Public Health England

Protecting and improving the nation's health

CANCER RESEARCH UK

CAS-SOP #4.2

Linking treatment tables – chemotherapy, tumour resections and radiotherapy

Version 4.2 (Correction issued February 2018)

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This report has been produced as part of the Cancer Research UK (CRUK) – Public Health England (PHE) partnership.

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Published: October 2017
Corrected: February 2018
PHE publications
gateway number: 2017508

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Introduction

This Standard Operating Procedure (SOP) (v4.2) replaces the previous version (v4.0), to reflect a change in the code used to identify radiotherapy. The accompanying workbook has also been replaced with Version 2 to reflect this change. The correction removes brachytherapy from the definition of radiotherapy, which was included in error. This notably affects the proportion of tumours recorded to have been treated with radiotherapy for two cancer sites – uterine and prostate.

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 – 2014 V2' (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 is the first time chemotherapy and radiotherapy flagging methods have been described, and 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 3. 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 4. The SQL script which accompanies this SOP is in Appendix 5. 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 and overall approach

Cancer registry data from AV_TUMOUR is used as the base to identify the cohort of patients. 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.

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 ≥98% of radiotherapy and ≥94% of chemotherapy were captured by registry, SACT and RTDS in the period October 2012 to March 2013 (with the data completeness believed to be increasing since) it did not justify the complication of including CWT data.

For patients with one tumour diagnosed in 2013-2014, 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 used[1]. This is because for the patient linked tables, the precise tumour that a treatment relates to is not identified, only the person. The current scope of this SOP is to define a working methodology for counting treatments in the absence of tumour level linked data, but this may be modified as and when further tumour-linked treatment data becomes available.

Tumours which received the same treatment more than once are only counted once.

[1] Please note, for tumours diagnosed in late 2014, 18 months of follow-up are currently incomplete.

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 by relevant 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 bladder 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 4.

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 data only, because of the length of follow-up data required.

For example, of the pancreatic tumours diagnosed in 2013 which received a tumour resection within two years of diagnosis, 95% had their resection within 221 days - therefore for all pancreatic cancers diagnosed in 2013-2014, 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 (breast, colorectal, gynaecological, urological and lung). For these sites, clinicians decided the timeframe using a combination of their own experience and the data. See Appendix 3 for details.

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))

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 patient only had one tumour in the time period of interest

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 4)
- and the OPCS4_CODE occurred in the relevant timeframe (see Appendix 3)

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 4)
- and the OPCS4_CODE occurred in the relevant timeframe

- and the patient only had one tumour in the time period of interest

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))

OR

- there is a record in RTDS (excluding those classed as Brachytherapy, i.e., with RTTREATMENTMODALITY='06') and the patient only had one tumour in the time period of interest

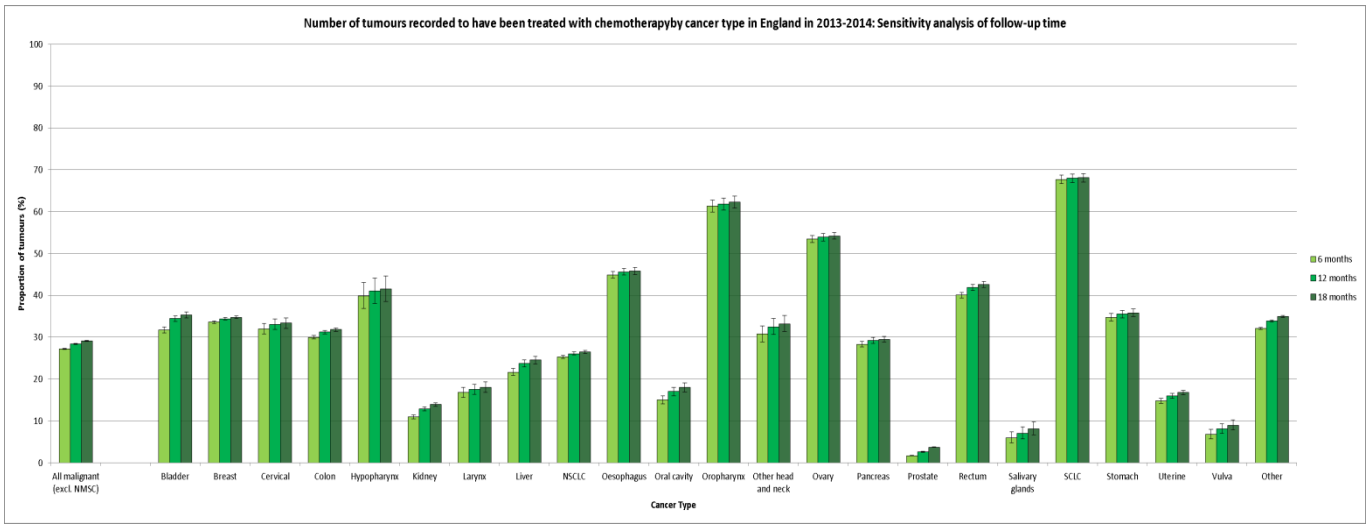
RTDS is linked to the cancer registration using a matching algorithm taking into account NHS number, date of birth, sex and postcode at diagnosis (details available on request to NCRAS). For selected tumours (liver, pancreatic and stomach), a follow up period of up to 18 months was included to capture patients’ first recorded radiotherapy. This means that for patients diagnosed towards the end of 2014, the number of tumours flagged with radiotherapy may be an underestimate.

Brachytherapy was excluded from the definition of radiotherapy because further investigation into its completeness is needed first.

