East Lancashire Hospitals NHS Trust
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Clinical Radiology Referral Guidelines

Cancer Referrals

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EAST LANCASHIRE HOSPITALS NHS TRUST

CLINICAL RADIOLOGY REFERRAL GUIDELINES

These guidelines are intended to be used by all "referrers" requesting imaging at East Lancashire Hospitals NHS Trust. They are appropriate for both primary and secondary care clinicians and Non-Medical Referrers (NMR) to promote the best use of imaging and resources for the benefit of our patients.

The Ionising Radiation (Medical Exposure) Regulations (IR(ME)R) provide for the health protection of individuals undergoing medical exposures involving ionising radiation. All diagnostic tests should therefore be carefully considered prior to referral and should only be requested appropriately. Diagnostic tests which do not utilise Ionising Radiation (such as ultrasound and magnetic resonance imaging) carry their own potential risks and as such are as strictly governed in terms of justification. This not only serves to protect patients, but also to manage demand appropriately and keep waiting times to a minimum.

The aim for all examinations should be to obtain the maximum information with the minimum of radiation. This means that on occasions the imaging undertaken may not be what the referring clinician/NMR expects. Radiology has set examination protocols utilised for the legal authorisation and justification of requests.

Optimising radiation dose

The use of radiological investigations is an accepted part of medical practice justified in terms of clear clinical benefits to the patient, which should far outweigh the small radiation risks. However, even small radiation doses are not entirely without risk. A small fraction of the generic mutations and malignant diseases that occur in the population can be attributed to natural background radiation. Diagnostic medical exposures account for one-sixth of the total population dose.

The Ionising Radiation (Medical Exposure) Regulations (IR(ME)2017 require that the unnecessary exposure of patients to radiation is kept to a minimum and ELHT must comply with these regulations. This is achieved by avoiding undertaking investigations unnecessarily (especially repeat examinations) and the use of dose optimisation utilising locally set diagnostic reference levels (DRLs).

The effective dose for a radiological investigation is the weighted sum of the doses to a number of body tissues, where the weighting factor for each tissue depends on its relative sensitivity to radiation-induced cancer of severe hereditary effects. This provides a single dose estimate related to the total radiation risk, no matter how the radiation dose is distributed around the body (Table 1).

Typical effective doses for some common diagnostic radiology procedures range over a factor of about 1,000 from the equivalent 1-2 days of natural background radiation.

Table 1

Typical effective doses from diagnostic medical exposure			
Diagnostic Procedure	**Typical effective dose (mSv)**	**Equivalent number of chest x-rays**	**Approximate equivalent period of natural background radiation**
Radiographic examinations			
Limbs & joints (except hip)	<0.01	<0.5	<1.5 days
Chest (single PA film)	0.02	1	3 days
Skull	0.06	3	9 days
Thoracic spine	0.7	35	4 months
Lumbar spine	1.0	50	5 months
Hip	0.4	20	2 months
Pelvis	0.7	35	4 months
Abdomen	0.7	35	4 months
IVU	2.4	120	14 months
Barium swallow	1.5	75	8 months
Barium meal	2.6	130	15 months
Barium follow-through	3	150	16 months
Barium enema	7.2	360	3.2 years
CT Head	2	100	10 months
CT Chest	8	400	3.6 years
CT abdomen or pelvis	10	500	4.5 years
Radionuclide Studies			
Lung ventilation (Xe-133)	0.3	15	7 weeks
Lung perfusion (Tc-99m)	1	50	6 months
Kidney (Tc-99m)	1	5	6 months
Thyroid (Tc-99m)	1	50	6 months
Bone (Tc-99m)	4	200	1.8 years
Dynamic cardiac (Tc-99m)	6	300	2.7 years
PET head (F-18 FDG)	5	250	2.3 years
*UK average background radiation = 2.2 mSv per year: regional averages 1.5-7.5 mSv per year			

Please note that the doses from some CT examinations are particularly high and the demand for CT imaging continues to rise. **It is therefore particularly important that referrals for CT are thoroughly justified and that techniques that minimise dose while retaining essential diagnostic information are adopted.**

In these referral guidelines, the doses are grouped to support the referrer in understanding the order of magnitude of radiation doses of the various investigations (Table 2).

