

# CT dose survey data acquisition form











CT Protocol		page 2		<input type="checkbox"/>
<input type="checkbox"/> CT Head (acute stroke)	<input type="checkbox"/> C-spine (fracture)			
<input type="checkbox"/> Chest (lung cancer)	<input type="checkbox"/> Chest High-Res. (interstitial lung disease)			
<input type="checkbox"/> CTA (blood vessels)	<input type="checkbox"/> CTPA (PE)			
<input type="checkbox"/> Abdomen (liver metastases)	<input type="checkbox"/> Abdomen and pelvis (abscess)			
<input type="checkbox"/> Virtual Colonoscopy (polyps/tumour)	<input type="checkbox"/> Enteroclysis (Crohn's disease)			
<input type="checkbox"/> CT KUB (stones/colic)	<input type="checkbox"/> CT Urogram (tumour or stones/colic)			
<input type="checkbox"/> Paediatric head (trauma)	<input type="checkbox"/> < 1 yr	<input type="checkbox"/> 1 – 4 yrs	<input type="checkbox"/> 5 – 12 yrs	
<b>Exam Accession Number</b>			<b>Sample Number</b>	/20
Health Care Facility			Scanner ID	
Age at time of scan (years)		Gender	<input type="checkbox"/> M <input type="checkbox"/> F	Body Mass <input type="checkbox"/> kg <input type="checkbox"/> st
Scanner Make	<input type="checkbox"/> GE	<input type="checkbox"/> Philips	<input type="checkbox"/> Siemens	<input type="checkbox"/> Toshiba <input type="checkbox"/> Other
Number of Detector Rows	<input type="checkbox"/> 16	<input type="checkbox"/> 64	<input type="checkbox"/> 128	<input type="checkbox"/> Other
Parameters	Sequence 1	Sequence 2	Sequence 3	
Tube Voltage (kV)				
Fixed mA or Auto mA's available range				
Tube Current Modulation brand used				
Auto mA quality factor				
IV contrast used	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Beam collimation (mm)				
Scan field of View (mm)				
Patient transverse width (mm)				
Patient anteroposterior (AP) width (mm)				
Axial (A) or Helical (H) scan	<input type="checkbox"/> A <input type="checkbox"/> H	<input type="checkbox"/> A <input type="checkbox"/> H	<input type="checkbox"/> A <input type="checkbox"/> H	<input type="checkbox"/> H
No. of slices or pitch				
Scan length (mm)				
CTDI <sub>vol</sub> (mGy)				
DLP (mGy.cm)				
DLP for total examination (mGy.cm)				
<input type="checkbox"/> mean mAs/slice or mean mA (if given)				
<input type="checkbox"/> total mAs (if given)				

# Bulleted instructions for using form



CT Protocol		page 2	
<input type="checkbox"/> CT Head (acute stroke)	<input type="checkbox"/> C-spine (fracture)		
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Tube Voltage (kV)			
Fixed mA or Auto mA's available range	}		
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Scan field of View (mm)			
Transverse width (mm)			
Anteroposterior (AP) width (mm)			
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No. of slices or pitch			
Scan length (mm)			
CTDI <sub>vol</sub> (mGy)			
DLP (mGy.cm)			
DLP for total examination (mGy.cm)			
<input type="checkbox"/> mean mAs/slice or mean mA (if given)			
<input type="checkbox"/> total mAs (if given)			