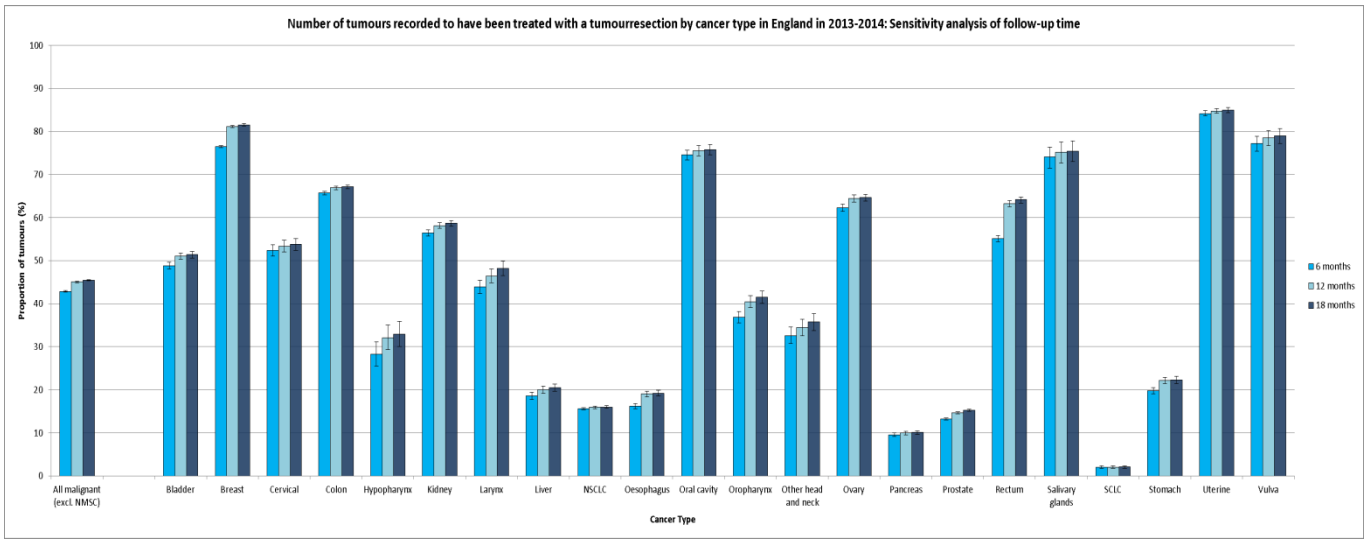
Appendix 1: Sensitivity analysis – impact of timeframe update

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.

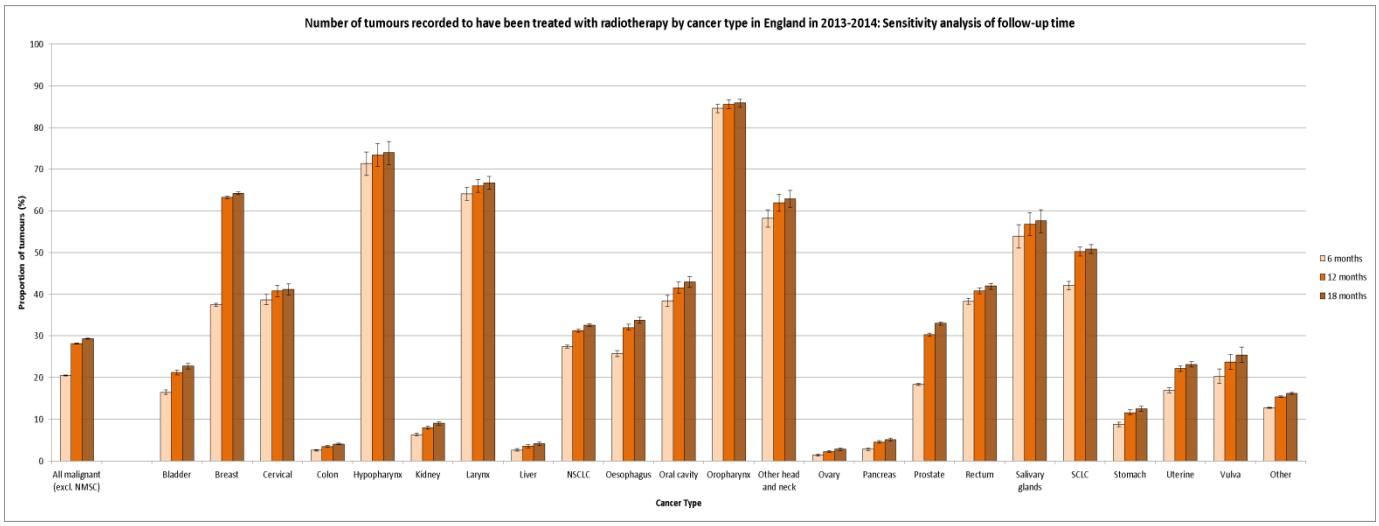
Chemotherapy



Tumour resections



Radiotherapy

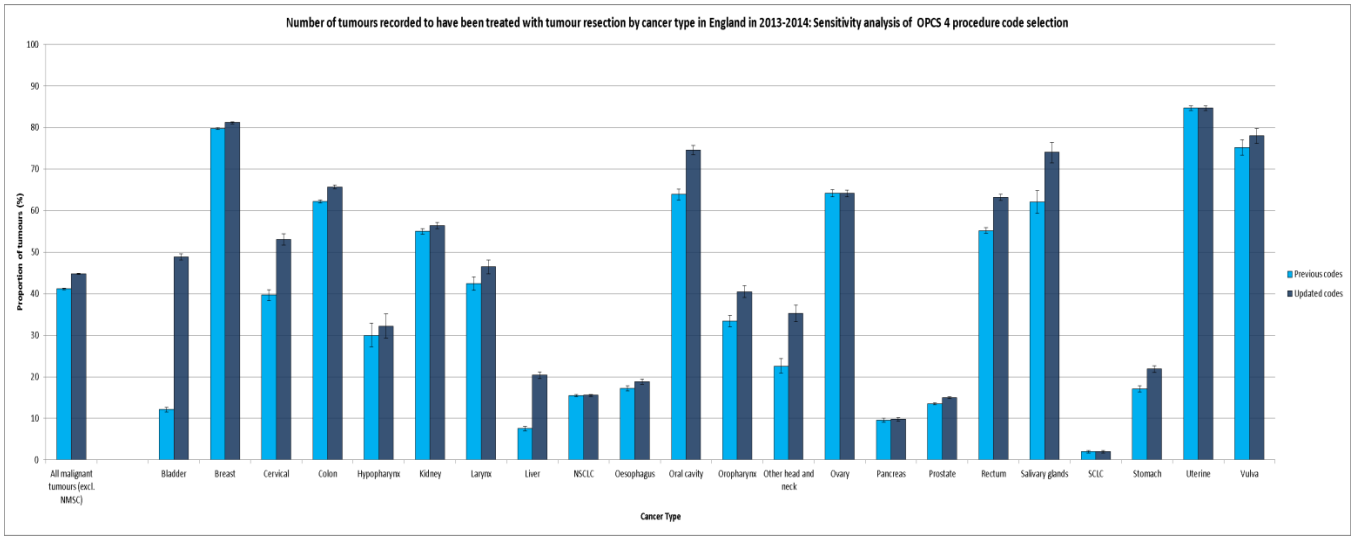


Findings

- Overall across all sites (excluding NMSC), 27% of tumours received chemotherapy within six months of diagnosis, increasing to 28% within 12 months, and 29% within 18 months. Sites with the greatest absolute differences in proportions from six to 18 months are bladder, kidney, liver, oral cavity 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), 21% 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 (8-27% absolute difference).