Table 2 **Typical effective doses of ionising radiation from common imaging procedures**		
Symbol	Typical effective dose (mSv)	Examples
None	0	Ultrasound (US), Magnetic Resonance Imaging (MRI)
☢	<1	Chest, limbs & pelvis X-ray, mammography
☢ ☢	1-5	Lumbar spine X-ray, Nuclear Medicine (NM) (e.g., bone), Computed tomography (CT) head and neck
☢ ☢ ☢	5-10	CT chest or abdomen, NM (e.g., cardiac)
☢ ☢ ☢ ☢	>10	Extensive CT studies, some NM studies (e.g., some Position Emission Tomography co-registered with CT (PET-CT)
The average annual background dose in most parts of Europe falls within the 1-5 mSv range ☢ ☢		

Pregnancy and Protection of the foetus

Irradiation of a foetus should be avoided whenever possible. This includes situations in which the woman herself does not suspect pregnancy. The prime responsibility for identifying such patients lies with the referring clinician. Radiology also checks the pregnancy status of patients when they attend for examination.

Persons of childbearing potential presenting for an examination in which the primary beam irradiates the pelvic area (essentially, any ionising irradiation between the diaphragm and the knees), directly or by scatter, or for a procedure involving radioactive isotopes, will be asked whether they are or may be pregnant.

If the patient can exclude the possibility of pregnancy, the examination can proceed. If the patient is definitely pregnant, or if pregnancy cannot be excluded, the justification for the proposed examination should be reviewed by the radiologist and the referring clinician/NMR, with a decision taken on whether to defer the investigation until after delivery. However, a procedure of clinical benefit to the parent may also be of indirect benefit to the unborn child and a delay in an essential procedure may increase the risk to the foetus as well as the parent. This consideration is especially relevant in an emergency situation and all decisions must be documented.

Guidelines Key

The pages of each section are composed five columns:

Clinical/diagnostic problem	Situation for requesting an examination
Investigation	Possible imaging techniques
Dose	Level of exposure to radiation ☢
Recommendation	Recommendation on appropriateness of the investigation
Comment	Explanatory notes

Cancer

Many of the clinical problems related to the diagnosis of cancer are addressed in part in the individual system sections. Brief notes are provided in this section regarding the use of imaging in the diagnosis, staging and follow-up in some of the common primary malignancies. Paediatric malignancies are not included since their management is always at specialist level. (For breast cancer – see breast disease).

A CXR is necessary at presentation for most malignant lesions to identify possible pulmonary metastases.

CXR is also part of many follow-up investigations to monitor progress. Some are driven by trial protocols rather than clinical need. Concerns relating to radiation dose in diagnostic imaging is less relevant in this section.

Clinical/diagnostic problem	Investigation	Dose	Recommendation	Comment
Mouth & Pharynx				
Diagnosis	MRI CT	None 	Indicated	Diagnosis is commonly by clinical examination, supported by MRI or CT when there is high suspicion of occult disease.
Staging of oral cancer	MRI CT U/S	None  None	Indicated	Imaging is not commonly needed for diagnosis. Staging with CT or MRI should include cervical node groups. Ultrasound with fine-needle aspiration cytology (FNAC) may improve N staging. Sentinel node imaging is under investigation, chest may be examined for metastatic disease by plain radiography or (preferably) CT, but clinical effectiveness of M staging is unproven.
	PET-CT		Specialised investigation	Used to identify recurrent local and distant disease in previously treated patients.
Parotid				
Diagnosis	U/S	None	Indicated	Useful for superficial lobe tumours. If FNAC is required, U/S can be used for guidance. If U/S does not enable visualisation of the entire tumour, MRI is the investigation of choice for establishing extent.