## Bulleted instructions:

Form Note	Description
	<p>CT protocols are listed along with their key clinical indications in parenthesis. Further details are included below, including keywords and generic search strings for RIS searches.</p> <p>Examples of typical CT protocols are also included below, including referral notes, anatomical markers and showing regions under investigation. Details of typical contrast use and number of sequences/phases are also given. <u>However, please provide data on your equivalent protocols that are in use at your centre.</u></p>
	<p>Indicate here if this is the second sheet for the same patient and scanner attendance, required if more than three image sequences were employed.</p>
	<p>Accession number is used as an anonymous scan ID reference, held locally only, that can be used to find examinations on RIS and PACS. Accession number is linked to sample number on this form, to facilitate help with any further queries after data have been submitted.</p> <p>The target for data collection is 20 different patients per CT protocol (tick sheet included at the end of the document), on a single scanner. Sample number out of 20 must be recorded here. Only sample number will be added to the spreadsheet later.</p>
	<p>Please supply age at the time of scan in years. NB. For paediatric scans record the age to the nearest half year. However, for paediatric patients under 1-year of age, please supply age in months (traceable from CT protocol selection).</p>
	<p>If available please supply body mass to the nearest half kilogram or stone.</p>
	<p>Many scanners are now in use with automatic tube current modulation. To help to assess how these systems are being used please record the range of mA that the automatic system can select between. (This is the range for the protocol not for each patient.)</p> <p>Please also record the auto mA brand (e.g. "Smart mA", "CareDose") and the actual quality factor (e.g. "noise index" of x, "quality reference mAs", "mAs/slice") used.</p>
	<p>Please supply the collimation product for multi-slice systems, e.g. 64x0.5mm.</p>
	<p>To get a measure of patient size, other than body mass and that can be calculated retrospectively, cross-sectional area is being used.</p> <p>To estimate this, using the middle image in the main scan sequence, measure the major (transverse) and minor (anteroposterior (AP)) patient widths using your PACS viewer (shown graphically below). These will be used to estimate the cross-sectional area, approximating the patient to be an ellipse. These measurements are only needed from one image sequence per patient.</p>

## Data acquisition:

1. Field work will be a collaboration between radiographers and medical physicists
2. We need a straightforward system that can be operated at any centre across the UK
3. We envisage the survey will be performed retrospectively at many centres
4. Prospective data acquisition has the advantage of being able to ask patients how much they weigh, with body mass (kg) then being used as an indicator of patient size
  - This is in addition to the major and minor axis widths measured from images recovered from PACS
  - Body mass is not recoverable retrospectively from some centres
5. For prospective data acquisition the accession number and body mass will need to be linked with CT protocol and sample number, for later collection of remaining data
6. Radiographers will be asked to perform RIS searches, identify relevant patients and to perform some of the data acquisition
7. Clinical professionals (radiographers and/or physicists) with access to PACS will complete data acquisition
8. Data managers (physicists or radiographer as appropriate) will verify data before transferring it to the survey spreadsheet
9. Final results should be returned to the HPA by e-mail

NB.

- Existing recent survey results can be used and added to as appropriate
- Where existing local electronic data searches are in operation these can be used to query and simplify data acquisition



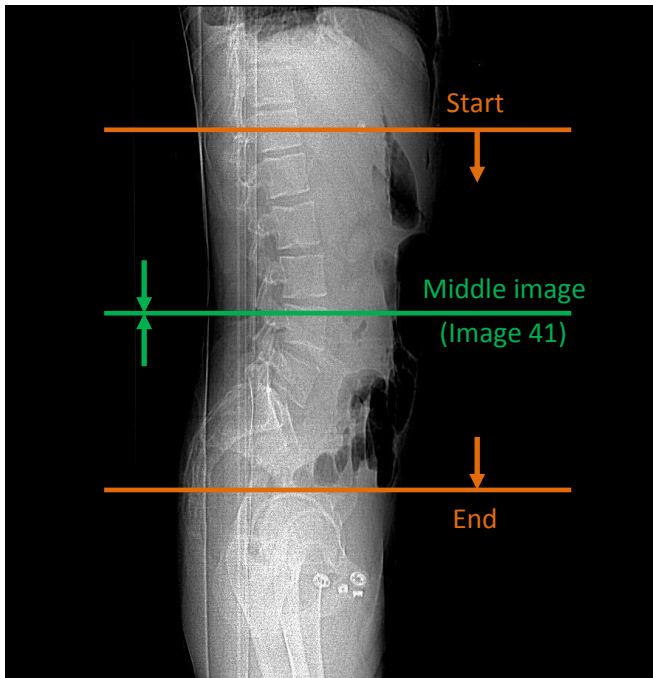
Any queries please contact me using: [stuart.meeson @ hpa.org.uk](mailto:stuart.meeson@hpa.org.uk)

## Continuing Professional Development:

The College of Radiographers has endorsed the survey via CPD Now. Participation will enable practitioners to develop their knowledge and expertise in a range of data collection and dose optimisation techniques.