Appendix 2: Sensitivity analysis – impact of tumour resection code update

The list of relevant tumour resection codes was updated for this SOP. Below is a comparison of the previous coding used and the updated version. 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 4).
- Statistically significant differences between the proportions are present for all but four of the 22 sites (non-small lung cancer, ovary, small cell lung cancer and uterine cancers).
- The differences are most noticeable for bladder cancer (37% absolute difference), cervical (13% absolute difference), other head and neck (13% absolute difference) and liver (13% absolute difference).

Appendix 3: Site-specific summary of timeframe rules

		Days included as post-diagnostic time period (months)		
Cancer site	ICD10 codes	Tumour resections	Chemotherapy	Radiotherapy
Bladder	C67	183 (6)	365 (12)	365 (12)
Breast	C50	365 (12)	365 (12)	365 (12)
Cervical	C53	274 (9)	274 (9)	274 (9)
Colon	C18-19	183 (6)	365 (12)	365 (12)
Rectum	C20	365 (12)	365 (12)	365 (12)
Hypopharynx	C12, C13	365 (12)	183 (6)	183 (6)
Larynx	C32	365 (12)	456 (15)	183 (6)
Oral cavity	C02, C03, C04, C06	183 (6)	547 (18)	456 (15)
Oropharynx	C01, C09, C10	365 (12)	183 (6)	183 (6)
Other head and neck	C05, C11, C14, C30, C31	456 (15)	456 (15)	365 (12)
Salivary glands	C07, C08	183 (6)	456 (15)	274 (9)
Kidney	C64-C66, C68	183 (6)	365 (12)	365 (12)
Liver	C22	456 (15)	365 (12)	547 (18)
Small cell lung cancer (SCLC)	C33-C34 with ICD-O-2 morphology in list 8041, 8042, 8043, 8044, 8045	183 (6)	183 (6)	183 (6)
Non small cell lung cancer (NSCLC)	C33-C34 with ICD-O-2 morphology not in list 8041, 8042, 8043, 8044, 8045	183 (6)	183 (6)	183 (6)
Oesophagus	C15	274 (9)	183 (6)	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	274 (9)	183 (6)	547 (18)
Prostate	C61	456 (15)	365 (12)	365 (12)
Stomach	C16	274 (9)	183 (6)	274 (9)
Uterine	C54-C55	274 (9)	274 (9)	274 (9)
Vulva	C51	274 (9)	274 (9)	274 (9)
Other malignant neoplasms	C17, C21, C23-C24,C26, C37-C49, C58, C60, C62-C63, C70-C97	N/A	456 (15)	183 (6)

Appendix 4: 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 rigid sigmoidoscope	Stage 1 only
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
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	
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
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	
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	
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	
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	
J564	Subtotal excision of head of pancreas with preservation of duodenum and drainage HFQ	
J568	Other specified excision of head of pancreas	
J569	Unspecified excision of head of pancreas	
J571	Subtotal pancreatectomy	
J572	Left pancreatectomy and drainage of pancreatic duct	
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
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	Oesophagogastrectomy 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
P058	Other specified excision of vulva
P059	Unspecified excision of vulva
P111	Excision of lesion of female perineum

Appendix 5: Example code

This example code outputs tumour-level records.