	MRI CT	None ☢ ☢	Specialised investigation	MRI is preferred for the assessment of parotid masses. Limitations in ability to identify calcification make CT better in inflammatory disease. MRI cannot reliably differentiate benign from malignant lesions and does not obviate the need for a tissue diagnosis in indeterminate cases. However, MRI is better than CT for soft-tissue resolution. Dental amalgam may also be a problem of CT. CT should be used if MRI is impracticable and in cases of suspected inflammatory disease.
	PET-CT	☢ ☢ ☢ ☢	Not indicated	PET-CT is poor at differentiating benign from malignant lesions.
Staging	MRI CT	None ☢ ☢	Indicated	MRI Should be used in preference to CTY for the staging of parotid masses because of its superior soft-tissue resolution, multiplanar capability and ability to define the extent of disease and any intracranial involvement.
	PET-CT	☢ ☢ ☢ ☢	Specialised investigation	May have a role in staging tumours because it will identify metastases in normal-sized lymph nodes.
Larynx				
Diagnosis	MRI CT	None ☢ ☢	Indicated only in specific circumstances	Clinical endoscopy and biopsy for diagnosis.
Staging of laryngeal tumours	MRI CT	None ☢ ☢	Indicated	MRI and multidetector CT are suitable investigations for T and N staging. The section of imaging technique principally depends on local preference and availability.
	US	None	Specialised investigation	Can be for T and N staging and for follow-up in centres with appropriate expertise.
	PET-CT	☢ ☢ ☢ ☢	Specialised investigation	PET and PET-CT have been suggested for a range of clinical roles, including determination of gross tumour volume at presentation and to identify recurrent disease in previously treated patients.
Thyroid				
Diagnosis	U/S	None	Indicated	Used in combination with or to guide FNAC.

	NM	☢ ☢	Indicated	For the detection of residual/recurrent differentiated thyroid cancer after thyroidectomy.
Staging	MRI CT U/S	None ☢ ☢ None	Indicated	To assess large primary tumours, detect distant metastases, and for medullary thyroid carcinoma in multiple endocrine neoplasia syndromes.
	NM	☢ ☢ ☢ ☢	Indicated	For the detection of residual/recurrent disease after thyroidectomy.
Lung				
Diagnosis	CXR	☢	Indicated	Lung cancer can have several different clinical presentations and if it is suspected, CXR is indicated. Some cancers will not show on X-ray despite the presence of malignant cells in the sputum.
	CT	☢ ☢ ☢	Indicated	CT is used earlier in the diagnostic pathway and will increase the sensitivity of detection of early tumours. However, CT has not yet been proved to be of benefit as a screening tool for lung cancer.
Staging	CT	☢ ☢ ☢	Indicated	When correlated with histological findings CT has an overall accuracy of up to 80% in the detection of mediastinal lymph node enlargement, but mediastinal lymph node biopsy will be required in some cases to confirm rumour involvement in nodes before thoracotomy. Where appropriate, PET-CT should be considered.
	PET-CT	☢ ☢ ☢ ☢	Indicated only in specific circumstances	PET-CT improves the diagnostic accuracy of preoperative staging non-small-cell lung cancer. PET-CT should be considered in all patients before an attempt at surgical resection or radical oncology
	MRI	None	Indicated only in specific circumstances	In most patient with lung cancer MRI does not offer any benefits over CT. However, it is of value in patients with superior pulmonary sulcus (Pancoast) tumours. MRI may also be of value in showing the vascular anatomy of the mediastinum in patients with previous reactions to iodinated contrast media. Studies have shown MRI to be better than CT at differentiating tumour from distal atelectasis.
	U/S	None	Indicated only in specific circumstances	In patients with mediastinal nodal involvement shown on CT, US with fine needle aspiration of abnormal neck nodes may provide cytological diagnosis and confirm spread of disease at an early stage in the investigative pathway.

