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CAS-SOP #4.4

Linking treatment tables – chemotherapy,
tumour resections and radiotherapy

Version 4.4

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Introduction

This Standard Operating Procedure (SOP) (v4.4) corrects a minor error in the previous version (v4.3), linking tumours to the NATCANSAT radiotherapy dataset and includes a corrected deprivation quintile variable. The accompanying data release, “[Chemotherapy, Radiotherapy and Tumour Resection in England, 2013 – 2015](#)”, has been updated. The minor changes to the code are summarised in Appendix 1 of this document.

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 recent 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 22 sites which have pre-defined lists of relevant tumour resection procedures. All other sites (excluding non-melanoma skin cancer) are grouped under ‘Other 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.

Method

Cohort definition

Cancer registry data from AV_TUMOUR is used as the base to identify the cohort of patients. All patients diagnosed with malignant cancer in England in 2013-2015 were included, excluding non-melanoma skin cancer (C44), males with gynaecological cancer and females with prostate cancer. Death certificate only registrations are included (1.2% of the cohort).

Overall approach to identify treatments

The datasets used to collate tumour resection data are AV_TREATMENT (CAS 1612 snapshot onwards can be used), SACT (Systemic Anti-Cancer Therapy), RTDS (RadioTherapy DataSet), and inpatient (Admitted Patient Care (APC)) HES (Hospital Episode Statistics). The AV_TREATMENT 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 AV_TREATMENT and SACT is lower before this point. However, treatment flags for select groups (e.g. childhood cancers) may be fairly complete in AV_TREATMENT 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 $\geq 98\%$ of radiotherapy and $\geq 94\%$ 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 2013-2015, and those patients with multiple tumours diagnosed more than eighteen months apart, data from both the tumour linked table (AV_TREATMENT) 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., AV_TREATMENT) is used¹.

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

¹ Please note, for tumours diagnosed in late 2015, 18 months of follow-up are currently incomplete.

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 22 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 of lesion of bladder (TURBT) 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.

Previous work on resections included a time-period of six months post-diagnosis for all (except six) of the cancer sites. The exceptions were breast and gynaecological cancers, which were regarded as requiring substantial pre-operative chemo- or radiotherapy and were therefore followed up for 12 months. Although six months captures the majority of treatments, neo-adjuvant treatments can delay surgery past this period, and other instances may occur where tumour resections, which are part of the initial care plan, occur after six months.

Therefore for this update, 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 2013-2015, 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.

SQL rules used to identify treatments

In order to match the output from CancerStats, the `cascade_inci_flag` (from the registry AV_TUMOUR 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 AV_TREATMENT 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 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 AV_TREATMENT which states that the tumour was treated with surgery (event is '01a', '01b', or '01z')
- 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 AV_TREATMENT 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.

For a small number of patients whose follow up period for radiotherapy extended past April 2016, data was supplemented from a new radiotherapy dataset that is still being tested. A sensitivity analysis that included and excluded this dataset showed that the maximum impact of any errors would affect results by up to 0.5 percentage points for all malignant cancers combined (including up to 1.5 and 1.2 percentage points for breast and prostate cancers, respectively).

Results breakdowns

Results are broken down by 22 tumour sites; the ICD-10 codes used to define these be found in Appendix 2.

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. 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 2015 income 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 4.4 compared to 4.2

Minor changes have been made to the extraction code in SOP version 4.4 since SOP version 4.2 was published for 2013-2014 diagnoses. These are noted below. Only non-superficial changes are noted; i.e. changes that could potentially impact the results.

Timeframe lookup table

- The timeframe lookup table was updated following a rerun of the data-driven approach giving guidance as to what follow up time-period to use for each treatment type of each cancer site (see Timeframe section of this document). The rerun now includes 2014 diagnoses, and a correction to the treatment dates flag. As a result, some of the follow-up timeframes have changed (where they were not agreed with a site-specific clinician).
- For "other" cancers in the timeframe lookup table, some ICD 10 codes were missing (C00, C52, C69, "Other" C48 (i.e. morphologies not classed as ovarian)). All other C codes not included under one of the main cancers have been added under "Other", to future proof the table.

OPCS4 resection lookup table

- After feedback from clinicians, OPCS4 codes J564 & J572 have been removed from the resection list for pancreatic cancers, so have been removed from the updated OPCS4 Resection Lookup table.

Tumour cohort table

- When identifying multiple tumours (tumour_flag), the time period has been increased to include all of 2017, to allow follow up of 18 months for the latest tumour diagnoses in the cohort (i.e. tumours diagnosed in December 2015).
- The Snapshot used for AV_TUMOUR and AV_TREATMENT was updated to 1712.
- FIGO stage is now taken from AV_TUMOUR in Snapshot 1712.
- The FIGO staging variable was corrected to include all formatting variations.
- "Ovarian" C48 tumours are now differentiated from "Other" (non-ovarian) C48 tumours in the tumour_cohort table, by replacing the 3 digit ICD 10 code with "C48Other" and "C48Ovary", depending on the morphology of the tumour.
- Ovarian C48 tumours are now grouped using the gynaecological staging rules, whereas "Other" C48 tumours continue to be grouped using the non-gynaecological staging rules.

Chemotherapy flag

- The Snapshot used for AV_TREATMENT was updated to 1712, and to 1710 for SACT.

Tumour resection flag

- The stage-specific resection code for cervical tumours was corrected. There are variations in how the FIGO stage variable is formatted, so cone biopsies are now included for FIGO stage 1a tumours for *all* formatting variations. Where cone biopsies are included for FIGO stage 1b1 cervical tumours where there was also a lymphadenectomy, *unspecified* FIGO stage 1b tumours are also now included and treated as 1b1 tumours. The coding has also been future-proofed against future variations in formatting of the Figo variable.
- The stomach and oesophageal stage-specific resection flags in the final treatment table have been corrected to include minor subcategories of stage 1a codes (e.g. "IA1" "1A2").
- As above, OPCS4 codes J564 & J572 have been removed from the updated OCPS4 resection lookup table.

Radiotherapy flag

- Some changes have been made to the code using data from the post-April 2016 (PHE-collected) RTDS dataset:
- The Snapshot used for AV_TREATMENT was updated to 1712, and to 1806 for RTDS datasets.
- A Welsh provider has been excluded, as PHE does not yet have permission to release this data.
- An error was corrected where APPTDATE was not being recognised correctly as a date in all cases, which could have resulted in a small number of patients being linked incorrectly (where two patients were seen on the same day in the same hospital). The `to_date` function has been added to correct this. As part of this correction, a maximum follow-up date needed to be included. The end of December 2020 was chosen in order to future-proof the code, but the Timeframe lookup table ensures that the date range of radiotherapy treatments included is still limited to those that occurred within the relevant timeframe for each tumour site and treatment type.
- SOP v4.4 also corrects a minor error in the previous version (v4.3), where tumours diagnosed from July to December 2015 were not linked to the NATCANSAT radiotherapy dataset (table 22 in Appendix 4). The data released alongside version 4.4 in July 2018 have been updated accordingly.

Additional variables

- The variable IMD.QUINTILE_2015 has been updated, following an error in the IMD dataset (identified July 2018). This resulted in minor changes to the proportion of tumours receiving each of the three treatments by quintile (all changes by quintile are under 0.3 percentage points for all cancers combined).

Appendix 2: Summary of tumour sites and timeframe rules

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.

Cancer site	ICD10 codes	Days included as post-diagnostic time period (months)		
		Chemotherapy	Tumour resections	Radiotherapy
Bladder	C67	365 (12)	274 (9)	365 (12)*
Breast	C50	365 (12)*	365 (12)*	365 (12)*
Cervical	C53	274 (9)*	274 (9)*	274 (9)*
Colorectal: Colon	C18-19	365 (12)*	183 (6)*	365 (12)*
Colorectal: Rectum	C20	365 (12)*	365 (12)*	365 (12)*
Hypopharynx	C12, C13	183 (6)	365 (12)	183 (6)
Larynx	C32	365 (12)	456 (15)	183 (6)
Oral cavity	C02, C03, C04, C06	456 (15)	183 (6)	456 (15)
Oropharynx	C01, C09, C10	183 (6)	365 (12)	183 (6)
Other head and neck	C05, C11, C14, C30, C31	365 (12)	456 (15)	274 (9)
Salivary glands	C07, C08	547 (18)	183 (6)	274 (9)
Kidney	C64-C66, C68	365 (12)*	183 (6)	365 (12)*
Liver	C22	456 (15)	365 (12)	547 (18)
SCLC	C33-C34 with ICD-O-2 morphology in list 8041, 8042, 8043, 8044, 8045	183 (6)*	183 (6)*	183 (6)*
NSCLC	C33-C34 with ICD-O-2 morphology not in list 8041, 8042, 8043, 8044, 8045	183 (6)*	183 (6)*	183 (6)*
Oesophagus	C15	183 (6)	274 (9)	274 (9)*
Ovary	C56-C57, C48 (females, excluding ICD-O-2 8800-8806, 8963, 8990, 8991, 9040-9044, 8811-8921, 9120-9373, 9530-9582)	274 (9)*	274 (9)*	274 (9)*
Pancreas	C25	183 (6)	274 (9)	547 (18)
Prostate	C61	365 (12)*	456 (15)	365 (12)*
Stomach	C16	183 (6)	274 (9)	274 (9)*
Uterine	C54-C55	274 (9)*	274 (9)*	274 (9)*
Vulva	C51	274 (9)*	274 (9)*	274 (9)*
Other malignant neoplasms	C00, C17, C21, C23-C24, C26, C37-C49, non-ovarian C48, C52, C58, C60, C62-C63, C69-C97	456 (15)	N/A	547 (18)
All malignant cancers excl. non-melanoma skin cancer	C00-97, excl C44	Dependent on above time periods		

Appendix 3: Site-specific summary of tumour resection rules

OPCS-4 code	Procedure name	Notes
Bladder (C67)		
M421	Endoscopic resection of lesion of bladder	Non muscle invasive (T1) tumours only
M341	Cystoprostatectomy	
M342	Cystourethrectomy	
M343	Cystectomy NEC	
M344	Simple cystectomy	
M348	Other specified total excision of bladder	
M349	Unspecified total excision of bladder	
M359	Unspecified partial excision of bladder	
X142	Anterior exenteration of pelvis	
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	
B288	Other specified other excision of breast	
B289	Unspecified other excision of breast	
B341	Subareolar excision of mammary duct	
B342	Excision of mammary duct NEC	
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	
B287	Wire guided excision of lesion of breast	