The code presented below should be used to identify treatments, instead of that presented in CAS-SOP #3. Key differences include updated site- and treatment-specific post-diagnostic timeframes to identify treatments, an updated tumour resection code lookup table, inclusion of stage-specific resections, and updated data sources. The code below can be modified if more simple data is required.

```
--------------------------------------------------------------------------------

--Version 2: This code contains a correction to the original CAS-SOP#4 code published in October 2017.

--The original version linked tumours to RTDS (table 18a & 18b) using left joins. This meant tumours were incorrectly flagged as receiving radiotherapy in table 18a when either the recorded treatment was brachytherapy (which should be excluded), or the prescription record in RTDS2016.RTDS_PRESCRIPTIONS was missing. In version 2, the left joins in tables 18a & 18b have been corrected to inner joins.

--This correction results in fewer patients being flagged as having radiotherapy. Across all cancer sites combined, the absolute decrease in the proportion of tumours flagged as having radiotherapy decreases by 0.4%, a relative decrease of 1.5%. The largest decreases are for uterine (1,228 fewer, 8.1% absolute decrease, 27.8% relative decrease) and prostate (1,060 fewer, 1.3% absolute decrease, 4.1% relative decrease). Decreases for other cancer sites are minimal (under 0.5% absolute decrease, or 1.2% relative decrease).

--Other minor corrections have also been made:
--The extraction of each tumour's 4 Digit ICD-10 code used to identify appendix tumours in tables 15 & 16 has been moved so that it is extracted with the initial cohort in the first table. This is a cosmetic change and does not impact results.
--The CAS snapshot used to identify radiotherapy records from RTDS after April 2016 (table 18b) has been updated from snapshot 1708 to 1712. This may result in minor differences in the number of patients receiving radiotherapy.
--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"). This change does not impact results for 2013-14 diagnoses.

--------------------------------------------------------------------------------
-- Use latest version of tumour resection lookup list OPCS4RESECTION_LOOKUP and timeframe lookup table TIMEFRAME_LOOKUP in CAS.

create table TUMOUR_COHORT AS
(SELECT TUMOURID, PATIENTID, NHSNUMBER, DIAGNOSISDATEBEST, TUMOUR_CODE,
TUMOUR_FLAG, FIGO, SITE_ICD10_O2, sex FROM (
SELECT AVT.TUMOURID, AVT.PATIENTID, AVT.NHSNUMBER, AVT.DIAGNOSISDATEBEST,
AVT.SITE_ICD10_O2_3CHAR AS TUMOUR_CODE, ave.FIGO, AVT.SITE_ICD10_O2, avt.sex,
CASE WHEN ABS(AVT.DIAGNOSISDATEBEST-AVT2.DIAGNOSISDATEBEST)<548 THEN 1 ELSE 0 END AS TUMOUR_FLAG
,RANK() OVER (PARTITION BY AVT.TUMOURID ORDER BY ABS(AVT.DIAGNOSISDATEBEST-AVT2.DIAGNOSISDATEBEST) ASC, AVT2.TUMOURID) AS RK
FROM AV2015.AV_TUMOUR AVT
left join AV2015.AV_TUMOUR_EXPERIMENTAL AVE on AVT.TUMOURID=AVe.TUMOURID

-- define other tumour cohort in join:
LEFT JOIN AV2015.AV_TUMOUR 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 2015

--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 2014
) WHERE RK=1);

--------------------------------------------------------------------------------
-- Create the below 22 tables, which are later used to create one treatment summary table:

--1)---------- LIVER ----------
create table TUMOUR_TABLE_AV_LIVER AS(
SELECT distinct TUMOURID,CASE WHEN DATEDIFF IS NULL THEN 0 ELSE 1 END AS LIVER_AVTREAT
FROM (SELECT TUMOURID, DATEDIFF, RK
FROM (SELECT TC.TUMOURID,
AVTREAT.EVENTDATE-TC.DIAGNOSISDATEBEST AS DATEDIFF,
RANK() OVER (PARTITION BY TC.TUMOURID ORDER BY AVTREAT.EVENTDATE, AVTREAT.EVENTID) AS
RK
FROM TUMOUR_COHORT TC
left JOIN TIMEFRAME_LOOKUP tim ON tim.TUMOURICDSITE3CODE = TC.TUMOUR_CODE
INNER JOIN AV2015.AV_TREATMENT@CASREF01 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));

--2)---------- LIVER ----------
create table TUMOUR_TABLE_HES_LIVER AS(
SELECT distinct TUMOURID,CASE WHEN DATEDIFF IS NULL THEN 0 ELSE 1 END AS LIVER_HES
FROM (SELECT TUMOURID, DATEDIFF, RK 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
FROM TUMOUR_COHORT TC
left JOIN TIMEFRAME_LOOKUP 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));

--3)---------- OESOPHAGUS ----------
create table TUMOUR_TABLE_AV_OESOPH AS(
SELECT distinct TUMOURID,CASE WHEN DATEDIFF IS NULL THEN 0 ELSE 1 END AS OESOPH_AVTREAT
FROM (SELECT TUMOURID, DATEDIFF, RK
FROM (SELECT TC.TUMOURID,
AVTREAT.EVENTDATE-TC.DIAGNOSISDATEBEST AS DATEDIFF,
RANK() OVER (PARTITION BY TC.TUMOURID ORDER BY AVTREAT.EVENTDATE, AVTREAT.EVENTID) AS
RK
FROM TUMOUR_COHORT TC
left JOIN TIMEFRAME_LOOKUP tim ON tim.TUMOURICDSITE3CODE = TC.TUMOUR_CODE
INNER JOIN AV2015.AV_TREATMENT@CASREF01 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));

--4)---------- OESOPHAGUS ----------
create table TUMOUR_TABLE_HES_OESOPH AS(