IPEM members participating can include any activities in their personal CPD record.

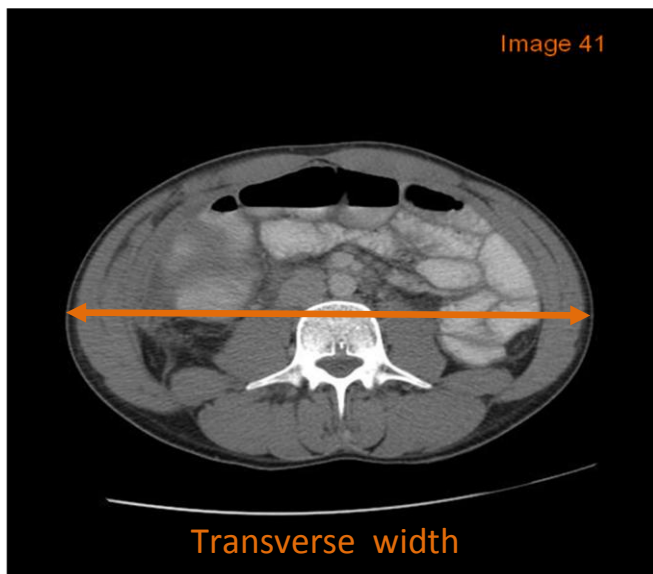
## Transverse and Anteroposterior (AP) patient width measurements:



Schematic showing a scout scan used to identify the middle image in the sequence.

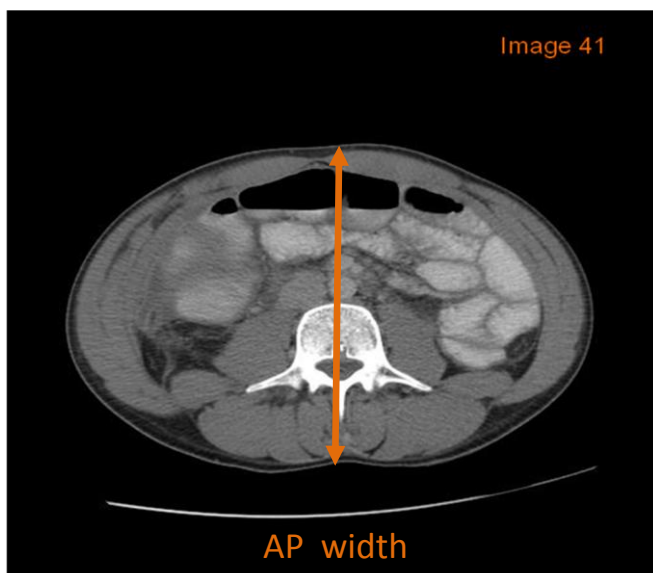
NB. For C-spine examinations, select an image close to the middle of the sequence that avoids the shoulders.

One set of width measurements per patient.



Transverse width (mm) measured using the image from the middle of the sequence.

NB. If axial images do not show the full extent of the patient, try other image views.



Anteroposterior (AP) width (mm) measured using the image from the middle of the sequence.