Breast (See Breast disease section)				
Oesophagus				
Diagnosis	Ba Swallow	☢ ☢	Indicated only in specific circumstances	Although endoscopy is usually the first investigation, barium studies are helpful, especially for high dysphagia.
Staging	CT	☢ ☢ ☢	Indicated	Many patients present with advanced disease, which is unresectable or unsuitable for radical radiotherapy. Ct ca be used as the initial investigation since locally advanced or metastatic disease may preclude surgery. CT may also help in planning neoadjuvant or palliative treatment.
	Endoscopic US	None	Indicated	Endoscopic US is preferred technique for staging the primary tumour and locoregional nodes when the tumour is thought to be resectable, and distant metastases have been excluded.
	PET-CT	☢ ☢ ☢ ☢	Specialised investigation	There is evidence that PET-CT is more sensitive than CT alone for detection of distant metastases at diagnosis and in the detection of residual or recurrent disease after surgical or other treatment. Accurate staging affects not only the surgical approach but also the used of other treatment, such as chemotherapy and radiotherapy in the neoadjuvant setting.
Stomach				
Diagnosis	Endoscopy Ba meal	None ☢ ☢	Indicated	Endoscopy and double-contrast barium meal equally sensitive in the diagnosis of advanced gastric cancer. Endoscopy enables biopsy for histological assessment.
Staging	CT	☢ ☢ ☢	Indicated	CT is the best staging investigation if active treatment is planned. Endoscopic US is useful for local staging. Laparoscopy is the most sensitive investigation for small peritoneal deposits.
Liver: Primary Lesion				
Diagnosis	US	None	Indicated	US is often used as the first examination for detection of liver metastases but should not be relied on to exclude metastases. CT or MRI should be used when full staging is required. The use of US contrast agents improves the accuracy of detection of metastases to match CT and MRI

Staging	MRI CT	None ☢ ☢ ☢	Specialised investigation	MRI is probably the optimum investigation for assessment of involved segments and lobes. CT arterial portography and intraoperative US are useful where available
Liver: Secondary Lesion				
Diagnosis	US	None	Indicated	In patients with proven malignancy, US is effective in the detection of metastases >2cm in diameter. It can characterise some benign lesions and can be used to guide biopsy in certain patients. The use of US contrast increase sensitivity of detection of metastases.
	MRI	None	Indicated	MRI can characterise lesions. Contrast-enhanced techniques are highly sensitive and are recommended when hepatic resection is being considered.
	CT	☢ ☢ ☢	Indicated	CT is indicated when US findings are negative and clinical suspicion is high. Portal venous phase imaging will detect most metastases and multiple-phase CT can be used when the primary tumour is associated with hyper vascular metastases. An advantage of CT is the ability to assess other organs during the same investigation.
	PET-CT	☢ ☢ ☢ ☢	Specialised investigation	PET-CT is indicated when other imaging is equivocal and can detect extrahepatic disease when surgical resection of liver metastases is being considered.
Pancreas				
Diagnosis	US CT	None ☢ ☢ ☢	Indicated	Choice of diagnostic technique depends on local availability of expertise and the patient's habitus. U/S is usually effective in slim patients, but CT is more reliable in visualising the whole pancreas. Especially in large patients. Endoscopic US is an accurate technique and is useful for guiding fluid aspiration and biopsy
	MRI MRCP ERCP	None None ☢ ☢	Specialised investigation	MRI is useful for clarification of problems. MRCP is useful for investigation of jaundice but needs to be combined with cross sectional MRI of suspected pancreatic tumour. ERCP takes place preferably after cross sectional imaging as a decision on intervention management e.g., permanent stent placement may be facilitated by earlier cross-sectional imaging.