SELECT distinct TUMOURID,CASE WHEN DATEDIFF IS NULL THEN 0 ELSE 1 END AS OESOPH_HES
FROM (SELECT TUMOURID, DATEDIFF, RK 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
FROM TUMOUR_COHORT TC
left JOIN TIMEFRAME_LOOKUP 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));

--5)---------- STOMACH ----------
create table TUMOUR_TABLE_AV_STOMACH AS(
SELECT distinct TUMOURID,CASE WHEN DATEDIFF IS NULL THEN 0 ELSE 1 END AS STOMACH_AVTREAT
FROM (SELECT TUMOURID, DATEDIFF, RK
FROM (SELECT TC.TUMOURID,
AVTREAT.EVENTDATE-TC.DIAGNOSISDATEBEST AS DATEDIFF,
RANK() OVER (PARTITION BY TC.TUMOURID ORDER BY AVTREAT.EVENTDATE, AVTREAT.EVENTID) AS
RK
FROM TUMOUR_COHORT TC
left JOIN TIMEFRAME_LOOKUP tim ON tim.TUMOURICDSITE3CODE = TC.TUMOUR_CODE
INNER JOIN AV2015.AV_TREATMENT@CASREF01 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));

--6)---------- STOMACH ----------
create table TUMOUR_TABLE_HES_STOMACH AS(
SELECT distinct TUMOURID,CASE WHEN DATEDIFF IS NULL THEN 0 ELSE 1 END AS STOMACH_HES
FROM (SELECT TUMOURID, DATEDIFF, RK 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
FROM TUMOUR_COHORT TC
left JOIN TIMEFRAME_LOOKUP 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));

--7)---------- BLADDER ----------
create table TUMOUR_TABLE_AV_BLADDER AS(
SELECT distinct TUMOURID,CASE WHEN DATEDIFF IS NULL THEN 0 ELSE 1 END AS BLADDER_AVTREAT
FROM (SELECT TUMOURID, DATEDIFF, RK
FROM (SELECT TC.TUMOURID,
AVTREAT.EVENTDATE-TC.DIAGNOSISDATEBEST AS DATEDIFF,
RANK() OVER (PARTITION BY TC.TUMOURID ORDER BY AVTREAT.EVENTDATE, AVTREAT.EVENTID) AS
RK
```

```
FROM TUMOUR_COHORT TC
left JOIN TIMEFRAME_LOOKUP tim ON tim.TUMOURICDSITE3CODE = TC.TUMOUR_CODE
INNER JOIN AV2015.AV_TREATMENT@CASREF01 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));

--8)---------- BLADDER ----------
create table TUMOUR_TABLE_HES_BLADDER AS(
SELECT distinct TUMOURID,CASE WHEN DATEDIFF IS NULL THEN 0 ELSE 1 END AS BLADDER_HES
FROM (SELECT TUMOURID, DATEDIFF, RK 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
FROM TUMOUR_COHORT TC
left JOIN TIMEFRAME_LOOKUP 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));

--9)---------- CERVICAL cone biopsies ----------
create table TUMOUR_TABLE_AV_CONEBIOPS AS(
SELECT distinct TUMOURID,CASE WHEN DATEDIFF IS NULL THEN 0 ELSE 1 END AS
CONEBIOPS_AVTREAT
FROM (SELECT TUMOURID, DATEDIFF, RK
FROM (SELECT TC.TUMOURID,
AVTREAT.EVENTDATE-TC.DIAGNOSISDATEBEST AS DATEDIFF,
RANK() OVER (PARTITION BY TC.TUMOURID ORDER BY AVTREAT.EVENTDATE, AVTREAT.EVENTID) AS
RK
FROM TUMOUR_COHORT TC
left JOIN TIMEFRAME_LOOKUP tim ON tim.TUMOURICDSITE3CODE = TC.TUMOUR_CODE
INNER JOIN AV2015.AV_TREATMENT@CASREF01 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));

--10)---------- CERVICAL cone biopsies ----------
create table TUMOUR_TABLE_HES_CONEBIOPS AS(
SELECT distinct TUMOURID,CASE WHEN DATEDIFF IS NULL THEN 0 ELSE 1 END AS CONEBIOPS_HES
FROM (SELECT TUMOURID, DATEDIFF, RK 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
FROM TUMOUR_COHORT TC
left JOIN TIMEFRAME_LOOKUP 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));

--11)---------- CERVICAL lymphadenectomy ----------
```

```
create table TUMOUR_TABLE_AV_LYMPH AS(
SELECT distinct TUMOURID,CASE WHEN DATEDIFF IS NULL THEN 0 ELSE 1 END AS LYMPH_AVTREAT
FROM (SELECT TUMOURID, DATEDIFF, RK
FROM (SELECT TC.TUMOURID,
AVTREAT.EVENTDATE-TC.DIAGNOSISDATEBEST AS DATEDIFF,
RANK() OVER (PARTITION BY TC.TUMOURID ORDER BY AVTREAT.EVENTDATE, AVTREAT.EVENTID) AS
RK
FROM TUMOUR_COHORT TC
left JOIN TIMEFRAME_LOOKUP tim ON tim.TUMOURICDSITE3CODE = TC.TUMOUR_CODE
INNER JOIN AV2015.AV_TREATMENT@CASREF01 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));

--12)---------- CERVICAL lymphadenectomy ----------
create table TUMOUR_TABLE_HES_LYMPH AS(
SELECT distinct TUMOURID,CASE WHEN DATEDIFF IS NULL THEN 0 ELSE 1 END AS LYMPH_HES
FROM (SELECT TUMOURID, DATEDIFF, RK 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
FROM TUMOUR_COHORT TC
left JOIN TIMEFRAME_LOOKUP 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));

--13)---------- COLORECTAL endoscopies ----------
create table TUMOUR_TABLE_AV_COLOREC AS(
SELECT distinct TUMOURID,CASE WHEN DATEDIFF IS NULL THEN 0 ELSE 1 END AS COLOREC_AVTREAT
FROM (SELECT TUMOURID, DATEDIFF, RK
FROM (SELECT TC.TUMOURID,
AVTREAT.EVENTDATE-TC.DIAGNOSISDATEBEST AS DATEDIFF,
RANK() OVER (PARTITION BY TC.TUMOURID ORDER BY AVTREAT.EVENTDATE, AVTREAT.EVENTID) AS
RK
FROM TUMOUR_COHORT TC
left JOIN TIMEFRAME_LOOKUP tim ON tim.TUMOURICDSITE3CODE = TC.TUMOUR_CODE
INNER JOIN AV2015.AV_TREATMENT@CASREF01 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','H2
09','H248','H238','H204','H419','H221','H251','H259','H229','H181','H281','H191','H561') AND TC.TUMOUR_CODE
in ('C18', 'C19', 'C20'))
WHERE RK=1));

--14)---------- COLORECTAL endoscopies ----------
create table TUMOUR_TABLE_HES_COLOREC AS(
SELECT distinct TUMOURID,CASE WHEN DATEDIFF IS NULL THEN 0 ELSE 1 END AS COLOREC_HES