Cervical (C53)		
Q014	Large loop excision of transformation zone	Figo stage 1a only, and stage 1b and 1b1 where also present with a lymphadenectomy code (TT856, T859, T865)
Q033	Cone biopsy of cervix uteri NEC	Figo stage 1a only, and stage 1b and 1b1 where also present with a lymphadenectomy code (TT856, T859, T865)
Q031	Knife cone biopsy of cervix uteri	Figo stage 1a only, and stage 1b and 1b1 where also present with a lymphadenectomy code (TT856, T859, T865)
Q032	Laser cone biopsy of cervix uteri	Figo stage 1a only, and stage 1b and 1b1 where also present with a lymphadenectomy code (TT856, T859, T865)
T856	Block dissection of pelvic lymph nodes	Figo stage 1b and 1b1 where also present with a cone biopsy code (Q014, Q033, Q031, Q032)
T859	Unspecified block dissection of lymph nodes	Figo stage 1b and 1b1 where also present with a cone biopsy code (Q014, Q033, Q031, Q032)
T865	Sampling of mediastinal lymph nodes	Figo stage 1b and 1b1 where also present with a cone biopsy code (Q014, Q033, Q031, Q032)
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	
Q073	Abdominal hysterocolpectomy NEC	
Q074	Total abdominal hysterectomy NEC	
Q078	Other specified abdominal excision of uterus	
Q079	Unspecified abdominal excision of uterus	
Q081	Vaginal hysterocolpectomy and excision of periuterine tissue	
Q082	Vaginal hysterectomy and excision of periuterine tissue NEC	
Q083	Vaginal hysterocolpectomy NEC	
Q088	Other specified vaginal excision of uterus	
Q089	Unspecified vaginal excision 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	
Colon and rectum (C18, C19 and C20)		
H221	Diagnostic fibreoptic endoscopic examination of colon and biopsy of lesion of colon	Stage 1 only
H251	Diagnostic endoscopic examination of lower bowel and biopsy of lesion of lower bowel using fibreoptic sigmoidoscope	Stage 1 only
H259	Unspecified diagnostic endoscopic examination of lower bowel using fibreoptic sigmoidoscope	Stage 1 only
H229	Unspecified diagnostic endoscopic examination of colon	Stage 1 only
H181	Open colonoscopy	Stage 1 only
H281	Diagnostic endoscopic examination of sigmoid colon and biopsy of lesion of sigmoid colon using	Stage 1 only

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	rigid sigmoidoscope	
H191	Open biopsy of lesion of colon	Stage 1 only
H561	Biopsy of lesion of anus	Stage 1 only
H201	Fibreoptic endoscopic snare resection of lesion of colon	Stage 1 only
H412	Peranal excision of lesion of rectum	Stage 1 only
H206	Fibreoptic endoscopic resection of lesion of colon NEC	Stage 1 only
H231	Endoscopic snare resection of lesion of lower bowel using fibreoptic sigmoidoscope	Stage 1 only
H236	Endoscopic resection of lesion of lower bowel using fibreoptic sigmoidoscope NEC	Stage 1 only
H205	Fibreoptic endoscopic submucosal resection of lesion of colon	Stage 1 only
H202	Fibreoptic endoscopic cauterisation of lesion of colon	Stage 1 only
H122	Excision of lesion of colon NEC	Stage 1 only
H235	Endoscopic submucosal resection of lesion of lower bowel using fibreoptic sigmoidoscope	Stage 1 only
H239	Unspecified endoscopic extirpation of lesion of lower bowel using fibreoptic sigmoidoscope	Stage 1 only
H402	Trans-sphincteric excision of lesion of rectum	Stage 1 only
H232	Endoscopic cauterisation of lesion of lower bowel using fibreoptic sigmoidoscope	Stage 1 only
H261	Endoscopic snare resection of lesion of sigmoid colon using rigid sigmoidoscope	Stage 1 only
H208	Other specified endoscopic extirpation of lesion of colon	Stage 1 only
H341	Open excision of lesion of rectum	Stage 1 only
H418	Other specified other operations on rectum through anus	Stage 1 only
H209	Unspecified endoscopic extirpation of lesion of colon	Stage 1 only
H248	Other specified other therapeutic endoscopic operations on lower bowel using fibreoptic sigmoidoscope	Stage 1 only
H238	Other specified endoscopic extirpation of lesion of lower bowel using fibreoptic sigmoidoscope	Stage 1 only
H204	Fibreoptic endoscopic destruction of lesion of colon NEC	Stage 1 only
H419	Unspecified other operations on rectum through anus	Stage 1 only
H024	Incidental appendicectomy	C18.1 (appendix tumours) only
H019	Unspecified emergency excision of appendix	C18.1 (appendix tumours) only
H011	Emergency excision of abnormal appendix and drainage HFQ	C18.1 (appendix tumours) only
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	

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H059	Unspecified total excision of colon
H061	Extended right hemicolectomy and end to end anastomosis
H062	Extended right hemicolectomy and anastomosis of ileum to colon
H063	Extended right hemicolectomy and anastomosis NEC
H064	Extended right hemicolectomy and ileostomy HFQ
H068	Other specified extended excision of right hemicolon
H069	Unspecified extended excision of right hemicolon
H071	Right hemicolectomy and end to end anastomosis of ileum to colon
H072	Right hemicolectomy and side to side anastomosis of ileum to transverse colon
H073	Right hemicolectomy and anastomosis NEC
H074	Right hemicolectomy and ileostomy HFQ
H078	Other specified other excision of right hemicolon
H079	Unspecified other excision of right hemicolon
H081	Transverse colectomy and end to end anastomosis
H082	Transverse colectomy and anastomosis of ileum to colon
H083	Transverse colectomy and anastomosis NEC
H084	Transverse colectomy and ileostomy HFQ
H085	Transverse colectomy and exteriorisation of bowel NEC
H088	Other specified excision of transverse colon
H089	Unspecified excision of transverse colon
H091	Left hemicolectomy and end to end anastomosis of colon to rectum
H092	Left hemicolectomy and end to end anastomosis of colon to colon
H093	Left hemicolectomy and anastomosis NEC
H094	Left hemicolectomy and ileostomy HFQ
H095	Left hemicolectomy and exteriorisation of bowel NEC
H098	Other specified excision of left hemicolon
H099	Unspecified excision of left hemicolon
H101	Sigmoid colectomy and end to end anastomosis of ileum to rectum
H102	Sigmoid colectomy and anastomosis of colon to rectum
H103	Sigmoid colectomy and anastomosis NEC
H104	Sigmoid colectomy and ileostomy HFQ
H105	Sigmoid colectomy and exteriorisation of bowel NEC
H108	Other specified excision of sigmoid colon
H109	Unspecified excision of sigmoid colon
H111	Colectomy and end to end anastomosis of colon to colon NEC
H112	Colectomy and side to side anastomosis of ileum to colon NEC
H113	Colectomy and anastomosis NEC
H114	Colectomy and ileostomy NEC
H115	Colectomy and exteriorisation of bowel NEC
H118	Other specified other excision of colon
H119	Unspecified other excision of colon
H291	Subtotal excision of colon and rectum and creation of colonic pouch and anastomosis of colon to anus
H292	Subtotal excision of colon and rectum and creation of colonic pouch NEC
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

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H299	Unspecified subtotal excision of colon
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
X148	Other specified clearance of pelvis
X149	Unspecified clearance of pelvis
H075	Right hemicolectomy and end to side anastomosis
H065	Extended right hemicolectomy and end to side anastomosis
H106	Sigmoid colectomy and end to side anastomosis
H322	Hartmann procedure(rectosigmoidectomy)

Head and neck (C01, C02, C03, C04, C05, C06, C07, C08, C09, C10, C11, C12, C13, C14, C30, C31, C32)

F341	Bilateral dissection tonsillectomy	Tonsil tumours (C09) only
E191	Total pharyngectomy	
E192	Partial pharyngectomy	
E214	Plastic repair of pharynx NEC	
E231	Open excision of lesion of pharynx	
E291	Total laryngectomy	
E292	Partial horizontal laryngectomy	
E293	Partial vertical laryngectomy	
E295	Laryngofissure and chordectomy of vocal chord	
E301	Excision of lesion of larynx using thyrotomy as approach	
E341	Microtherapeutic endoscopic extirpation of lesion of larynx using laser	
E342	Microtherapeutic endoscopic resection of lesion of larynx NEC	
E343	Microtherapeutic endoscopic destruction of lesion of larynx NEC	
E414	Tracheo-oesophageal puncture with insertion of speech prosthesis	
F011	Excision of vermilion border of lip and advancement of mucosa of lip	
F018	Other specified partial excision of lip	
F042	Reconstruction of lip using skin flap	
F202	Excision of lesion of gingiva	
F221	Total glossectomy	
F222	Partial glossectomy	
F301	Plastic repair of palate using flap of palate	
F303	Plastic repair of palate using flap of tongue	

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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
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
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
S248	Other specified local flap of skin and muscle
S288	Other specified flap of mucosa
S353	Split autograft of skin to head or neck NEC
T851	Block dissection of cervical lymph nodes
V141	Hemimandibulectomy
V142	Extensive excision of mandible NEC
V143	Partial excision of mandible NEC
V144	Excision of lesion of mandible
V168	Other specified division of mandible
V191	Reconstruction of mandible
Y051	Total excision of organ NOC
Y592	Harvest of radial artery flap of skin and fascia
Y598	Other specified harvest of flap of skin and fascia
Y612	Harvest of flap of skin and pectoralis major muscle
Y631	Harvest of flap of latissimus dorsi muscle NEC
Y638	Other specified harvest of flap of muscle of trunk
Y662	Harvest of bone from rib
F231	Excision of lesion of tongue
F281	Excision of lesion of palate
F021	Excision of lesion of lip
F443	Excision of parotid gland NEC
E296	Laryngectomy NEC
E352	Endoscopic resection of lesion of larynx
F444	Excision of submandibular gland
F451	Excision of lesion of parotid gland
E242	Endoscopic extirpation of lesion of pharynx NEC
E294	Partial laryngectomy NEC
V068	Other specified excision of maxilla
V069	Unspecified excision of maxilla
V061	Medial maxillectomy
V149	Unspecified excision of mandible

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E299 Unspecified excision of larynx

Kidney (C64-C66, C68)		
M291	Endoscopic extirpation of lesion of ureter	Tumours of ureter (C66) & pelvis (C65) only
M021	Nephrectomy and excision of perirenal tissue	
M022	Nephroureterectomy NEC	
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	
M181	Total ureterectomy	
M182	Excision of segment of ureter	
M183	Secondary ureterectomy	
M252	Open excision of lesion of ureter NEC	
M137	Percutaneous radiofrequency ablation of lesion of kidney	
Y112	Cryotherapy to organ NOC	
Liver (C22)		
J124	Percutaneous radiofrequency ablation of lesion of liver	Stage 1 only
J127	Percutaneous microwave ablation of lesion of liver	Stage 1 only
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	
J019	Unspecified transplantation of liver	
J011	Orthotopic transplantation of liver NEC	
J031	Excision of lesion of liver NEC	
J015	Orthotopic transplantation of whole liver	
J101	Percutaneous transluminal embolisation of hepatic artery	
J053	Open wedge biopsy of lesion of liver	
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	
E441	Excision of carina	

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E461	Sleeve resection of bronchus and anastomosis HFQ
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
E559	Unspecified open extirpation of lesion of lung
T013	Excision of lesion of chest wall
T023	Insertion of prosthesis into chest wall NEC
E554	Open destruction of lesion of lung NEC

Oesophagus (C15)

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
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
G438	Other specified fibreoptic endoscopic extirpation of lesion of upper gastrointestinal tract	Stage 1a disease only
G011	Oesophagogastrectomy and anastomosis of oesophagus to stomach	
G018	Other specified excision of oesophagus and stomach	
G019	Unspecified excision of oesophagus and stomach	
G021	Total oesophagectomy and anastomosis of pharynx to stomach	
G022	Total oesophagectomy and interposition of microvascularly attached jejunum	
G023	Total oesophagectomy and interposition of jejunum NEC	
G024	Total oesophagectomy and interposition of microvascularly attached colon	
G025	Total oesophagectomy and interposition of colon NEC	
G028	Other specified total excision of oesophagus	
G029	Unspecified total excision of oesophagus	
G031	Partial oesophagectomy and end to end anastomosis of oesophagus	
G032	Partial oesophagectomy and interposition of microvascularly attached jejunum	
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	
G033	Partial oesophagectomy and anastomosis of oesophagus to transposed jejunum	
G274	Total gastrectomy and anastomosis of oesophagus to transposed jejunum	
G034	Partial oesophagectomy and anastomosis of oesophagus to jejunum NEC	
G013	Oesophagogastrectomy and anastomosis of oesophagus to jejunum NEC	
G279	Unspecified total excision of stomach	
G275	Total gastrectomy and anastomosis of oesophagus to jejunum NEC	
G271	Total gastrectomy and excision of surrounding tissue	