## Clinical indications and keywords:

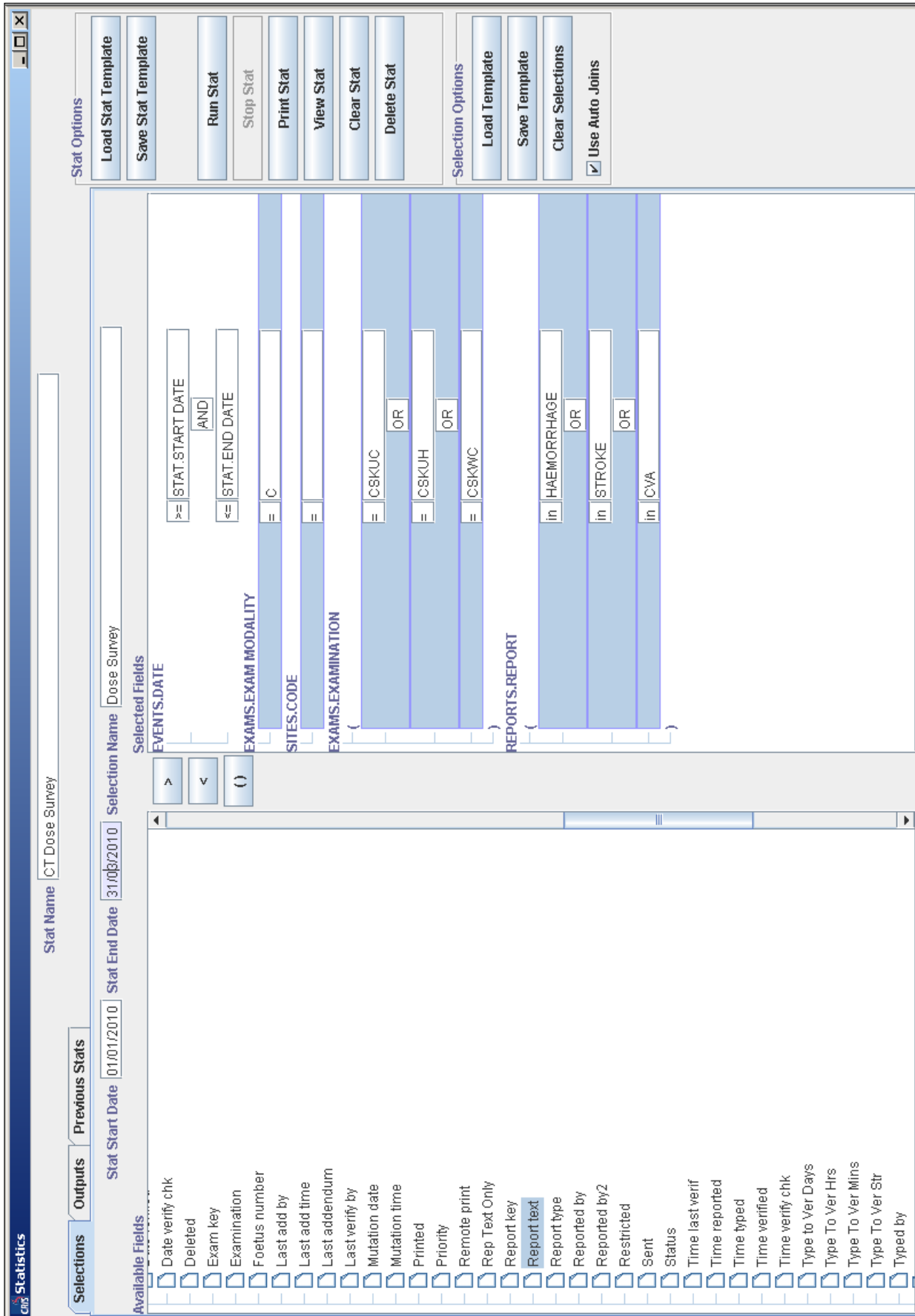
CT Protocol	Clinical indications	Keywords for electronic searches
Head	Acute stroke	Stroke, CVA, haemorrhage
C-spine	Fracture	Fracture, #, dislocation, trauma
Chest	Lung cancer query	Lung: cancer, metastases, malignancy, tumour, neoplasm
Chest High-Resolution	Interstitial lung disease	Emphysema, pulmonary fibrosis, bronchiectasis
CTA	Abdominal aorta	AAA, aorta, peripheral vessels, aneurysm, atherosclerosis, stent, ischaemia, leak
CTPA	PE	Pulmonary embolism, PE
Abdomen	Liver metastases	Liver: cancer, metastases, malignancy, tumour, neoplasm
Abdomen and pelvis	Abscess	Abscess, infection, infected fluid
Virtual Colonoscopy	Polyps/tumour	Polyp, cancer, malignancy, tumour, neoplasm
Enteroclysis	Crohn's disease	Crohn's, small bowel inflammation
KUB	Stones/colic	Renal, kidney, ureter, stones, colic, haematuria, calculi
Urogram	Stones/colic or tumour	Renal, kidney, ureter, stones, colic, haematuria, calculi, cancer, malignancy, tumour, neoplasm
Paediatric Head (x3)	Trauma	Trauma, injury, NAI, haemorrhage, fracture

## Generic RIS search examples for retrospective data collection:

The screenshots included below provide examples of searches that may be undertaken on RIS to locate suitable CT examinations as required for the HPA CT dose survey.