FROM (SELECT TUMOURID, DATEDIFF, RK 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
FROM TUMOUR_COHORT TC
```

```
left JOIN TIMEFRAME_LOOKUP 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','H2
09','H248','H238','H204','H419','H221','H251','H259','H229','H181','H281','H191','H561') AND TC.TUMOUR_CODE
in ('C18', 'C19', 'C20'))
WHERE RK=1));

--15)---------- COLORECTAL appendectomy  ----------
create table TUMOUR_TABLE_AV_COLOREC_appen as(
SELECT distinct TUMOURID,CASE WHEN DATEDIFF IS NULL THEN 0 ELSE 1 END AS
COLOREC_AVTREAT_appen
FROM (SELECT TUMOURID, DATEDIFF, RK
FROM (SELECT TC.TUMOURID,
AVTREAT.EVENTDATE-TC.DIAGNOSISDATEBEST AS DATEDIFF,
RANK() OVER (PARTITION BY TC.TUMOURID ORDER BY AVTREAT.EVENTDATE, AVTREAT.EVENTID) AS
RK
FROM TUMOUR_COHORT TC
left JOIN TIMEFRAME_LOOKUP tim ON tim.TUMOURICDSITE3CODE = TC.TUMOUR_CODE
INNER JOIN AV2015.AV_TREATMENT@CASREF01 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));

--16)---------- COLORECTAL appendectomy  ----------
create table TUMOUR_TABLE_HES_COLOREC_appen as(
SELECT distinct TUMOURID,CASE WHEN DATEDIFF IS NULL THEN 0 ELSE 1 END AS
COLOREC_HES_appen
FROM (SELECT TUMOURID, DATEDIFF, RK 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
FROM TUMOUR_COHORT  TC
left JOIN TIMEFRAME_LOOKUP 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));

--17)---------- ALL SITES - HES SG TABLE  ----------
create table TUMOUR_TABLE_HESSG AS(
SELECT distinct TUMOURID, CASE WHEN DATEDIFF IS NULL THEN 0 ELSE 1 END AS HESSG_FLAG
FROM (SELECT TUMOURID, DATEDIFF, RK
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
FROM TUMOUR_COHORT TC
left JOIN TIMEFRAME_LOOKUP 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.OPDATE-TC.DIAGNOSISDATEBEST BETWEEN -31 AND tim.RESECT_TIME
INNER JOIN OPCS4RESECTION_LOOKUP OPCS ON OPCS.TUMOURICDSITE3CODE = TC.TUMOUR_CODE
AND TRIM(OPCS.OPCSRESECTIONCODE) = HO.OPERTN
```

```
) WHERE RK=1));

--18a)---------- ALL SITES - RTDS TABLE  ----------
create table TUMOUR_TABLE_RTDS AS(
SELECT distinct TUMOURID,CASE WHEN DATEDIFF IS NULL THEN 0 ELSE 1 END AS RTDS_FLAG
FROM ( SELECT TUMOURID,DATEDIFF,RK FROM (
SELECT TC.TUMOURID, RL.APPTDATE-TC.DIAGNOSISDATEBEST AS DATEDIFF,
RANK() OVER (PARTITION BY TC.TUMOURID ORDER BY
Rl.APPTDATE,Rl.ATTENDID,Rl.ORGCODEPROVIDER,PR.RADIOTHERAPYEPISODEID,PR.PRESCRIPTIONID
) AS RK
FROM TUMOUR_COHORT TC
INNER JOIN TIMEFRAME_LOOKUP tim ON tim.TUMOURICDSITE3CODE = TC.TUMOUR_CODE
INNER JOIN RTDS2016.OPCDS_AV_TUMOUR_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')
)WHERE RK=1));

--18b)---------- ALL SITES - RTDS TABLE  from CAS1712 ----------
create table TUMOUR_TABLE_RTDS_2 as (
SELECT distinct TUMOURID,CASE WHEN DATEDIFF IS NULL THEN 0 ELSE 1 END AS RTDS2_FLAG
FROM (SELECT TUMOURID,DATEDIFF,RK FROM (
SELECT TC.TUMOURID, PR.APPTDATE-TC.DIAGNOSISDATEBEST AS DATEDIFF,
RANK() OVER (PARTITION BY TC.TUMOURID ORDER BY
PR.APPTDATE,PR.ATTENDID,PR.ORGCODEPROVIDER,PR.RADIOTHERAPYEPISODEID,PR.PRESCRIPTIO
NID) AS RK
FROM TUMOUR_COHORT TC
INNER JOIN TIMEFRAME_LOOKUP tim ON tim.TUMOURICDSITE3CODE = TC.TUMOUR_CODE
INNER JOIN RTDS.ROVPRESCRIPTIONS@CAS1712 PR ON PR.PATIENTID=TC.PATIENTID AND
PR.RTTREATMENTMODALITY NOT IN ('06')  AND PR.APPTDATE-TC.DIAGNOSISDATEBEST BETWEEN -31
AND tim.RADIO_TIME and PR.APPTDATE>='01-Apr-16'
)WHERE RK=1));

--19)---------- ALL SITES - AVSG TABLE  ----------
create table TUMOUR_TABLE_AVSG AS(
SELECT distinct TUMOURID, CASE WHEN DATEDIFF IS NULL THEN 0 ELSE 1 END AS AVSG_FLAG
FROM (SELECT TUMOURID, DATEDIFF, RK FROM (SELECT TC.TUMOURID,
AVTREAT.EVENTDATE-TC.DIAGNOSISDATEBEST AS DATEDIFF,
RANK() OVER (PARTITION BY TC.TUMOURID ORDER BY AVTREAT.EVENTDATE, AVTREAT.EVENTID) AS
RK
FROM TUMOUR_COHORT TC
left JOIN TIMEFRAME_LOOKUP tim ON tim.TUMOURICDSITE3CODE = TC.TUMOUR_CODE
INNER JOIN AV2015.AV_TREATMENT@CASREF01 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 OPCS4RESECTION_LOOKUP OPCS ON OPCS.TUMOURICDSITE3CODE = TC.TUMOUR_CODE
AND TRIM(OPCS.OPCSRESECTIONCODE) = AVTREAT.OPCS4_CODE
) WHERE RK=1));

--20)---------- ALL SITES - AVRT TABLE  ----------
create table TUMOUR_TABLE_AVRT AS(
SELECT distinct TUMOURID,CASE WHEN DATEDIFF IS NULL THEN 0 ELSE 1 END AS AVRT_FLAG
FROM (SELECT TUMOURID, DATEDIFF, RK FROM (
SELECT TC.TUMOURID,
AVTREAT.EVENTDATE-TC.DIAGNOSISDATEBEST AS DATEDIFF,
RANK() OVER (PARTITION BY TC.TUMOURID ORDER BY AVTREAT.EVENTDATE, AVTREAT.EVENTID) AS
RK
FROM TUMOUR_COHORT TC
left JOIN TIMEFRAME_LOOKUP tim ON tim.TUMOURICDSITE3CODE = TC.TUMOUR_CODE
```

```
LEFT JOIN AV2015.AV_TREATMENT@CASREF01 AVTREAT ON AVTREAT.TUMOURID=TC.TUMOURID and
EVENTCODE IN ('04','05','22','RTX') and (AVTREAT.EVENTDATE-TC.DIAGNOSISDATEBEST BETWEEN -31
AND tim.RADIO_TIME)
) WHERE RK=1));

--21)---------- ALL SITES - SACT TABLE  ----------
create table TUMOUR_TABLE_SACT AS(
SELECT distinct TUMOURID,CASE WHEN DATEDIFF IS NULL THEN 0 ELSE 1 END AS SACT_FLAG
FROM (SELECT TUMOURID,DATEDIFF,RK 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