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
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
Q071	Abdominal hysterocolpectomy and excision of periuterine tissue
Q072	Abdominal hysterectomy and excision of periuterine tissue NEC
Q073	Abdominal hysterocolpectomy NEC
Q074	Total abdominal hysterectomy NEC
Q075	Subtotal abdominal hysterectomy
Q078	Other specified abdominal excision of uterus
Q079	Unspecified abdominal excision of uterus
Q081	Vaginal hysterocolpectomy and excision of periuterine tissue
Q082	Vaginal hysterectomy and excision of periuterine tissue NEC
Q083	Vaginal hysterocolpectomy NEC
Q088	Other specified vaginal excision of uterus
Q089	Unspecified vaginal excision of uterus
Q221	Bilateral salpingoophorectomy
Q223	Bilateral oophorectomy NEC
Q231	Unilateral salpingoophorectomy NEC
Q232	Salpingoophorectomy of remaining solitary fallopian tube and ovary
Q235	Unilateral oophorectomy NEC
Q236	Oophorectomy of remaining solitary ovary NEC
Q241	Salpingoophorectomy NEC
Q243	Oophorectomy NEC
Q438	Other specified partial excision of ovary
Q439	Unspecified partial excision of ovary
Q473	Open biopsy of lesion of ovary
Q478	Other specified other open operations on ovary
Q491	Endoscopic extirpation of lesion of ovary NEC
T331	Open excision of lesion of peritoneum
T332	Open destruction of lesion of peritoneum
T338	Other specified open extirpation of lesion of peritoneum
T339	Unspecified open extirpation of lesion of peritoneum
T361	Omentectomy
T362	Excision of lesion of omentum
X141	Total exenteration of pelvis
X142	Anterior exenteration of pelvis
X143	Posterior exenteration of pelvis
X148	Other specified clearance of pelvis

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X149 Unspecified clearance of pelvis

Pancreas (C25)		
J551	Total pancreatectomy and excision of surrounding tissue	
J552	Total pancreatectomy NEC	
J558	Other specified total excision of pancreas	
J559	Unspecified total excision of pancreas	
J561	Pancreaticoduodenectomy and excision of surrounding tissue	
J562	Pancreaticoduodenectomy and resection of antrum of stomach	
J563	Pancreaticoduodenectomy NEC	
J568	Other specified excision of head of pancreas	
J569	Unspecified excision of head of pancreas	
J571	Subtotal pancreatectomy	
J573	Left pancreatectomy NEC	
J574	Excision of tail of pancreas and drainage of pancreatic duct	
J575	Excision of tail of pancreas NEC	
J578	Other specified other partial excision of pancreas	
J579	Unspecified other partial excision of pancreas	
J582	Excision of lesion of pancreas NEC	
Prostate (C61)		
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	
M341	Cystoprostatectomy	
M711	High intensity focused ultrasound of prostate	
M671	Endoscopic cryotherapy to lesion of prostate	
X141	Total exenteration of pelvis	
Stomach (C16)		
G421	Fibreoptic endoscopic submucosal resection of lesion of upper gastrointestinal tract	Stage 1a disease only
G146	Fibreoptic endoscopic submucosal resection of lesion of oesophagus	Stage 1a disease only
G449	Unspecified other therapeutic fibreoptic endoscopic operations on upper gastrointestinal tract	Stage 1a disease only
G012	Oesophagogastrectomy and anastomosis of oesophagus to transposed jejunum	
G013	Oesophagogastrectomy and anastomosis of oesophagus to jejunum NEC	
G271	Total gastrectomy and excision of surrounding tissue	
G272	Total gastrectomy and anastomosis of oesophagus to duodenum	
G273	Total gastrectomy and interposition of jejunum	
G274	Total gastrectomy and anastomosis of oesophagus to transposed jejunum	
G275	Total gastrectomy and anastomosis of oesophagus to jejunum NEC	
G278	Other specified total excision of stomach	
G279	Unspecified total excision of stomach	
G281	Partial gastrectomy and anastomosis of stomach to duodenum	

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G282	Partial gastrectomy and anastomosis of stomach to transposed jejunum
G283	Partial gastrectomy and anastomosis of stomach to jejunum NEC
G288	Other specified partial excision of stomach
G289	Unspecified partial excision of stomach
G011	Oesophagogastronomy and anastomosis of oesophagus to stomach
G039	Unspecified partial excision of oesophagus

Uterine (C54-C55)

Q071	Abdominal hysterocolpectomy and excision of periuterine tissue
Q072	Abdominal hysterectomy and excision of periuterine tissue NEC
Q073	Abdominal hysterocolpectomy NEC
Q074	Total abdominal hysterectomy NEC
Q075	Subtotal abdominal hysterectomy
Q078	Other specified abdominal excision of uterus
Q079	Unspecified abdominal excision of uterus
Q081	Vaginal hysterocolpectomy and excision of periuterine tissue
Q082	Vaginal hysterectomy and excision of periuterine tissue NEC
Q083	Vaginal hysterocolpectomy NEC
Q088	Other specified vaginal excision of uterus
Q089	Unspecified vaginal excision of uterus
Q093	Open excision of lesion of uterus NEC
Q161	Vaginal excision of lesion of uterus
Q221	Bilateral salpingoophorectomy
Q222	Bilateral salpingectomy NEC
Q223	Bilateral oophorectomy NEC
Q228	Other specified bilateral excision of adnexa of uterus
Q229	Unspecified bilateral excision of adnexa of uterus
Q231	Unilateral salpingoophorectomy NEC
Q232	Salpingoophorectomy of remaining solitary fallopian tube and ovary
Q235	Unilateral oophorectomy NEC
Q236	Oophorectomy of remaining solitary ovary NEC
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

Vulva (C51)

P011	Clitoridectomy
P033	Excision of lesion of bartholin gland
P051	Total excision of vulva
P052	Partial excision of vulva
P054	Excision of lesion of vulva NEC

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P058	Other specified excision of vulva
P059	Unspecified excision of vulva
P111	Excision of lesion of female perineum

Appendix 4: Example code

--The code presented below was used to generate the AV2016.AV_TREATMENT_TABLE_1315_SOP4P4 table and should be used to identify treatments for cancers diagnosed in 2013-2015.

--There are also minor corrections to the code, so it supersedes the code published in both SOP version 4.2 for 2013-2014 diagnoses (shared via NCRAS website) and 4.3 for 2013-2015 diagnoses (shared internally only).

-----User notes:-----

-- This is the SQL to generate treatment flags (resection, chemo, radio) for 2013-15 diagnoses, including demographic & geographies breakdown

--It creates an extract to be used both in the unadjusted treatment rates workbook.

--You will need access to SACT in Snapshot 1710 and RTDS in Snapshot 1806

--It uses these tables in CASREF01:

--AV2016.AV_OPCODE4RESECTION_LOOKUP_1315@CASREF01

--AV2016.AV_TIMEFRAME_LOOKUP_1315@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)

--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 ANALYSISBECKYWHITE to your user

--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 (

--5. Alternatively you can use the final table we have already created here:

--AV2016.AV_TREATMENT_TABLE_1315_SOP4P4@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)

--Extraction code


```
-----
-----Create base tumour cohort table-----
-----
```

```
create table TR_TUMOUR_COHORT AS
(
SELECT TUMOURID, PATIENTID, NHSNUMBER, DIAGNOSISDATEBEST, TUMOUR_CODE,
SITE_ICD10_O2, TUMOUR_FLAG, FIGO, SEX, ETHNICITY, MORPH_ICD10_O2,
FIVEYEARAGEBAND, AGE 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

--Create amended tumour_code variable to differentiate between ovarian and non-ovarian C48 tumours
,case
when avt.SITE_ICD10_O2_3CHAR in ('C48') and (avt.morph_icd10_o2 not in (8800, 8801, 8802, 8803,
8804, 8805, 8806, 8963, 8990, 8991, 9040, 9041, 9042, 9043, 9044)
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'
else avt.SITE_ICD10_O2_3CHAR
end AS TUMOUR_CODE,

-- This join flags any tumours diagnosed in 2013-15 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 ANALYSISNCR.AV_TUMOUR@CAS1712 AVT

-- Multiple tumours join:
-- For tumours diagnosed from 2013-2015, identify any other tumour IDs that occurred between 2011-
2017
-- A second copy of the tumour cohort (AVT2) is joined to the original tumour cohort of 2013-15 diagnoses
(AVT)
-- Records from AVT2 are only joined if the patient ID is the same but the tumour ID is different
LEFT JOIN ANALYSISNCR.AV_TUMOUR@CAS1712 AVT2 ON AVT.PATIENTID=AVT2.PATIENTID
AND NOT(AVT.TUMOURID=AVT2.TUMOURID)
AND AVT2.CASCADE_INCI_FLAG = 1
AND NOT(AVT2.SITE_ICD10_O2_3CHAR='C44')
AND SUBSTR(AVT2.SITE_ICD10_O2, 1,1) = 'C'
AND AVT2.DIAGNOSISYEAR BETWEEN 2011 AND 2017

--Define cohort of interest here
WHERE AVT.CASCADE_INCI_FLAG = 1
AND NOT(AVT.SITE_ICD10_O2_3CHAR='C44')
AND SUBSTR(avt.SITE_ICD10_O2, 1,1) = 'C'
AND AVT.DIAGNOSISYEAR BETWEEN 2013 AND 2015

--Removes duplicate tumour rows that had been added in order to identify patients with multiple tumours
```

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```
) WHERE RK=1  
);
```

```
-----  
--Create table indexes for tumour cohort table  
CREATE UNIQUE INDEX ANALYSISBECKYWHITE.TR_TUMCOHORT_TUMOURID_UQ ON  
ANALYSISBECKYWHITE.TR_TUMOUR_COHORT ( TUMOURID ) NOLOGGING TABLESPACE  
ANALYSISDATA_IX;  
CREATE INDEX ANALYSISBECKYWHITE.TR_TUMCOHORT_PATIENTID_IX ON  
ANALYSISBECKYWHITE.TR_TUMOUR_COHORT ( PATIENTID ) NOLOGGING TABLESPACE  
ANALYSISDATA_IX;  
CREATE INDEX ANALYSISBECKYWHITE.TR_TUMCOHORT_NHSNUMBER_IX ON  
ANALYSISBECKYWHITE.TR_TUMOUR_COHORT ( NHSNUMBER ) NOLOGGING TABLESPACE  
ANALYSISDATA_IX;  
  
EXECUTE DBMS_STATS.GATHER_TABLE_STATS('analysisbeckywhite', 'TR_TUMOUR_COHORT')  
EXECUTE DBMS_STATS.GATHER_INDEX_STATS('analysisbeckywhite',  
'TR_TUMCOHORT_TUMOURID_UQ')
```