Staging	US CT MRI	None ☢ ☢ ☢ None	Indicated	US at the time of diagnosis may detect liver metastases. If radical surgery is considered CT is the main staging investigation with multiple phase imaging to assess potential vascular invasion. MRI with MRCP is a supplementary investigation.
	PET-CT	☢ ☢ ☢ ☢	Specialised investigation	PET-CT may be of use in equivocal cases for distant staging where there is significant possibility of metastatic disease and resection is being considered.
	Endoscopic US	None	Indicated only in specific circumstances	Endoscopic US is usually done in tertiary referral centres where there is uncertainty after cross sectional imaging. It is useful for guiding biopsy when a tumour is considered unresectable on other imaging.
Colon and Rectum				
Diagnosis	CT colonography colonoscopy	☢ ☢ ☢ ☢ ☢ ☢ None	Indicated	Colonoscopy is the mainstay of diagnosis. CT colonoscopy is used frequently for the investigation of suspected colonic tumours in the elderly or infirm. It may be used after failed colonoscopy, avoiding the need for repeat bowel preparation.
	CT	☢ ☢ ☢	Specialised investigation	Staging investigation may be performed simultaneously with CT colonography. Standard protocol CT of the abdomen and pelvis is used in the elderly and infirm.
Staging	CXR	☢	Indicated	For pulmonary metastatic disease in the palliative setting, or if CT is unavailable.
	US	None	Indicated	Endoluminal US may be useful for anal and rectal tumours thought to be of early stage. Hepatic US is used but CT, MRI and PET-CT are more sensitive for secondary liver tumours.
	CT	☢ ☢ ☢	Indicated	CT now routinely used to guide treatment decisions.
	MRI	None	Indicated	MRI is the investigation of choice in the assessment of local spread rectal tumours. Contrast-enhanced MRI of the liver is indicated before resection of hepatic metastases is considered.
	PET-CT	☢ ☢ ☢ ☢	Specialised investigation	PET-CT is used increasingly in patient who are candidates for resection of hepatic and pulmonary metastases.

Follow-up	US CT	None ☢ ☢ ☢	Indicated	In some groups of asymptomatic patients, routine surveillance for hepatic and pulmonary metastases is indicated.
	MRI	None	Indicated	MRI is useful in the detection of local recurrence.
	PET-CT	☢ ☢ ☢ ☢	Indicated	PET-CT is a sensitive method of detecting local and peritoneal recurrence of rectal and colonic tumours. It is useful especially when a rising tumour marker is detected but initial imaging is normal.
Kidney				
Diagnosis	CXR	☢	Indicated	CXR is useful in the detection of pulmonary metastases.
	US	None	Indicated	US is a sensitive detector of renal masses >2cm and can accurately characterise some masses as cystic or solid. US helps to characterise some masses indeterminate at CT.
	CT	☢ ☢ ☢	Indicated	CT is a sensitive detector of renal masses 1-1.5cm and can accurately characterise masses.
	MRI	None	Specialised investigation	Contrast-enhanced MRI is as sensitive as contrast-enhanced CT for detecting characterising renal masses. MRI should be used if masses are not adequately characterised by CT and US, or if iodinated contrast medium is contraindicated because of diminished renal function or previous adverse reaction to iodinated contrast agents.
Staging	CT MRI	☢ ☢ ☢ None	Indicated	MDCT is the initial investigation of choice unless iodinated contrast medium is contraindicated. CT facilitates detection of pulmonary and other distant metastases at the same investigation. MRI may be used in a problem-solving role-e.g. If degree of vascular involvement is unclear on CT alone.