In Screenshot 1 the Selections screen includes fields that may be used to refine a search of the RIS. These include:

- date range – typically a 3 month window, but longer for low frequency examinations and up to 1-year retrospectively
- modality
- site
- examinations – multiple exam code may be used to include examinations of a body part with and without contrast
- text found in a report – multiple key words may be used in a single search

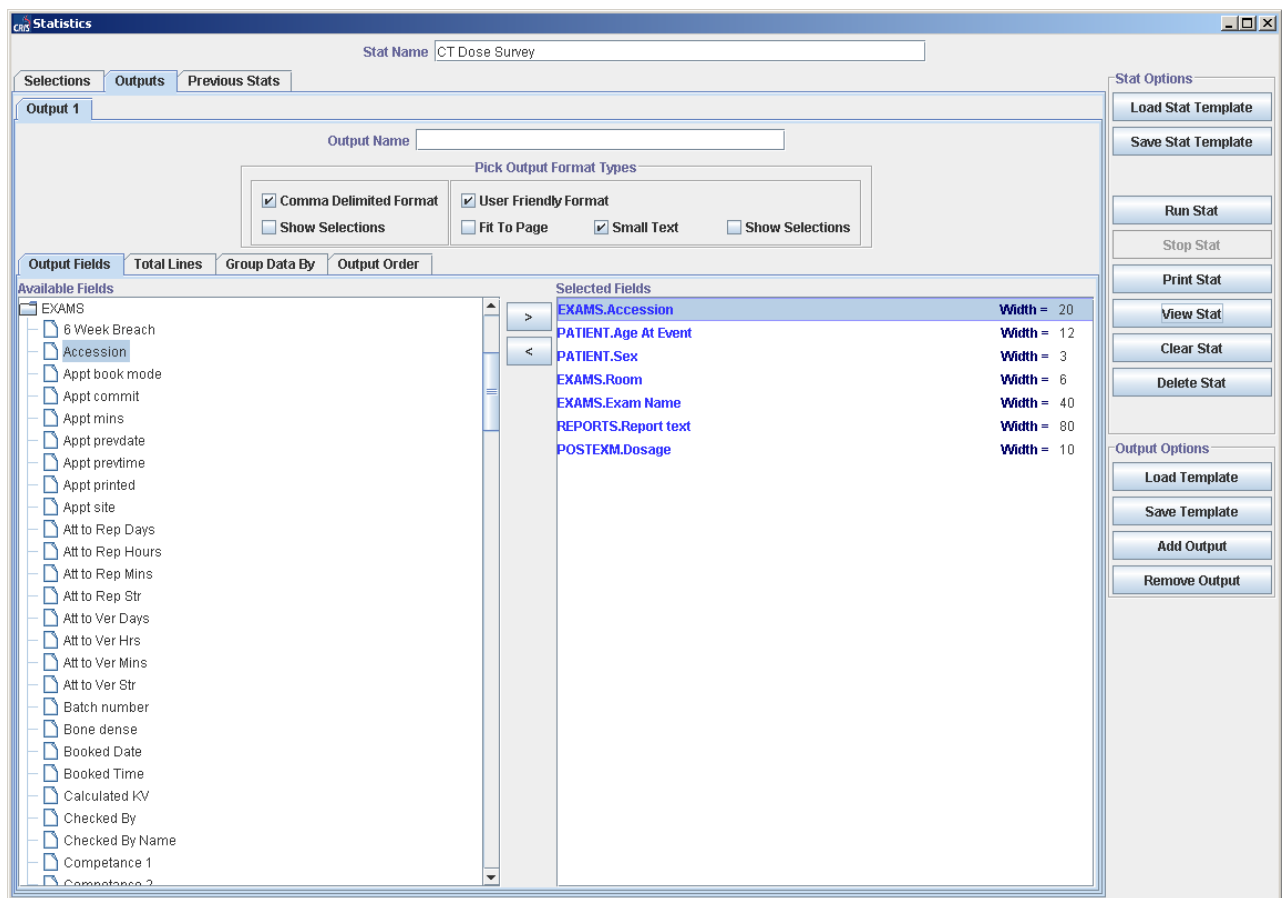


Screenshot 1: example of a RIS Selections screen

From this search Screenshot 2 shows some of the outputs that may be displayed:

- exam accession number
- age at the time of scan
- patient sex
- room – this will identify which scanner was used if more than one at a site
- exam name
- report – by being able to view the report the reason for the scan may be determined
- dose

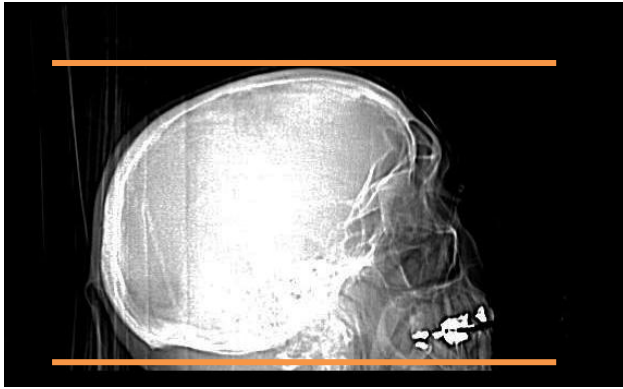
This list is not exhaustive and it may be that more fields will be used as appropriate.



*Screenshot 2: example of a RIS Outputs screen*

Once examinations that meet the criteria have been identified, the accession number may be used to locate the images on PACS. From these images other required information as laid out on the data acquisition form can be recorded.