```
-----  
-----CREATE SURGERY FLAG TABLES - ALL SITES-----  
-----
```

```
--1)----- ALL SITES - SURGERY FROM AV_TREATMENT -----
```

```
-- Create a surgery flag for the tumour if:  
-- there is a record in AV_TREATMENT which states that the tumour was treated with surgery (event is  
'01a', '01b', or '01z')  
-- 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  
FROM (  
SELECT TUMOURID, DATEDIFF, RK , EVENTDATE  
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  
FROM TR_TUMOUR_COHORT TC  
INNER JOIN AV2016.AV_TIMEFRAME_LOOKUP_1315 tim ON tim.TUMOURICDSITE3CODE =  
TC.TUMOUR_CODE  
INNER JOIN ANALYSISNCR.AV_TREATMENT@CAS1712 AVTREAT ON  
AVTREAT.TUMOURID=TC.TUMOURID  
AND EVENTCODE IN ('01a','01b','01z') AND (AVTREAT.EVENTDATE-TC.DIAGNOSISDATEBEST  
BETWEEN -31 AND tim.RESECT_TIME)  
INNER JOIN AV2016.AV_OPCS4RESECTION_LOOKUP_1315 OPCS ON  
OPCS.TUMOURICDSITE3CODE = TC.TUMOUR_CODE AND TRIM(OPCS.OPCSRESECTIONCODE)  
= AVTREAT.OPCS4_CODE
```

CAS-SOP #4.4: Linking treatment tables

```
)  
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  
TR_HES_SG  
AS(  
SELECT distinct  
TUMOURID,  
CASE WHEN DATEDIFF IS NULL THEN 0 ELSE 1 END AS HESSG_FLAG  
, OPCODE as hessg_date  
FROM (  
SELECT TUMOURID, DATEDIFF, RK , OPCODE  
FROM (  
SELECT TC.TUMOURID,  
HO.OPCODE-TC.DIAGNOSISDATEBEST AS DATEDIFF,  
RANK() OVER (PARTITION BY TC.TUMOURID ORDER BY HO.OPCODE,  
HL.DATAYEAR,HL.EPIKEYANON,POS) AS RK  
, HO.OPCODE  
FROM TR_TUMOUR_COHORT TC  
INNER JOIN AV2016.AV_TIMEFRAME_LOOKUP_1315 tim ON tim.TUMOURICDSITE3CODE =  
TC.TUMOUR_CODE  
INNER JOIN HES2017.HES_LINKAGE_AV_APC HL ON TC.PATIENTID = HL.PATIENTID  
INNER JOIN HES2017.HESAPC_OPERTN HO ON HO.DATAYEAR = HL.DATAYEAR AND  
HO.EPIKEYANON = HL.EPIKEYANON  
AND HO.OPCODE-TC.DIAGNOSISDATEBEST BETWEEN -31 AND tim.RESECT_TIME  
INNER JOIN AV2016.AV_OPCODE4RESECTION_LOOKUP_1315 OPCS ON  
OPCS.TUMOURICDSITE3CODE = TC.TUMOUR_CODE AND TRIM(OPCS.OPCODE4RESECTIONCODE)  
= HO.OPERTN  
)  
WHERE RK=1  
));
```

-----CREATE SURGERY FLAG TABLES - STAGE SPECIFIC RESECTIONS-----

--3)----- LIVER C22 - AV_TREATMENT -----

-- Create a surgery flag for the tumour if:
-- there is a record in AV_TREATMENT which states that the tumour was treated with surgery (event is
'01a', '01b', or '01z')
-- 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 (OPERTN) 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)

```
create table  
TR_AV_LIVER as (  
SELECT distinct  
TUMOURID,
```


CAS-SOP #4.4: Linking treatment tables

```
CASE WHEN DATEDIFF IS NULL THEN 0 ELSE 1 END AS LIVER_AVTREAT
, EVENTDATE as avsg_date
FROM (
SELECT TUMOURID, DATEDIFF, RK, EVENTDATE
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
FROM TR_TUMOUR_COHORT TC
INNER JOIN AV2016.AV_TIMEFRAME_LOOKUP_1315 tim ON tim.TUMOURICDSITE3CODE =
TC.TUMOUR_CODE
INNER JOIN ANALYSISNCR.AV_TREATMENT@CAS1712 AVTREAT ON
AVTREAT.TUMOURID=TC.TUMOURID
AND EVENTCODE IN ('01a','01b','01z') AND (AVTREAT.EVENTDATE-TC.DIAGNOSISDATEBEST
BETWEEN -31 AND tim.RESECT_TIME)
AND AVTREAT.OPCS4_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 (OPERTN) 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
FROM (
SELECT TUMOURID, DATEDIFF, RK, OPDATE 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
FROM TR_TUMOUR_COHORT TC
INNER JOIN AV2016.AV_TIMEFRAME_LOOKUP_1315 tim ON tim.TUMOURICDSITE3CODE =
TC.TUMOUR_CODE
INNER JOIN HES2017.HES_LINKAGE_AV_APC@casref01 HL ON TC.PATIENTID = HL.PATIENTID
INNER JOIN HES2017.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 - AV_TREATMENT -----

-- Create a surgery flag for the tumour if:

CAS-SOP #4.4: Linking treatment tables

- there is a record in AV_TREATMENT which states that the tumour was treated with surgery (event is '01a', '01b', or '01z')
- and the OPCS4_CODE is a fiberoptic 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
FROM (
SELECT TUMOURID, DATEDIFF, RK, EVENTDATE
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
FROM TR_TUMOUR_COHORT TC
INNER JOIN AV2016.AV_TIMEFRAME_LOOKUP_1315 tim ON tim.TUMOURICDSITE3CODE =
TC.TUMOUR_CODE
INNER JOIN ANALYSISNCR.AV_TREATMENT@CAS1712 AVTREAT ON
AVTREAT.TUMOURID=TC.TUMOURID
AND EVENTCODE IN ('01a','01b','01z') AND (AVTREAT.EVENTDATE-TC.DIAGNOSISDATEBEST
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 fiberoptic 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
, OPCODE as hessg_date
FROM (
SELECT TUMOURID, DATEDIFF, RK, OPCODE FROM (
SELECT TC.TUMOURID,
HO.OPCODE-TC.DIAGNOSISDATEBEST AS DATEDIFF,
RANK() OVER (PARTITION BY TC.TUMOURID ORDER BY HO.OPCODE,
HL.DATAYEAR,HL.EPIKEYANON,POS) AS RK
, HO.OPCODE
```

CAS-SOP #4.4: Linking treatment tables

```
FROM TR_TUMOUR_COHORT TC
INNER JOIN AV2016.AV_TIMEFRAME_LOOKUP_1315 tim ON tim.TUMOURICDSITE3CODE =
TC.TUMOUR_CODE
INNER JOIN HES2017.HES_LINKAGE_AV_APC@casref01 HL ON TC.PATIENTID = HL.PATIENTID
INNER JOIN HES2017.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 - AV_TREATMENT -----

-- Create a surgery flag for the tumour if:
-- there is a record in AV_TREATMENT which states that the tumour was treated with surgery (event is '01a', '01b', or '01z')
-- and the OPCS4_CODE is a fiberoptic 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
FROM (
SELECT TUMOURID, DATEDIFF, RK, EVENTDATE
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
FROM TR_TUMOUR_COHORT TC
INNER JOIN AV2016.AV_TIMEFRAME_LOOKUP_1315 tim ON tim.TUMOURICDSITE3CODE =
TC.TUMOUR_CODE
INNER JOIN ANALYSISNCR.AV_TREATMENT@CAS1712 AVTREAT ON
AVTREAT.TUMOURID=TC.TUMOURID
    AND EVENTCODE IN ('01a','01b','01z') 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 fiberoptic 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
```

CAS-SOP #4.4: Linking treatment tables

```
TR_HES_STOMACH AS(
SELECT distinct
  TUMOURID,
CASE WHEN DATEDIFF IS NULL THEN 0 ELSE 1 END AS STOMACH_HES
, OPDATE as hessg_date
FROM (
SELECT TUMOURID, DATEDIFF, RK, OPDATE 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
FROM TR_TUMOUR_COHORT TC
INNER JOIN AV2016.AV_TIMEFRAME_LOOKUP_1315 tim ON tim.TUMOURICDSITE3CODE =
TC.TUMOUR_CODE
INNER JOIN HES2017.HES_LINKAGE_AV_APC@casref01 HL ON TC.PATIENTID = HL.PATIENTID
INNER JOIN HES2017.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) - AV_TREATMENT-----

```
-- Create a surgery flag for the tumour if:
-- there is a record in AV_TREATMENT which states that the tumour was treated with surgery (event is
'01a', '01b', or '01z')
-- 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
FROM (
SELECT TUMOURID, DATEDIFF, RK, EVENTDATE
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
FROM TR_TUMOUR_COHORT TC
INNER JOIN AV2016.AV_TIMEFRAME_LOOKUP_1315 tim ON tim.TUMOURICDSITE3CODE =
TC.TUMOUR_CODE
INNER JOIN ANALYSISNCR.AV_TREATMENT@CAS1712 AVTREAT ON
AVTREAT.TUMOURID=TC.TUMOURID
AND EVENTCODE IN ('01a','01b','01z') AND (AVTREAT.EVENTDATE-TC.DIAGNOSISDATEBEST
BETWEEN -31 AND tim.RESECT_TIME)
AND AVTREAT.OPCS4_CODE IN ('M421') AND TC.TUMOUR_CODE in ('C67'))
WHERE RK=1));
```

--10)----- BLADDER CANCERS (C67) - HES -----

CAS-SOP #4.4: Linking treatment tables

- 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
FROM (
SELECT TUMOURID, DATEDIFF, RK, OPDATE 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
FROM TR_TUMOUR_COHORT TC
INNER JOIN AV2016.AV_TIMEFRAME_LOOKUP_1315 tim ON tim.TUMOURICDSITE3CODE =
TC.TUMOUR_CODE
INNER JOIN HES2017.HES_LINKAGE_AV_APC@casref01 HL ON TC.PATIENTID = HL.PATIENTID
INNER JOIN HES2017.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') AND TC.TUMOUR_CODE in ('C67'))
WHERE RK=1));
```

--11)----- CERVICAL CANCERS; CONE BIOPSIES - AV_TREATMENT -----

- 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 AV_TREATMENT which states that the tumour was treated with surgery (event is '01a', '01b', or '01z')
 - 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 CONEBIOPS_AVTREAT
```

CAS-SOP #4.4: Linking treatment tables

```
, EVENTDATE as avsg_date
FROM (
SELECT TUMOURID, DATEDIFF, RK, EVENTDATE
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
FROM TR_TUMOUR_COHORT TC
INNER JOIN AV2016.AV_TIMEFRAME_LOOKUP_1315 tim ON tim.TUMOURICDSITE3CODE =
TC.TUMOUR_CODE
INNER JOIN ANALYSISNCR.AV_TREATMENT@CAS1712 AVTREAT ON
AVTREAT.TUMOURID=TC.TUMOURID
AND EVENTCODE IN ('01a','01b','01z') 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
FROM (
SELECT TUMOURID, DATEDIFF, RK, OPDATE 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
FROM TR_TUMOUR_COHORT TC
INNER JOIN AV2016.AV_TIMEFRAME_LOOKUP_1315 tim ON tim.TUMOURICDSITE3CODE =
TC.TUMOUR_CODE
INNER JOIN HES2017.HES_LINKAGE_AV_APC@casref01 HL ON TC.PATIENTID = HL.PATIENTID
INNER JOIN HES2017.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 - AV_TREATMENT -----

```
-- Create a lymphadenectomy flag for the tumour if:
-- there is a record in AV_TREATMENT which states that the tumour was treated with surgery (event is
'01a', '01b', or '01z')
-- 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)
```

CAS-SOP #4.4: Linking treatment tables

