung cancer and uterine cancers).
- The differences are most noticeable for bladder cancer (36% absolute difference), cervical (14% absolute difference), salivary glands (13% absolute difference), liver (13% absolute difference), and other head and neck (12% absolute difference).
Appendix 7: Sensitivity analysis – impact of timeframe update

The timeframes as defined above may not capture all treatments for certain cancer sites (underestimate of true figure) or include treatments for recurrence (overestimate of true figure). Therefore, follow-up periods of 6/12/18 months were tested and the results are shown below. Please note, this analysis is from SOP (v4.4) and has not been updated for this v4.7 SOP update.

Chemotherapy

![Chemotherapy Graph]

Tumour Resection

![Tumour Resection Graph]
Radiotherapy

Findings

- Overall across all sites (excluding NMSC), 27% of tumours received chemotherapy within six months of diagnosis, increasing to 29% within 12 and 18 months. Sites with the greatest absolute differences in proportions from six to 18 months are bladder, kidney, liver, oral cavity, rectum and other (3-4% absolute difference).
- Of the 22 cancer sites with defined tumour resections codes (excluding ‘Other’ sites), 43% of tumours received a tumour resection within six months of diagnosis, increasing to 45% within 12 and 18 months. Sites with the greatest absolute differences in proportions from six to 18 months are rectum, breast, hypopharynx and oropharynx (5-9% absolute difference).
- Overall across all sites (excluding NMSC), 20% of tumours received radiotherapy within six months of diagnosis, increasing to 28% within 12 months and 29% within 18 months. Sites with the greatest absolute differences in proportions from six to 18 months are breast, prostate, small cell lung cancer and oesophageal (8-26% absolute difference).