## CT Head – typical protocol



**Clinical indication:** acute stroke

**Typical scan justification:** query stroke/CVA/haemorrhage

Could include: *head trauma. Onset of headaches or facial pain. Visual disturbances, aura/migraine, atypical seizure. Confusion, vomiting, slurred speech, limb weakness/worsening mobility. Existing aneurysm. Previous surgery: CVA, evacuation of haematoma, biopsy.*

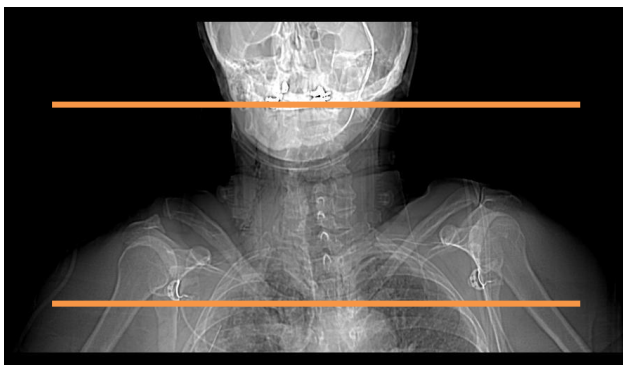
**Scan from:** base of skull

**Ending at:** top of skull

**Sequences/Phases for examination:** 1

**Contrast used:** Y or N

## C-spine – typical protocol



**Clinical indication:** fracture

**Typical scan justification:** trauma, query fracture/dislocation

Could include: *head and neck injury. Fall/trauma/polytrauma. Previous vertebral tension. Neck pain or tenderness.*

*RTC*

*Contact sports neck related injury.*

**Scan from:** base of skull

**Ending at:** T2

**Sequences/Phases for examination:** 1

**Contrast used:** Y or N

## Chest – typical protocol



**Clinical indication:** query lung cancer

**Typical scan justification:** query lung cancer/metastases/malignancy/tumour/neoplasm

Could include: *query cause of shadowing. Query lymphadenopathy. Previous lymph node enlargement. Bulky hilum (that persist on plain film).*