```
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
FROM (
SELECT TUMOURID, DATEDIFF, RK, EVENTDATE
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
FROM TR_TUMOUR_COHORT TC
INNER JOIN AV2016.AV_TIMEFRAME_LOOKUP_1315 tim ON tim.TUMOURICDSITE3CODE =
TC.TUMOUR_CODE
INNER JOIN ANALYSISNCR.AV_TREATMENT@CAS1712 AVTREAT ON
AVTREAT.TUMOURID=TC.TUMOURID
AND EVENTCODE IN ('01a','01b','01z') 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)

```
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
FROM (
SELECT TUMOURID, DATEDIFF, RK, OPDATE 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
FROM TR_TUMOUR_COHORT TC
INNER JOIN AV2016.AV_TIMEFRAME_LOOKUP_1315 tim ON tim.TUMOURICDSITE3CODE =
TC.TUMOUR_CODE
INNER JOIN HES2017.HES_LINKAGE_AV_APC@casref01 HL ON TC.PATIENTID = HL.PATIENTID
INNER JOIN HES2017.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));
```

CAS-SOP #4.4: Linking treatment tables

--15)----- COLORECTAL CANCERS; ENDOSCOPIES - AV_TREATMENT-----

- Create a surgery flag for the tumour if:
 - there is a record in AV_TREATMENT which states that the tumour was treated with surgery (event is '01a', '01b', or '01z')
 - and the OPCS4_CODE is an endoscopic resection or endoscopic biopsy 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 TNM stage 1 (a stage-specific tumour resection flag will incorporate this stage criteria in the final table)

```
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
FROM (
SELECT TUMOURID, DATEDIFF, RK, EVENTDATE
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
FROM TR_TUMOUR_COHORT TC
INNER JOIN AV2016.AV_TIMEFRAME_LOOKUP_1315 tim ON tim.TUMOURICDSITE3CODE =
TC.TUMOUR_CODE
INNER JOIN ANALYSISNCR.AV_TREATMENT@CAS1712 AVTREAT ON
AVTREAT.TUMOURID=TC.TUMOURID
AND EVENTCODE IN ('01a','01b','01z') 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));
```

--16)----- COLORECTAL CANCERS; ENDOSCOPIES - 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 resection or endoscopic biopsy 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 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
FROM (
```


CAS-SOP #4.4: Linking treatment tables

```
SELECT TUMOURID, DATEDIFF, RK, OPDATE 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
FROM TR_TUMOUR_COHORT TC
INNER JOIN AV2016.AV_TIMEFRAME_LOOKUP_1315 tim ON tim.TUMOURICDSITE3CODE =
TC.TUMOUR_CODE
INNER JOIN HES2017.HES_LINKAGE_AV_APC@casref01 HL ON TC.PATIENTID = HL.PATIENTID
INNER JOIN HES2017.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
('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));
```

--17)----- COLORECTAL CANCERS; APPENDECTOMIES FOR APPENDIX TUMOURS ONLY
C18.1 - AV_TREATMENT -----

```
-- Create a surgery flag for the tumour if:
-- there is a record in AV_TREATMENT which states that the tumour was treated with surgery (event is
'01a', '01b', or '01z')
-- 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
FROM (
SELECT TUMOURID, DATEDIFF, RK, EVENTDATE
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
FROM TR_TUMOUR_COHORT TC
INNER JOIN AV2016.AV_TIMEFRAME_LOOKUP_1315@casref01 tim ON
tim.TUMOURICDSITE3CODE = TC.TUMOUR_CODE
INNER JOIN ANALYSISNCR.AV_TREATMENT@CAS1712 AVTREAT ON
AVTREAT.TUMOURID=TC.TUMOURID
AND EVENTCODE IN ('01a','01b','01z') 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
```

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-- 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
FROM (
SELECT TUMOURID, DATEDIFF, RK, OPDATE 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
FROM TR_TUMOUR_COHORT TC
INNER JOIN AV2016.AV_TIMEFRAME_LOOKUP_1315 tim ON tim.TUMOURICDSITE3CODE =
TC.TUMOUR_CODE
INNER JOIN HES2017.HES_LINKAGE_AV_APC@casref01 HL ON TC.PATIENTID = HL.PATIENTID
INNER JOIN HES2017.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 AV_TREATMENT 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
FROM (
SELECT TUMOURID, DATEDIFF, RK ,EVENTDATE 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
```

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```
FROM TR_TUMOUR_COHORT@casref01 TC
INNER JOIN AV2016.AV_TIMEFRAME_LOOKUP_1315 tim ON tim.TUMOURICDSITE3CODE =
TC.TUMOUR_CODE
INNER JOIN ANALYSISNCR.AV_TREATMENT@CAS1712 AVTREAT ON
AVTREAT.TUMOURID=TC.TUMOURID
  AND EVENTCODE IN ('02','04','15','19','CTX') AND (AVTREAT.EVENTDATE-
TC.DIAGNOSISDATEBEST BETWEEN -31 AND tim.CHEMO_TIME)
)
WHERE RK=1));
```

--20)-----ALL SITES - SACT -----

```
-- Create a chemo flag for the tumour if:
-- 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 only had one tumour in the time period of interest (this is also incorporated in the final
table)
```

```
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
FROM (
SELECT TUMOURID,DATEDIFF,RK    , START_DATE_OF_REGIMEN
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
FROM TR_TUMOUR_COHORT TC
INNER JOIN AV2016.AV_TIMEFRAME_LOOKUP_1315 tim ON tim.TUMOURICDSITE3CODE =
TC.TUMOUR_CODE
INNER JOIN SACT201710.PATIENT SP ON TC.NHSNUMBER=SP.NHS_NUMBER
INNER JOIN SACT201710.TUMOUR ST ON SP.MERGED_PATIENT_ID=ST.MERGED_PATIENT_ID
INNER JOIN SACT201710.REGIMEN 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-TC.DIAGNOSISDATEBEST BETWEEN -31 AND
tim.CHEMO_TIME
) WHERE RK=1
));
```

----- CREATE RADIOTHERAPY FLAG TABLES -----

--21)----- ALL SITES - AV_TREATMENT -----

```
-- Create a radiotherapy flag for the tumour if:
-- There is a record in AV_TREATMENT 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
FROM (
SELECT TUMOURID, DATEDIFF, RK, EVENTDATE 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
FROM TR_TUMOUR_COHORT TC
INNER JOIN AV2016.AV_TIMEFRAME_LOOKUP_1315 tim ON tim.TUMOURICDSITE3CODE =
TC.TUMOUR_CODE
INNER JOIN ANALYSISNCR.AV_TREATMENT@CAS1712 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
));

```

--22)-----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
FROM (
SELECT TUMOURID,DATEDIFF,RK      , APPTDATE FROM (
SELECT TC.TUMOURID, RL.APPTDATE-TC.DIAGNOSISDATEBEST AS DATEDIFF,
RANK() OVER (PARTITION BY TC.TUMOURID ORDER BY
RI.APPTDATE,RI.ATTENDID,RI.ORGCODEPROVIDER,PR.RADIOTHERAPYEPIISODEID,PR.PRESCRI
PTIONID) AS RK
      , RL.APPTDATE
FROM TR_TUMOUR_COHORT TC
INNER JOIN AV2016.AV_TIMEFRAME_LOOKUP_1315 tim ON tim.TUMOURICDSITE3CODE =
TC.TUMOUR_CODE
INNER JOIN RTDS2016.OPCDS_CAS1712_LINKAGE RL ON TC.PATIENTID=RL.PATIENTID AND
RL.APPTDATE-TC.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')
)
)

```

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```
WHERE RK=1
)
);
```

--23)----- 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

-- Note that snapshot CAS1803 has now been dropped and a later snapshot needs to be used. This may result in small differences when replicating results.