FROM TUMOUR_COHORT TC
left JOIN TIMEFRAME_LOOKUP tim ON tim.TUMOURICDSITE3CODE = TC.TUMOUR_CODE
LEFT JOIN SACT201703.PATIENT SP ON TC.NHSNUMBER=SP.NHS_NUMBER
LEFT JOIN SACT201703.TUMOUR ST ON SP.MERGED_PATIENT_ID=ST.MERGED_PATIENT_ID
LEFT JOIN SACT201703.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));

--22)---------- ALL SITES - AVCT TABLE  ----------
create table TUMOUR_TABLE_AVCT AS(
SELECT distinct
TUMOURID,
CASE WHEN DATEDIFF IS NULL THEN 0 ELSE 1 END AS AVCT_FLAG
FROM (
SELECT TUMOURID, DATEDIFF, RK FROM (
SELECT TC.TUMOURID,
AVTREAT.EVENTDATE-TC.DIAGNOSISDATEBEST AS DATEDIFF,
RANK() OVER (PARTITION BY TC.TUMOURID ORDER BY AVTREAT.EVENTDATE, AVTREAT.EVENTID) AS
RK
FROM TUMOUR_COHORT TC
left JOIN TIMEFRAME_LOOKUP tim ON tim.TUMOURICDSITE3CODE = TC.TUMOUR_CODE
LEFT JOIN AV2015.AV_TREATMENT@CASREF01 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));
--------------------------------------------------------------------------------

-- Code for data extraction, combining the treatment-specific tables, plus the site-specific treatment tables:

CREATE TABLE TX_TBL_1314SOP_CRT
AS

SELECT  AVT.TUMOURID
,AVT.DIAGNOSISYEAR

-- Incorporate all three sources of radiotherapy data (AV_treatment, and RTDS data from CAS1712 and
RTDS2016):

,CASE
WHEN AVRT_FLAG=1 THEN 1
WHEN RTDS_FLAG=1 AND TC.TUMOUR_FLAG=0 THEN 1
WHEN RTDS2_FLAG=1 AND TC.TUMOUR_FLAG=0 THEN 1
ELSE 0
END AS RT_FLAG
,CASE
```

```
WHEN AVCT_FLAG=1 THEN 1
WHEN SACT_FLAG=1 AND TC.TUMOUR_FLAG=0 THEN 1
ELSE 0
END AS CT_FLAG

-- Incorporate tumour resection (surgery) data from AV_treatment and HES (including the site-specific rules for cervical, colorectal, bladder, liver, oesophagus and stomach cancers):
,CASE
WHEN AVSG_FLAG=1 THEN 1
WHEN HESSG_FLAG=1 AND TC.TUMOUR_FLAG=0 THEN 1

-- for cervical cancers:

when
(CASE
WHEN AVT.SITE_ICD10_O2_3CHAR='C53' and TC.FIGO in ('1a','1a1','1a','1a2','IA','IA1','IA2') and CONEBIOPS_AVTREAT=1 then 1
WHEN AVT.SITE_ICD10_O2_3CHAR='C53' and TC.FIGO in ('1a','1a1','1a','1a2','IA','IA1','IA2') and CONEBIOPS_HES=1 and TC.TUMOUR_FLAG=0 then 1
WHEN AVT.SITE_ICD10_O2_3CHAR='C53' and TC.FIGO in ('1b1','1b','IB','IB1','1B','1B1') and (CONEBIOPS_AVTREAT=1) and (LYMPH_AVTREAT=1) THEN 1
WHEN AVT.SITE_ICD10_O2_3CHAR='C53' and TC.FIGO in ('1b1','1b','IB','IB1','1B','1B1') and (CONEBIOPS_AVTREAT=1) and (LYMPH_HES=1 and TC.TUMOUR_FLAG=0) THEN 1
WHEN AVT.SITE_ICD10_O2_3CHAR='C53' and TC.FIGO in ('1b1','1b','IB','IB1','1B','1B1') and (CONEBIOPS_HES=1 and TC.TUMOUR_FLAG=0) and (LYMPH_AVTREAT=1) THEN 1
WHEN AVT.SITE_ICD10_O2_3CHAR='C53' and TC.FIGO in ('1b1','1b','IB','IB1','1B','1B1') and (CONEBIOPS_HES=1 and TC.TUMOUR_FLAG=0) and (LYMPH_HES=1 and TC.TUMOUR_FLAG=0) THEN 1
ELSE 0
END)=1 and AVT.SITE_ICD10_O2_3CHAR='C53' then 1

-- for colorectal cancers:

when
(CASE
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
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
ELSE 0
END)=1 and AVT.SITE_ICD10_O2_3CHAR in ('C18','C19','C20') then 1

-- for bladder cancers:

when
(CASE
WHEN AVT.SITE_ICD10_O2_3CHAR in ('C67') and SUBSTR(AVT.T_BEST, 1,1) = '1' and BLADDER_AVTREAT=1 then 1
WHEN AVT.SITE_ICD10_O2_3CHAR in ('C67') and SUBSTR(AVT.T_BEST, 1,1) = '1' and BLADDER_HES=1 AND TC.TUMOUR_FLAG=0 then 1
ELSE 0
END)=1 and AVT.SITE_ICD10_O2_3CHAR in ('C67') then 1

-- for liver cancers:

when
(CASE
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
ELSE 0
END)=1 and AVT.SITE_ICD10_O2_3CHAR in ('C22') then 1

-- for oesophagus cancers:

when
(CASE
WHEN AVT.SITE_ICD10_O2_3CHAR in ('C15') and SUBSTR(AVT.stage_best,1,2)='1A' and
OESOPH_AVTREAT=1 then 1
WHEN AVT.SITE_ICD10_O2_3CHAR in ('C15') and SUBSTR(AVT.stage_best,1,2)='1A' and OESOPH_HES=1
AND TC.TUMOUR_FLAG=0 then 1
ELSE 0
END)=1 and AVT.SITE_ICD10_O2_3CHAR in ('C15') then 1

-- for stomach cancers:

when
(CASE
WHEN AVT.SITE_ICD10_O2_3CHAR in ('C16') and SUBSTR(AVT.stage_best,1,2)='1A' and
STOMACH_AVTREAT=1 then 1
WHEN AVT.SITE_ICD10_O2_3CHAR in ('C16') and SUBSTR(AVT.stage_best,1,2)='1A' and STOMACH_HES=1
AND TC.TUMOUR_FLAG=0 then 1
ELSE 0
END)=1 and AVT.SITE_ICD10_O2_3CHAR in ('C16') then 1
ELSE 0
END AS SG_FLAG

--stage at diagnosis variable result of discussion with gynaecological clinician:

,case
when SITE_ICD10_O2_3CHAR in ('C53','C56', 'C57','C48','C54', 'C55','C51') and tc.figo in ('1', '1a1', '1a', '1e', '1c',
'1a2', '1b2', '1b', '1b1', '1s', '1c1', '1c2', '1c3','I', 'IA', 'IB', 'IC', 'IA1', 'IB1', 'IA2', 'IB2', '1C3') then '1'
when SITE_ICD10_O2_3CHAR in ('C53','C56', 'C57','C48','C54', 'C55','C51') and tc.figo in ('2b', '2c', '2a2', '2', '2a',
'2e', '2a1', '2s', 'IIB', 'IIA','IIA2','IIC') then '2'
when SITE_ICD10_O2_3CHAR in ('C53','C56', 'C57','C48','C54', 'C55','C51') and tc.figo in ('3a', '3', '3b', '3s', '3c',
'3e', '3c1', '3c2', '3a1', '3a2','IIIC','IIIB','IIIA','IIIC1','III','IIIC2','3a1i','3a1ii') then '3'
when SITE_ICD10_O2_3CHAR in ('C53','C56', 'C57','C48','C54', 'C55','C51') and tc.figo in ('4s', '4a', '4c', '4',