**Scan from:** top of the lungs

**Ending at:** below liver

**Sequences/Phases for examination:** 2

**Contrast used:** Y or N

**Breath held:** Y or N

## Chest High-Resolution – typical protocol



**Clinical indication:** interstitial lung disease

**Typical scan justification:** query emphysema/pulmonary fibrosis/bronchiectasis

Could include: *patient < 45-years old. Severe breathlessness, hypoxia, query parenchymal involvement. Subpleural ground-glass opacity.*

**Scan from:** top of the lungs

**Ending at:** below diaphragm

**Sequences/Phases for examination:** 2

**Contrast used:** Y or N

**Breath held:** Y or N

## CTA – typical protocol, AAA only



**Clinical indication:** blood vessels, AAA

**Typical scan justification:** query AAA. Check appearance of aorta and peripheral vessels. Query atherosclerosis/ischaemia/leak/stent properties.

Could include: *sudden onset of abdominal pain (that may radiate to back). Review of existing AAA, bifurcation and suitability for EVAR (post ultrasound).*

**Scan:** For AAA – abdomen

**Sequences/Phases for examination:** 2

**Contrast used:** Y or N

**Breath held:** Y or N

## CTPA – typical protocol



**Clinical indication:** PE

**Typical scan justification:** query PE

Could include: *Pleuritic chest pain, decreased saturations, breathlessness. Sudden onset SOB.*

*Previous surgery/PE.*

**Scan from:** top of the lungs

**Ending at:** below diaphragm

**Sequences/Phases for examination:** 2

**Contrast used:** Y or N

**Breath held:** Y or N

## Abdomen – typical protocol



**Clinical indication:** liver metastases

**Typical scan justification:** query liver cancer/metastases/malignancy/tumour/neoplasm

Could include: *abdominal pain, jaundice, abnormal liver lesions on ultrasound for further assessment, liver enlarged on ultrasound.*

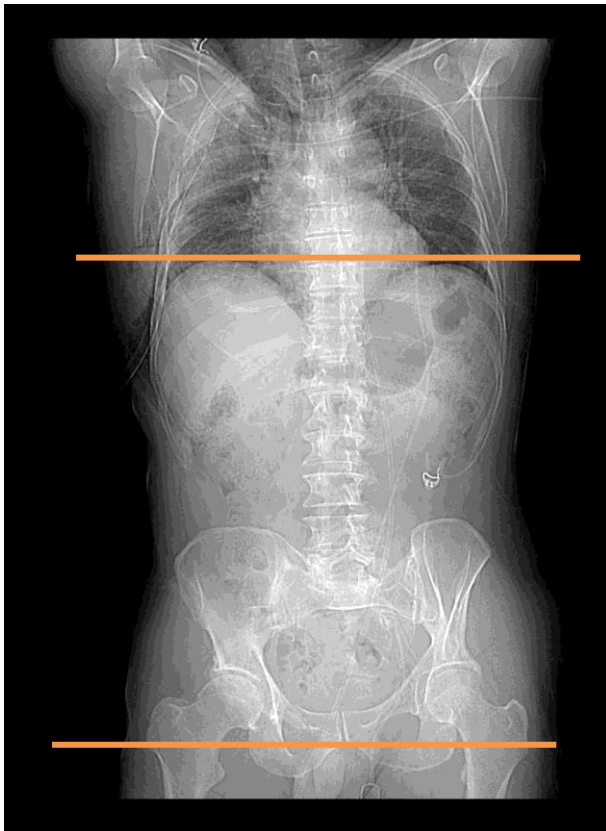
*Other existing/treated sites of malignancy.*

**Scan:** abdomen

**Sequences/Phases for examination:** 3

**Contrast used:** Y or N

## Abdomen and pelvis – typical protocol



**Clinical indication:** abscess

**Typical scan justification:** query abscess/infection/infected fluid

Could include: *abdominal distension, tenderness/pain/guarding, sepsis. Fever, leukocytosis and surgery in the last four weeks.*