```
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
FROM (
SELECT TUMOURID,DATEDIFF,RK, APPTDATE 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.RADIOTHERAPYEPISEID,PR.PRESCRIPTIONID) AS RK
FROM TR_TUMOUR_COHORT TC
INNER JOIN AV2016.AV_TIMEFRAME_LOOKUP_1315 tim ON tim.TUMOURICDSITE3CODE =
TC.TUMOUR_CODE
INNER JOIN RTDS.ROVPRESCRIPTIONS@CAS1806 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 ANALYSISBECKYWHITE.TR_AVCT_TUMOURID_UQ ON
ANALYSISBECKYWHITE.TR_AV_CT (TUMOURID) NOLOGGING TABLESPACE
ANALYSISDATA_IX;
```

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```
CREATE UNIQUE INDEX ANALYSISBECKYWHITE.TR_AVRT_TUMOURID_UQ ON
ANALYSISBECKYWHITE.TR_AV_RT (TUMOURID) NOLOGGING TABLESPACE
ANALYSISDATA_IX;
CREATE UNIQUE INDEX ANALYSISBECKYWHITE.TR_AVSG_TUMOURID_UQ ON
ANALYSISBECKYWHITE.TR_AV_SG (TUMOURID) NOLOGGING TABLESPACE
ANALYSISDATA_IX;
CREATE UNIQUE INDEX ANALYSISBECKYWHITE.TR_AV_BLADDER1_TUMOURID_UQ ON
ANALYSISBECKYWHITE.TR_AV_BLADDER (TUMOURID) NOLOGGING TABLESPACE
ANALYSISDATA_IX;
CREATE UNIQUE INDEX ANALYSISBECKYWHITE.TR_AV_COLOAPPEN_TUMID_UQ ON
ANALYSISBECKYWHITE.TR_AV_COLOAPPEN (TUMOURID) NOLOGGING TABLESPACE
ANALYSISDATA_IX;
CREATE UNIQUE INDEX ANALYSISBECKYWHITE.TR_AV_COLOREC_TUMOURID_UQ ON
ANALYSISBECKYWHITE.TR_AV_COLOREC (TUMOURID) NOLOGGING TABLESPACE
ANALYSISDATA_IX;
CREATE UNIQUE INDEX ANALYSISBECKYWHITE.TR_AV_CONEBIOPS_TUMID_UQ ON
ANALYSISBECKYWHITE.TR_AV_CONEBIOPS (TUMOURID) NOLOGGING TABLESPACE
ANALYSISDATA_IX;
CREATE UNIQUE INDEX ANALYSISBECKYWHITE.TR_AV_LIVER_TUMOURID_UQ ON
ANALYSISBECKYWHITE.TR_AV_LIVER (TUMOURID) NOLOGGING TABLESPACE
ANALYSISDATA_IX;
CREATE UNIQUE INDEX ANALYSISBECKYWHITE.TR_AV_LYMPH_TUMOURID_UQ ON
ANALYSISBECKYWHITE.TR_AV_LYMPH (TUMOURID) NOLOGGING TABLESPACE
ANALYSISDATA_IX;
CREATE UNIQUE INDEX ANALYSISBECKYWHITE.TR_AV_OESOPH_TUMOURID_UQ ON
ANALYSISBECKYWHITE.TR_AV_OESOPH (TUMOURID) NOLOGGING TABLESPACE
ANALYSISDATA_IX;
CREATE UNIQUE INDEX ANALYSISBECKYWHITE.TR_AV_STOMACH_TUMOURID_UQ ON
ANALYSISBECKYWHITE.TR_AV_STOMACH (TUMOURID) NOLOGGING TABLESPACE
ANALYSISDATA_IX;

EXECUTE DBMS_STATS.GATHER_TABLE_STATS('ANALYSISBECKYWHITE', 'TR_AV_CT')
EXECUTE DBMS_STATS.GATHER_INDEX_STATS('ANALYSISBECKYWHITE',
'TR_AVCT_TUMOURID_UQ')

EXECUTE DBMS_STATS.GATHER_TABLE_STATS('ANALYSISBECKYWHITE', 'TR_AV_RT')
EXECUTE DBMS_STATS.GATHER_INDEX_STATS('ANALYSISBECKYWHITE',
'TR_AVRT_TUMOURID_UQ')

EXECUTE DBMS_STATS.GATHER_TABLE_STATS('ANALYSISBECKYWHITE', 'TR_AV_SG')
EXECUTE DBMS_STATS.GATHER_INDEX_STATS('ANALYSISBECKYWHITE',
'TR_AVSG_TUMOURID_UQ')

EXECUTE DBMS_STATS.GATHER_TABLE_STATS('ANALYSISBECKYWHITE', 'TR_AV_BLADDER')
EXECUTE DBMS_STATS.GATHER_INDEX_STATS('ANALYSISBECKYWHITE',
'TR_AV_BLADDER1_TUMOURID_UQ')

EXECUTE DBMS_STATS.GATHER_TABLE_STATS('ANALYSISBECKYWHITE',
'TR_AV_COLOAPPEN')
EXECUTE DBMS_STATS.GATHER_INDEX_STATS('ANALYSISBECKYWHITE',
'TR_AV_COLOAPPEN_TUMID_UQ')

EXECUTE DBMS_STATS.GATHER_TABLE_STATS('ANALYSISBECKYWHITE', 'TR_AV_COLOREC')
EXECUTE DBMS_STATS.GATHER_INDEX_STATS('ANALYSISBECKYWHITE',
'TR_AV_COLOREC_TUMOURID_UQ')

EXECUTE DBMS_STATS.GATHER_TABLE_STATS('ANALYSISBECKYWHITE',
'TR_AV_CONEBIOPS')
EXECUTE DBMS_STATS.GATHER_INDEX_STATS('ANALYSISBECKYWHITE',
'TR_AV_CONEBIOPS_TUMID_UQ')
```

```
EXECUTE DBMS_STATS.GATHER_TABLE_STATS('ANALYSISBECKYWHITE', 'TR_AV_LIVER')
EXECUTE DBMS_STATS.GATHER_INDEX_STATS('ANALYSISBECKYWHITE',
'TR_AV_LIVER_TUMOURID_UQ')
```

```
EXECUTE DBMS_STATS.GATHER_TABLE_STATS('ANALYSISBECKYWHITE', 'TR_AV_LYMPH')
EXECUTE DBMS_STATS.GATHER_INDEX_STATS('ANALYSISBECKYWHITE',
'TR_AV_LYMPH_TUMOURID_UQ')
```

```
EXECUTE DBMS_STATS.GATHER_TABLE_STATS('ANALYSISBECKYWHITE', 'TR_AV_OESOPH')
EXECUTE DBMS_STATS.GATHER_INDEX_STATS('ANALYSISBECKYWHITE',
'TR_AV_OESOPH_TUMOURID_UQ')
```

```
EXECUTE DBMS_STATS.GATHER_TABLE_STATS('ANALYSISBECKYWHITE', 'TR_AV_STOMACH')
EXECUTE DBMS_STATS.GATHER_INDEX_STATS('ANALYSISBECKYWHITE',
'TR_AV_STOMACH_TUMOURID_UQ')
```

```
CREATE UNIQUE INDEX ANALYSISBECKYWHITE.TR_HESSG_TUMOURID_UQ ON
ANALYSISBECKYWHITE.TR_HES_SG (TUMOURID) NOLOGGING TABLESPACE
ANALYSISDATA_IX;
CREATE UNIQUE INDEX ANALYSISBECKYWHITE.TR_HES_BLADDER1_TUMID_UQ ON
ANALYSISBECKYWHITE.TR_HES_BLADDER (TUMOURID) NOLOGGING TABLESPACE
ANALYSISDATA_IX;
CREATE UNIQUE INDEX ANALYSISBECKYWHITE.TR_HES_COLOAPPEN_TUMID_UQ ON
ANALYSISBECKYWHITE.TR_HES_COLOAPPEN (TUMOURID) NOLOGGING TABLESPACE
ANALYSISDATA_IX;
CREATE UNIQUE INDEX ANALYSISBECKYWHITE.TR_HES_COLOREC_TUMOURID_UQ ON
ANALYSISBECKYWHITE.TR_HES_COLOREC (TUMOURID) NOLOGGING TABLESPACE
ANALYSISDATA_IX;
CREATE UNIQUE INDEX ANALYSISBECKYWHITE.TR_HES_CONEBIOPS_TUMID_UQ ON
ANALYSISBECKYWHITE.TR_HES_CONEBIOPS (TUMOURID) NOLOGGING TABLESPACE
ANALYSISDATA_IX;
CREATE UNIQUE INDEX ANALYSISBECKYWHITE.TR_HES_LIVER_TUMOURID_UQ ON
ANALYSISBECKYWHITE.TR_HES_LIVER (TUMOURID) NOLOGGING TABLESPACE
ANALYSISDATA_IX;
CREATE UNIQUE INDEX ANALYSISBECKYWHITE.TR_HES_LYMPH_TUMOURID_UQ ON
ANALYSISBECKYWHITE.TR_HES_LYMPH (TUMOURID) NOLOGGING TABLESPACE
ANALYSISDATA_IX;
CREATE UNIQUE INDEX ANALYSISBECKYWHITE.TR_HES_OESOPH_TUMOURID_UQ ON
ANALYSISBECKYWHITE.TR_HES_OESOPH (TUMOURID) NOLOGGING TABLESPACE
ANALYSISDATA_IX;
CREATE UNIQUE INDEX ANALYSISBECKYWHITE.TR_HES_STOMACH_TUMOURID_UQ ON
ANALYSISBECKYWHITE.TR_HES_STOMACH (TUMOURID) NOLOGGING TABLESPACE
ANALYSISDATA_IX;
CREATE UNIQUE INDEX ANALYSISBECKYWHITE.TR_RTDS_TUMOURID_UQ ON
ANALYSISBECKYWHITE.TR_RTDS (TUMOURID) NOLOGGING TABLESPACE
ANALYSISDATA_IX;
CREATE UNIQUE INDEX ANALYSISBECKYWHITE.TR_RTDS_2_TUMOURID_UQ ON
ANALYSISBECKYWHITE.TR_RTDS_2 (TUMOURID) NOLOGGING TABLESPACE
ANALYSISDATA_IX;
CREATE UNIQUE INDEX ANALYSISBECKYWHITE.TR_SACT_TUMOURID_UQ ON
ANALYSISBECKYWHITE.TR_SACT (TUMOURID) NOLOGGING TABLESPACE
ANALYSISDATA_IX;
```

```
EXECUTE DBMS_STATS.GATHER_TABLE_STATS('ANALYSISBECKYWHITE', 'TR_HES_SG')
EXECUTE DBMS_STATS.GATHER_INDEX_STATS('ANALYSISBECKYWHITE',
'TR_HESSG_TUMOURID_UQ')
```

```
EXECUTE DBMS_STATS.GATHER_TABLE_STATS('ANALYSISBECKYWHITE', 'TR_HES_BLADDER')
```

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```
EXECUTE DBMS_STATS.GATHER_INDEX_STATS('ANALYSISBECKYWHITE',  
'TR_HES_BLADDER1_TUMID_UQ')
```

```
EXECUTE DBMS_STATS.GATHER_TABLE_STATS('ANALYSISBECKYWHITE',  
'TR_HES_COLOAPPEN')  
EXECUTE DBMS_STATS.GATHER_INDEX_STATS('ANALYSISBECKYWHITE',  
'TR_HES_COLOAPPEN_TUMID_UQ')
```

```
EXECUTE DBMS_STATS.GATHER_TABLE_STATS('ANALYSISBECKYWHITE', 'TR_HES_COLOREC')  
EXECUTE DBMS_STATS.GATHER_INDEX_STATS('ANALYSISBECKYWHITE',  
'TR_HES_COLOREC_TUMOURID_UQ')
```

```
EXECUTE DBMS_STATS.GATHER_TABLE_STATS('ANALYSISBECKYWHITE',  
'TR_HES_CONEBIOPS')  
EXECUTE DBMS_STATS.GATHER_INDEX_STATS('ANALYSISBECKYWHITE',  
'TR_HES_CONEBIOPS_TUMID_UQ')
```

```
EXECUTE DBMS_STATS.GATHER_TABLE_STATS('ANALYSISBECKYWHITE', 'TR_HES_LIVER')  
EXECUTE DBMS_STATS.GATHER_INDEX_STATS('ANALYSISBECKYWHITE',  
'TR_HES_LIVER_TUMOURID_UQ')
```

```
EXECUTE DBMS_STATS.GATHER_TABLE_STATS('ANALYSISBECKYWHITE', 'TR_HES_LYMPH')  
EXECUTE DBMS_STATS.GATHER_INDEX_STATS('ANALYSISBECKYWHITE',  
'TR_HES_LYMPH_TUMOURID_UQ')
```

```
EXECUTE DBMS_STATS.GATHER_TABLE_STATS('ANALYSISBECKYWHITE', 'TR_HES_OESOPH')  
EXECUTE DBMS_STATS.GATHER_INDEX_STATS('ANALYSISBECKYWHITE',  
'TR_HES_OESOPH_TUMOURID_UQ')
```

```
EXECUTE DBMS_STATS.GATHER_TABLE_STATS('ANALYSISBECKYWHITE', 'TR_HES_STOMACH')  
EXECUTE DBMS_STATS.GATHER_INDEX_STATS('ANALYSISBECKYWHITE',  
'TR_HES_STOMACH_TUMOURID_UQ')
```

```
EXECUTE DBMS_STATS.GATHER_TABLE_STATS('ANALYSISBECKYWHITE', 'TR_RTDS')  
EXECUTE DBMS_STATS.GATHER_INDEX_STATS('ANALYSISBECKYWHITE',  
'TR_RTDS_TUMOURID_UQ')
```

```
EXECUTE DBMS_STATS.GATHER_TABLE_STATS('ANALYSISBECKYWHITE', 'TR_RTDS_2')  
EXECUTE DBMS_STATS.GATHER_INDEX_STATS('ANALYSISBECKYWHITE',  
'TR_RTDS_2_TUMOURID_UQ')
```

```
EXECUTE DBMS_STATS.GATHER_TABLE_STATS('ANALYSISBECKYWHITE', 'TR_SACT')  
EXECUTE DBMS_STATS.GATHER_INDEX_STATS('ANALYSISBECKYWHITE',  
'TR_SACT_TUMOURID_UQ')
```

```
-----  
----- Create final table drawing on all previous tables-----  
-----
```

```
CREATE TABLE AV_TREATMENT_TABLE_1315_SOP4P4  
AS
```

```
SELECT
```

```
--Create radiotherapy (RT) flag for the tumour  
--Only use the patient level datasets (RTDS, RTDS2) if the patient had no other tumours recorded in the  
18 months before or after this tumour diagnosis  
CASE
```


CAS-SOP #4.4: Linking treatment tables

```
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
```

```
--Create chemo (CT) flag for the tumour
--Only use the patient level datasets (SACT) if the patient had no other tumours recorded in the 18
months before or after this tumour diagnosis
,CASE
WHEN AVCT_FLAG=1 THEN 1
WHEN SACT_FLAG=1 AND TC.TUMOUR_FLAG=0 THEN 1
ELSE 0
END AS CT_FLAG
```

```
--Create resection flag for the tumour
--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
,CASE
```

```
-- Firstly, incorporate non-stage specific resection flag using OPCS4 resection lookup table
WHEN AVSG_FLAG=1 THEN 1
WHEN HESSG_FLAG=1 AND TC.TUMOUR_FLAG=0 THEN 1
```