'4b','IV','IVA','IVB') then '4'
when SITE_ICD10_O2_3CHAR not in ('C53') and SUBSTR(stage_best,1,1)='1' then '1'
when SITE_ICD10_O2_3CHAR not in ('C53') and SUBSTR(stage_best,1,1)='2' then '2'
when SITE_ICD10_O2_3CHAR not in ('C53') and SUBSTR(stage_best,1,1)='3' then '3'
when SITE_ICD10_O2_3CHAR not in ('C53') and SUBSTR(stage_best,1,1)='4' then '4'
else 'Unk/Oth' end as stage_group
,case when SITE_ICD10_O2_3CHAR in ('C67') then 'Bladder'
 when SITE_ICD10_O2_3CHAR in ('C50') then 'Breast'
 when SITE_ICD10_O2_3CHAR in ('C53') then 'Cervical'
 when SITE_ICD10_O2_3CHAR in ('C18','C19') then 'Colon'
 when SITE_ICD10_O2_3CHAR in ('C20') then 'Rectum'
 when SITE_ICD10_O2_3CHAR in ('C01', 'C09', 'C10') then 'Oropharynx'
 when SITE_ICD10_O2_3CHAR in ('C02', 'C03', 'C04', 'C06') then 'Oral cavity'
 when SITE_ICD10_O2_3CHAR in ('C07', 'C08') then 'Salivary glands'
 when SITE_ICD10_O2_3CHAR in ('C12', 'C13') then 'Hypopharynx'
 when SITE_ICD10_O2_3CHAR in ('C32') then 'Larynx'
 when SITE_ICD10_O2_3CHAR in ('C05', 'C11', 'C14', 'C30', 'C31') then 'Other head and neck'
 when SITE_ICD10_O2_3CHAR in ('C64', 'C65', 'C66', 'C68') then 'Kidney'
 when SITE_ICD10_O2_3CHAR in ('C22') then 'Liver'
 when SITE_ICD10_O2_3CHAR in ('C33', 'C34') and morph_icd10_o2 in ('8041','8042','8043','8044','8045') then
'SCLC'
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 when SITE_ICD10_O2_3CHAR in ('C33', 'C34') and morph_icd10_o2 not in ('8041','8042','8043','8044','8045')
then 'NSCLC'
 when SITE_ICD10_O2_3CHAR in ('C25') then 'Pancreas'
 when SITE_ICD10_O2_3CHAR in ('C61') then 'Prostate'
 when SITE_ICD10_O2_3CHAR in ('C15') then 'Oesophagus'
 when SITE_ICD10_O2_3CHAR in ('C56', 'C57') then 'Ovary'
 when SITE_ICD10_O2_3CHAR in ('C48') and (morph_icd10_o2 not in (8800, 8801, 8802, 8803, 8804, 8805,
8806, 8963, 8990, 8991, 9040, 9041, 9042, 9043, 9044) and (morph_icd10_o2 not between 8811 and 8921) and
(morph_icd10_o2 not between 9120 and 9373) and (morph_icd10_o2 not between 9530 and 9582) and avt.sex=2)
then 'Ovary'
 when SITE_ICD10_O2_3CHAR in ('C16') then 'Stomach'
 when SITE_ICD10_O2_3CHAR in ('C54', 'C55') then 'Uterine'
 when SITE_ICD10_O2_3CHAR in ('C51') then 'Vulva'
 else 'Other'
END as cancergroup

-- final join of tables with flags

FROM AV2015.AV_TUMOUR AVT
INNER JOIN TUMOUR_COHORT TC ON AVT. TUMOURID =TC. TUMOURID
LEFT JOIN TUMOUR_TABLE_AVCT AVCT ON AVT.TUMOURID=AVCT.TUMOURID
LEFT JOIN TUMOUR_TABLE_SACT SACT ON AVT.TUMOURID=SACT.TUMOURID
LEFT JOIN TUMOUR_TABLE_AVRT AVRT ON AVT.TUMOURID=AVRT.TUMOURID
LEFT JOIN TUMOUR_TABLE_AVSG AVSG ON AVT.TUMOURID=AVSG.TUMOURID and
(SITE_ICD10_O2_3CHAR not in ('C48') or (SITE_ICD10_O2_3CHAR in ('C48') and avt.sex=2 and
morph_icd10_o2 not in (8800, 8801, 8802, 8803, 8804, 8805, 8806, 8963, 8990, 8991, 9040, 9041, 9042, 9043,
9044) and (morph_icd10_o2 not between 8811 and 8921) and (morph_icd10_o2 not between 9120 and 9373) and
(morph_icd10_o2 not between 9530 and 9582) ))
LEFT JOIN TUMOUR_TABLE_RTDS RTDS ON AVT.TUMOURID=RTDS.TUMOURID
LEFT JOIN TUMOUR_TABLE_HESSG HESSG ON AVT.TUMOURID=HESSG.TUMOURID and
(SITE_ICD10_O2_3CHAR not in ('C48') or (SITE_ICD10_O2_3CHAR in ('C48') and avt.sex=2 and
morph_icd10_o2 not in (8800, 8801, 8802, 8803, 8804, 8805, 8806, 8963, 8990, 8991, 9040, 9041, 9042, 9043,
9044) and (morph_icd10_o2 not between 8811 and 8921) and (morph_icd10_o2 not between 9120 and 9373) and
(morph_icd10_o2 not between 9530 and 9582)) )
LEFT JOIN TUMOUR_TABLE_RTDS_2 RTDS2 ON AVT.TUMOURID=RTDS2.TUMOURID

-- Add further joins for site-specific tables:

-- add gynae tables:
LEFT JOIN  TUMOUR_TABLE_AV_CONEBIOPS CBAVT ON AVT.TUMOURID=CBAVT.TUMOURID
LEFT JOIN  TUMOUR_TABLE_HES_CONEBIOPS CBHES ON AVT.TUMOURID=CBHES.TUMOURID
LEFT JOIN  TUMOUR_TABLE_AV_LYMPH LYAVT ON AVT.TUMOURID=LYAVT.TUMOURID
LEFT JOIN  TUMOUR_TABLE_HES_LYMPH LYHES ON AVT.TUMOURID=LYHES.TUMOURID

-- add colorectal tables:
LEFT JOIN  TUMOUR_TABLE_AV_COLOREC COLOAVT ON AVT.TUMOURID=COLOAVT.TUMOURID
LEFT JOIN  TUMOUR_TABLE_HES_COLOREC COLOHES ON AVT.TUMOURID=COLOHES.TUMOURID
LEFT JOIN  TUMOUR_TABLE_AV_COLOREC_appen  COLOAVT_appen ON
AVT.TUMOURID=COLOAVT_appen.TUMOURID
LEFT JOIN  TUMOUR_TABLE_HES_COLOREC_appen  COLOHES_appen ON
AVT.TUMOURID=COLOHES_appen.TUMOURID

-- add urological tables:
LEFT JOIN  TUMOUR_TABLE_AV_BLADDER BLAD_AVT ON AVT.TUMOURID=BLAD_AVT.TUMOURID
LEFT JOIN  TUMOUR_TABLE_HES_BLADDER BLAD_HES ON AVT.TUMOURID=BLAD_HES.TUMOURID

-- add UGI tables:
LEFT JOIN  TUMOUR_TABLE_AV_LIVER LIVAVT ON AVT.TUMOURID=LIVAVT.TUMOURID
LEFT JOIN  TUMOUR_TABLE_HES_LIVER LIVHES ON AVT.TUMOURID=LIVHES.TUMOURID
LEFT JOIN  TUMOUR_TABLE_AV_OESOPH OESOAVT ON AVT.TUMOURID=OESOAVT.TUMOURID
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LEFT JOIN  TUMOUR_TABLE_HES_OESOPH OESOHES ON AVT.TUMOURID=OESOHES.TUMOURID
LEFT JOIN  TUMOUR_TABLE_AV_STOMACH STOMAVT ON AVT.TUMOURID=STOMAVT.TUMOURID
LEFT JOIN  TUMOUR_TABLE_HES_STOMACH STOMHES ON AVT.TUMOURID=STOMHES.TUMOURID;
```