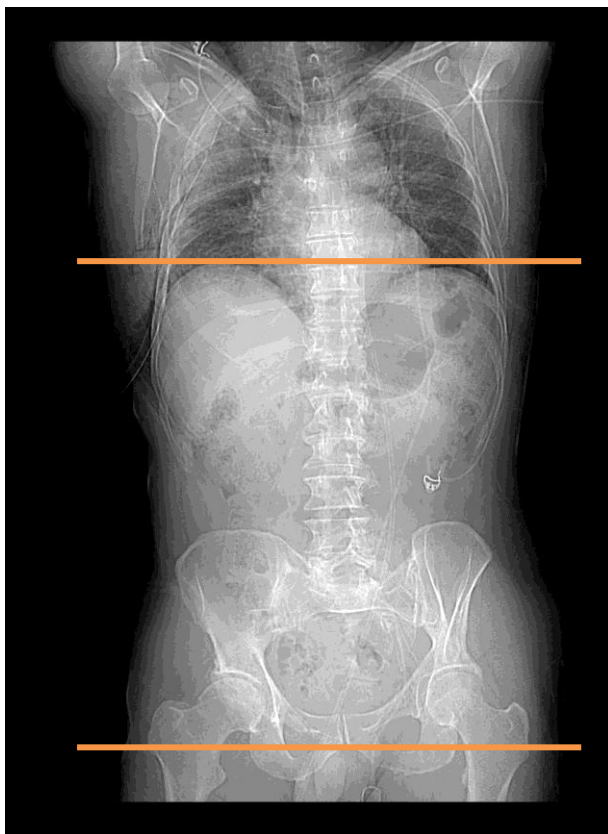
**Scan:** abdomen and pelvis

**Sequences/Phases for examination:** 1

**Contrast used:** Y or N

**Breath held:** Y or N

## Virtual Colonoscopy – typical protocol



**Clinical indication:** polyps/tumour

**Typical scan justification:** query polyps/tumour

Could include: *diarrhoea/constipation, rectal bleeding, change in bowel habit, anaemia, abdominal pain.*

*Incomplete colonoscopy.*

**Scan from:** diaphragm

**Ending at:** symphysis pubis

**Sequences/Phases for examination:** 2

**Contrast used:** Y or N

**Breath held:** Y or N

## Enteroclysis – typical protocol



**Clinical indication:** Crohn's disease

**Typical scan justification:** query Crohn's disease/small bowel

Could include: *attacks of vomiting, pain and diarrhoea.*

*Recent diagnosis of coeliac disease. Existing condition. Findings from colonoscopy – such as small bowel mesenteric nodes.*

**Scan from:** diaphragm

**Ending at:** symphysis pubis

**Sequences/Phases for examination:** 1

**Contrast used:** Y or N

**Breath held:** Y or N

## CT KUB – typical protocol



**Clinical indication:** stones/colic

**Typical scan justification:** query stones/renal colic

Could include: *colicky pain, vomiting, previous calculus, haematuria.*

**Scan from:** above kidneys

**Ending at:** below bladder

**Sequences/Phases for examination:** 1

**Contrast used:** Y or N

**Breath held:** Y or N

## CT Urogram – typical protocol



**Clinical indication:** tumour or stones/colic

**Typical scan justification:** query tumour or stones/renal colic

Could include: *query urological malignancy/ tumour/neoplasm. Query urological injury.*

*Colicky pain, vomiting, previous calculus, haematuria.*

**Scan from:** above kidneys

**Ending at:** below bladder

**Sequences/Phases for examination:** 3

**Contrast used:** Y or N

**Breath held:** Y or N

CT Protocol	PROSPECTIVE DATA COLLECTION - Progress tick-sheet for samples of 20 patients																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
CT Head (acute stroke)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
C-spine (fracture)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Chest (lung cancer)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Chest Hi-Res (l. lung disease)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
CTA (blood vessels)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
CTPA (PE)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Abdomen (liver metastases)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Abdomen (abscess)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
V. Colonoscopy (polyps/tumour)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Enteroclysis (Crohn's disease)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
CT KUB (stones/colic)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Urogram (tumour or stones)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Paediatric Head < 1 yr	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Paediatric Head 1 – 4 yrs	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Paediatric Head 5 – 12 yrs	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20