```
-- Secondly, incorporate stage specific rules for particular cancer sites
```

```
--Cervical
WHEN AVT.SITE_ICD10_O2_3CHAR='C53' and (upper(SUBSTR(tc.figo,1,2))) in ('1A','IA') and
CONEBIOPS_AVTREAT=1 then 1
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 1
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 1
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 1
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_AVTREAT=1) THEN 1
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 1
```

```
--Colorectal:
WHEN AVT.SITE_ICD10_O2_3CHAR in ('C18','C19','C20') and SUBSTR(AVT.stage_best,1,1)='1' and
COLOREC_AVTREAT=1 then 1
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 1
```

```
--Sub rule for appendectomies for colorectal:
```

```
WHEN AVT.SITE_ICD10_O2 in ('C181') and COLOREC_AVTREAT_appen=1 then 1
WHEN AVT.SITE_ICD10_O2 in ('C181') and COLOREC_HES_appen=1 AND TC.TUMOUR_FLAG=0
then 1
```

```
--Bladder
```

CAS-SOP #4.4: Linking treatment tables

```
WHEN AVT.SITE_ICD10_O2_3CHAR in ('C67') and SUBSTR(AVT.T_BEST, 1,1) = '1' and  
BLADDER1_AVTREAT=1 then 1  
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 1
```

-- Liver

```
WHEN AVT.SITE_ICD10_O2_3CHAR in ('C22') and SUBSTR(stage_best,1,1)='1' and  
LIVER_AVTREAT=1 then 1  
WHEN AVT.SITE_ICD10_O2_3CHAR in ('C22') and SUBSTR(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(stage_best,1,2)='1A' and  
OESOPH_AVTREAT=1 then 1  
WHEN AVT.SITE_ICD10_O2_3CHAR in ('C15') and SUBSTR(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(stage_best,1,2)='1A' and  
STOMACH_AVTREAT=1 then 1  
WHEN AVT.SITE_ICD10_O2_3CHAR in ('C16') and SUBSTR(stage_best,1,2)='1A' and  
STOMACH_HES=1 AND TC.TUMOUR_FLAG=0 then 1
```

```
ELSE 0  
END AS SG_FLAG
```

--Create stage variable

-- Stage breakdowns use TNM staging, except gynaecological cancers which use Figo staging.
-- For cervical cancers, only FIGO staging has been used. For ovarian, uterine and vulval cancers, TNM
stage has been used where Figo stage was unknown.
-- FIGO substages were collated into Figo stages 1, 2, 3, 4, and unknown.

```
,case  
when tumour_code in ('C53','C56', 'C57','C48ovary','C54', 'C55','C51') and (SUBSTR(tc.figo,1,1)='4' or  
SUBSTR(tc.figo,1,2)='IV') then '4'  
when tumour_code in ('C53','C56', 'C57','C48ovary','C54', 'C55','C51') and (SUBSTR(tc.figo,1,1)='3' or  
SUBSTR(tc.figo,1,3)='III') then '3'  
when tumour_code in ('C53','C56', 'C57','C48ovary','C54', 'C55','C51') and (SUBSTR(tc.figo,1,1)='2' or  
SUBSTR(tc.figo,1,2)='II') then '2'  
when tumour_code in ('C53','C56', 'C57','C48ovary','C54', 'C55','C51') and (SUBSTR(tc.figo,1,1)='1' or  
SUBSTR(tc.figo,1,1)='I') then '1'  
when tumour_code not in ('C53') and SUBSTR(stage_best,1,1)='1' then '1'  
when tumour_code not in ('C53') and SUBSTR(stage_best,1,1)='2' then '2'  
when tumour_code not in ('C53') and SUBSTR(stage_best,1,1)='3' then '3'  
when tumour_code not in ('C53') and SUBSTR(stage_best,1,1)='4' then '4'  
else 'Unk/Oth' end as stage_group
```

--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'
```

CAS-SOP #4.4: Linking treatment tables

```
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') then 'Ovary'  
  
when tumour_code in ('C16') then 'Stomach'  
when tumour_code in ('C54', 'C55') then 'Uterine'  
when tumour_code in ('C51') then 'Vulva'  
else 'Other'  
END as cancergroup
```

-- Select all other variables

```
,AVT.TUMOURID  
,AVT.DIAGNOSISYEAR  
  
,avt.age  
,avt.dco  
,avt.basisofdiagnosis  
,avt.CCG_CODE  
,avt.GOR_CODE  
,avt.FIVEYEARAGEBAND  
,avt.SEX  
,avt.ethnicity  
,CHRL.CHRL_TOT_27_03  
,IMD.QUINTILE_2015  
,CALNCV17CD  
,CALNCV17NM  
  
--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 AV_Treatment

```
,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 RTDS.rtds_date end as rtds_date
```

CAS-SOP #4.4: Linking treatment tables

```
,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 were flagged:

-----CERVICAL-----

```
-- Take date of cone biopsy in AVTREATMENT 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_date  
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_date  
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_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','IA')) 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','IB') or  
upper(SUBSTR(tc.figo,1,3)) in ('1B1','IB1')) 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','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_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 SUBSTR(AVT.stage_best,1,1)='1'  
and COLOREC_AVTREAT=1 then COLOAVT.avsg_date  
end as COLOavsg_date
```

```
,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_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
```

CAS-SOP #4.4: Linking treatment tables

end as appenhessg_date

-----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(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(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
```

-- 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 ANALYSISNCR.AV_TUMOUR@CAS1712 AVT
INNER JOIN TR_TUMOUR_COHORT TC ON AVT.TUMOURID =TC.TUMOURID
LEFT JOIN analysisbeckywhite.TR_AV_CT AVCT ON AVT.TUMOURID=AVCT.TUMOURID
LEFT JOIN analysisbeckywhite.TR_SACT SACT ON AVT.TUMOURID=SACT.TUMOURID
LEFT JOIN analysisbeckywhite.TR_AV_RT AVRT ON AVT.TUMOURID=AVRT.TUMOURID
LEFT JOIN analysisbeckywhite.TR_AV_SG AVSG ON AVT.TUMOURID=AVSG.TUMOURID and
(tc.tumour_code not in ('C48other'))
LEFT JOIN analysisbeckywhite.TR_RTDS RTDS ON AVT.TUMOURID=RTDS.TUMOURID
LEFT JOIN analysisbeckywhite.TR_HES_SG HESSG ON AVT.TUMOURID=HESSG.TUMOURID and
(tc.tumour_code not in ('C48other'))
LEFT JOIN analysisbeckywhite.TR_RTDS_2 RTDS2 ON AVT.TUMOURID=RTDS2.TUMOURID
```

CAS-SOP #4.4: Linking treatment tables

-- Add further joins for stage-specific resections:

-- add gynae tables:

```
LEFT JOIN analysisbeckywhite.TR_AV_CONEBIOPS CBAVT ON  
AVT.TUMOURID=CBAVT.TUMOURID  
LEFT JOIN analysisbeckywhite.TR_HES_CONEBIOPS CBHES ON  
AVT.TUMOURID=CBHES.TUMOURID  
LEFT JOIN analysisbeckywhite.TR_AV_LYMPH LYAVT ON AVT.TUMOURID=LYAVT.TUMOURID  
LEFT JOIN analysisbeckywhite.TR_HES_LYMPH LYHES ON AVT.TUMOURID=LYHES.TUMOURID
```

-- add colorectal tables:

```
LEFT JOIN analysisbeckywhite.TR_AV_COLOREC COLOAVT ON  
AVT.TUMOURID=COLOAVT.TUMOURID  
LEFT JOIN analysisbeckywhite.TR_HES_COLOREC COLOHES ON  
AVT.TUMOURID=COLOHES.TUMOURID  
LEFT JOIN analysisbeckywhite.TR_AV_COLOAPPEN COLOAVT_appen ON  
AVT.TUMOURID=COLOAVT_appen.TUMOURID  
LEFT JOIN analysisbeckywhite.TR_HES_COLOAPPEN COLOHES_appen ON  
AVT.TUMOURID=COLOHES_appen.TUMOURID
```

-- add urological tables:

```
LEFT JOIN analysisbeckywhite.TR_AV_BLADDER BLAD1_AVT ON  
AVT.TUMOURID=BLAD1_AVT.TUMOURID  
LEFT JOIN analysisbeckywhite.TR_HES_BLADDER BLAD1_HES ON  
AVT.TUMOURID=BLAD1_HES.TUMOURID
```

-- add UGI tables:

```
LEFT JOIN analysisbeckywhite.TR_AV_LIVER LIVAVT ON AVT.TUMOURID=LIVAVT.TUMOURID  
LEFT JOIN analysisbeckywhite.TR_HES_LIVER LIVHES ON AVT.TUMOURID=LIVHES.TUMOURID  
LEFT JOIN analysisbeckywhite.TR_AV_OESOPH OESOAVT ON  
AVT.TUMOURID=OESOAVT.TUMOURID  
LEFT JOIN analysisbeckywhite.TR_HES_OESOPH OESOHES ON  
AVT.TUMOURID=OESOHES.TUMOURID  
LEFT JOIN analysisbeckywhite.TR_AV_STOMACH STOMAVT ON  
AVT.TUMOURID=STOMAVT.TUMOURID  
LEFT JOIN analysisbeckywhite.TR_HES_STOMACH STOMHES ON  
AVT.TUMOURID=STOMHES.TUMOURID
```

-- Additional demographics

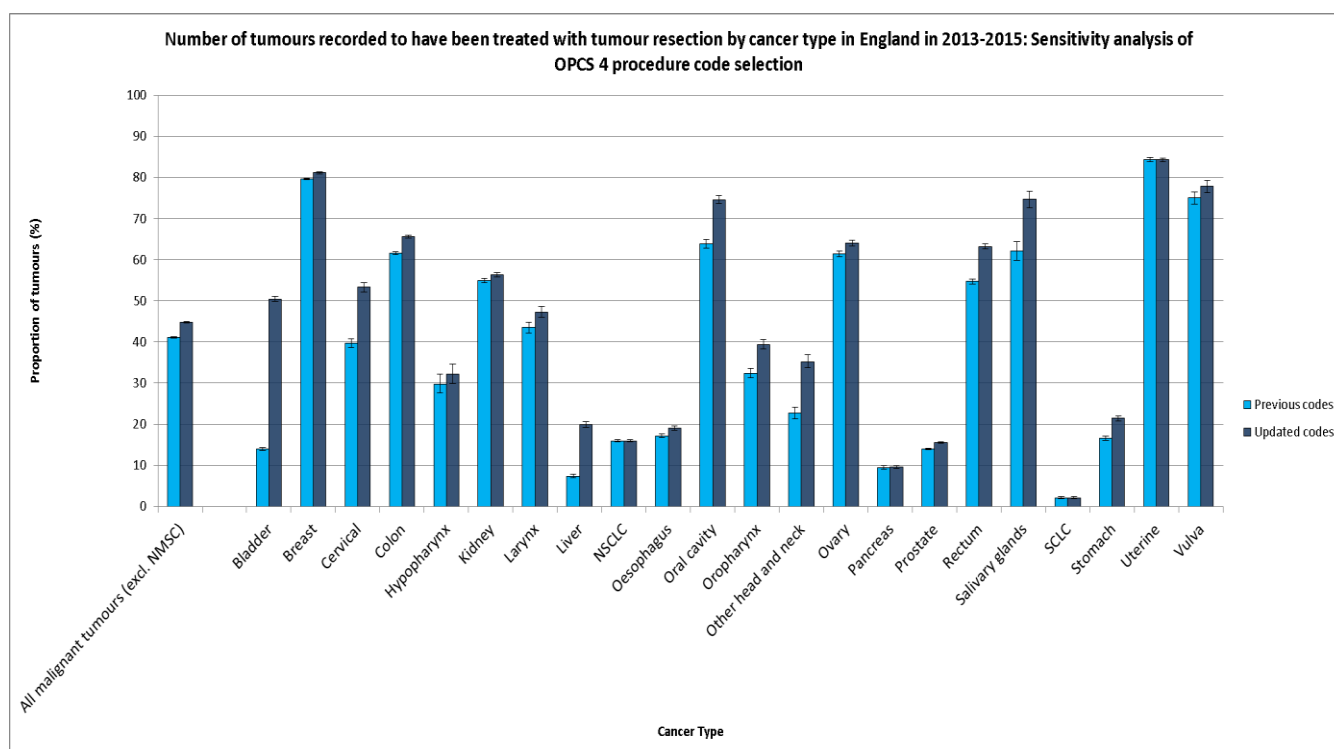
```
LEFT JOIN IMD.ID2015@CASREF01 IMD ON IMD.LSOA11_CODE=AVT.LSOA11_CODE  
LEFT JOIN AV2015.CHARLSON2006TO2015@casref01 CHRL ON  
CHRL.TUMOURID=AVT.TUMOURID  
LEFT JOIN ANALYSISNCR.LSOA_CA_201706 NCR ON NCR.LSOA11CD=AVT.LSOA11_CODE  
;
```

Appendix 5: Datasets used

Treatment type	Dataset	Data table version	Follow up period available	Linkage type	Data quality notes
Chemotherapy	Registry data from AV_TREATMENT	ANALYSISNCR.AV_TREATMENT@CAS1712	Historical - December 2017	Tumour level	
Chemotherapy	Systemic Anti-Cancer Therapy (SACT) 2017	SACT 201710.REGIMEN@CASREF01	January 2013 - July 2017	Patient level	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.
Tumour resection	Registry data from AV_TREATMENT	ANALYSISNCR.AV_TREATMENT@CAS1712	Historical - December 2017	Tumour level	
Tumour resection	Inpatient Hospital Episodes Statistics (HES) 2017	HES2017.HESAPC_OPERTN@CASREF01	April 2000 – February 2017	Patient level	Where a time period of 18 months has been used, some tumours diagnosed in 2015 will not yet have surgery data recorded in HES, so the percentage receiving a tumour resection may be an underestimate.
Radiotherapy	Registry data from AV_TREATMENT	ANALYSISNCR.AV_TREATMENT@CAS1712	Historical - December 2017	Tumour level	
Radiotherapy	Radiotherapy Dataset (RTDS) collected by NATCANSAT, pre April 2016	RTDS2016.RTDS_PRESCRIPTIONS@CASREF01	April 2009 – April 2016	Patient level	Brachytherapy & teletherapy variable known to be inaccurate (there is over allocation to brachytherapy & underreporting of teletherapy). Data may be incomplete for selected NHS Trusts.
Radiotherapy	Radiotherapy Dataset (RTDS) collected by PHE, post April 2016	RTDS.ROVPRESCRIPTIONS@CAS1806	April 2016 – March 2018	Patient level	As above

Appendix 6: Sensitivity analysis – impact of tumour resection code update

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



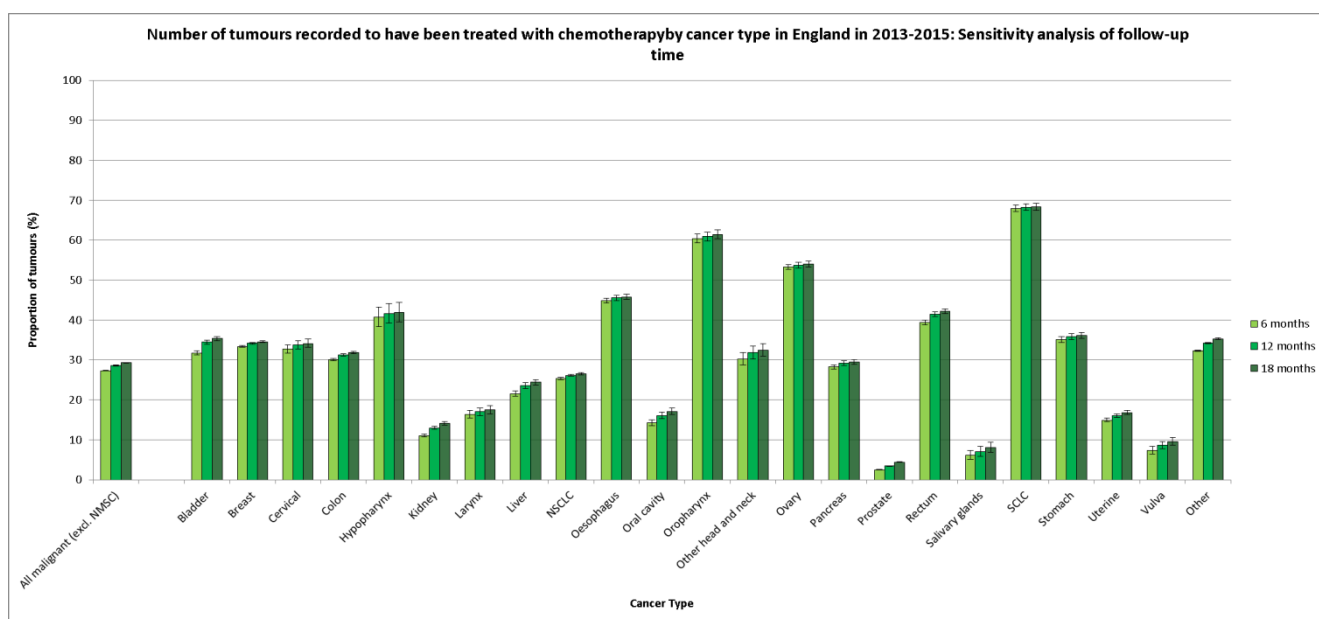
Findings

- 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).

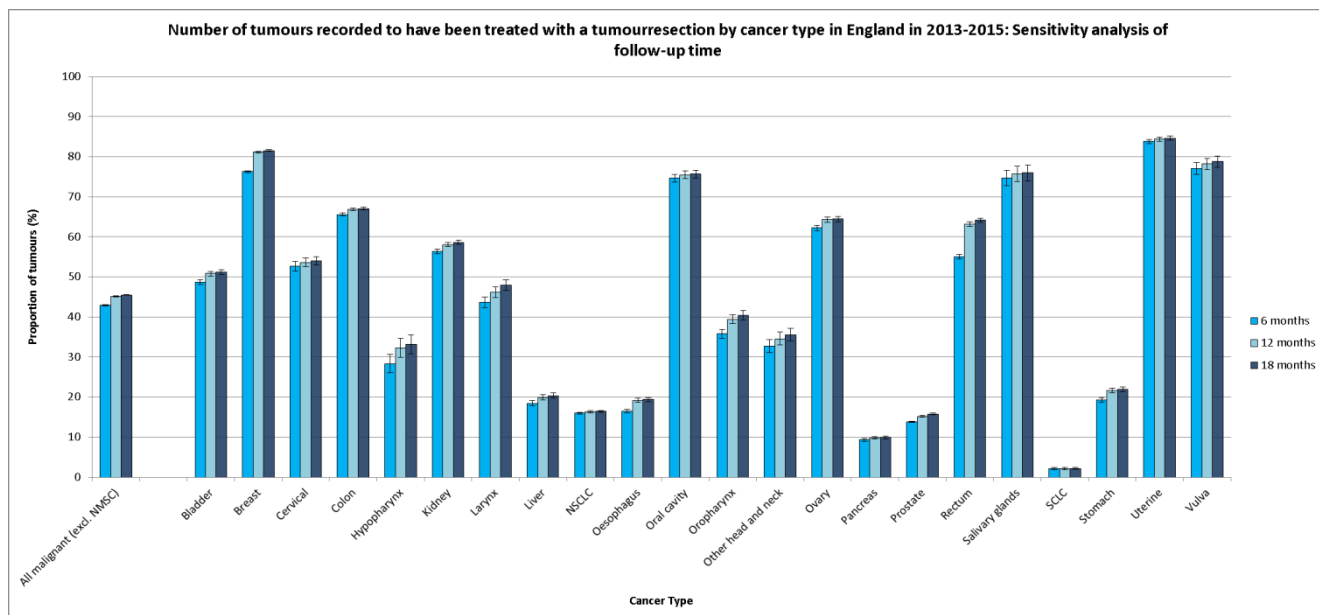
Appendix 7: Sensitivity analysis – impact of timeframe update

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.

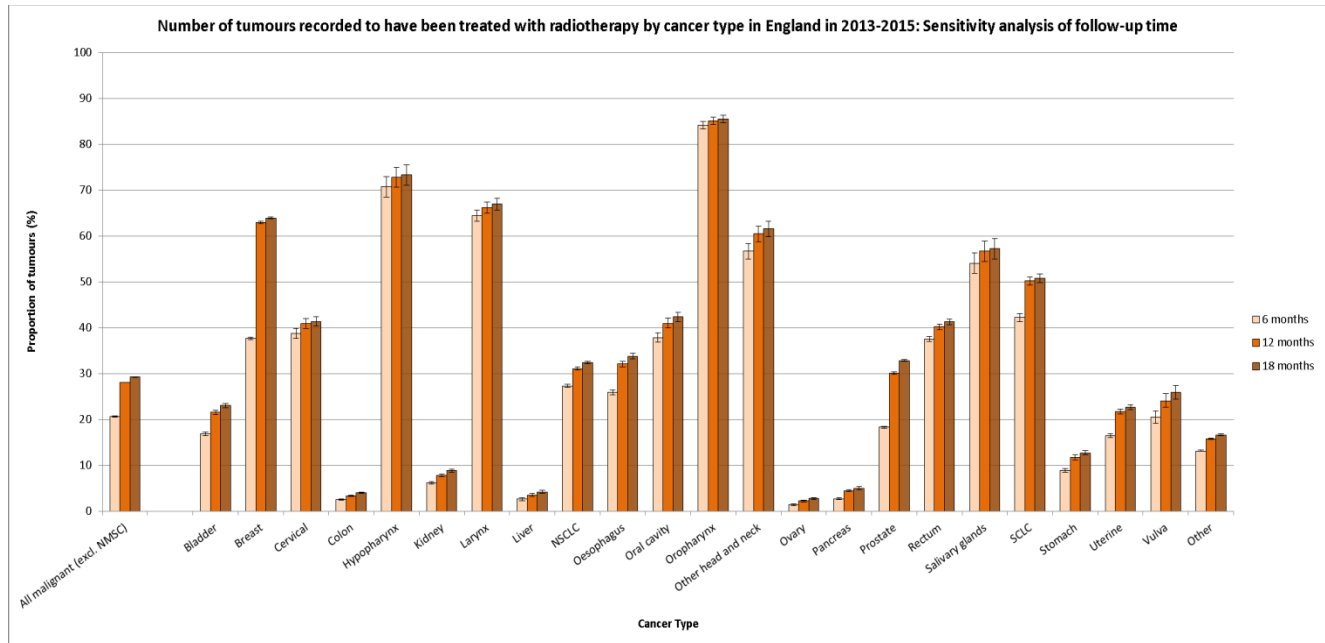
Chemotherapy



Tumour resections



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).