	PET-CT	☢ ☢ ☢ ☢	Indicated only in specific circumstances	PET-CT offers no advantage in T staging but may be helpful if CT/MRI is inconclusive for metastases.
Recurrence	CXR	☢	Indicated	For stage T1/2 tumours that are considered at low risk from recurrence, CXR should be done at regular intervals up to 5 years after surgery.
	CT	☢ ☢ ☢	Indicated	Patients at high risk from relapse (such as those with pT3a or b tumours) should undergo routine surveillance with abdominal CT. Any patient with symptoms that suggest local relapse should be investigated with abdominal CT.
Bladder				
Diagnosis	US	None ☢ ☢	Indicated only in specific circumstances	Cystoscopy is the investigation of choice in the diagnosis of bladder tumours. US is sufficiently accurate to assess small (<5 mm) bladder tumours.
Staging	CT	☢ ☢ ☢	Indicated	CT can assess local extramural spread within the pelvis, and at the same time survey for nodal and distant metastatic disease in the thorax and abdomen, obviating the need for CXR. MDCT is also capable of detecting upper urinary tract urothelial tumours.
	CXR	☢	Indicated	CXR to assess for pulmonary metastatic disease.
	MRI	None	Indicated	MRI is sensitive and specific for assessment of the bladder and local invasion to adjacent organs. Increased tissue contrast compared with CT makes MRI more useful for assessment of local invasion, but MRI is less versatile in staging of distant disease.
	PET-CT	☢ ☢ ☢ ☢	Specialised investigation	PET-CT may be used for complex problems after discussion with an MDT.
Prostate				
Diagnosis	US	None	Indicated	Use of US varies according to local availability and expertise. Transrectal US is widely used together with guided biopsies.

Staging	MRI	None	Indicated	There is a wide range of treatment options for both early and late-stage prostatic carcinoma. No clear consensus has been reached on the treatment of prostate cancer is varying stages of the disease. MRI with pelvic phased array for endorectal coils is the most sensitive and specific method for assessment of disease that may be organ confined and that is being considered for radical treatment. Staging may be continued into the abdomen when pelvic nodal disease is shown. Useful information can also be gathered from the diagnostic transrectal US. CT is of no value for local staging of prostatic disease.
	NM	☢ ☢	Indicated	Bone scan is used in the assessment of metastases in patients considered to be at risk. A range of parameters including PSA and Gleason score, can be combined to assess the likelihood of distant dissemination of disease. Bone scintigraphy is useful for patients with a PSA concentration >20, with locally advanced disease or with a Gleeson score >8.
Testicle				
Diagnosis	US	None	Indicated	US is used in suspected testicular malignancy and when presumed inflammatory disease does not respond to treatment.
Staging	CT	☢ ☢ ☢	Indicated	CT is mainstay of staging and at initial diagnosis should include the chest, abdomen, and pelvis. Pelvis can be omitted if all risk factors, including abdominal nodal disease have been excluded. For non-seminomatous germ cell tumours, thoracic CT is more sensitive than CXR in the detection of pulmonary metastases.
Follow-up	CT	☢ ☢ ☢	Indicated	If risk factors for pelvic nodal disease have been excluded, pelvic CT may be omitted. The appearance of residual masses may assist in decision on whether to undertake surgery. MRI has no clear advantage over CT, apart from reducing radiation burden. CT of previously involved areas can show morphology evidence of enlargement of masses.
	PET-CT	☢ ☢ ☢ ☢	Specialised investigation	When a marker rises after treatment, FDG-PET may be helpful in identifying the site of relapse, in the presence of residual mass,

				FDG uptake may be useful in indicating the presence of a persistent of recurrent tumour.
Ovary				
Diagnosis	US	None	Indicated	Most ovarian lesions are identified initially on clinical examination of US. A combination of transabdominal IS and transvaginal US, supplemented by colour Doppler, is recommended.
	MRI	None	Specialised investigation	MRI of the abdomen and pelvis is useful for problem solving since it is more accurate than US in establishing the presence of benign features in complex masses.
Staging	CT	☢ ☢ ☢	Indicated	CT of the abdomen and pelvis has a role in identifying patients that may benefit from chemotherapy or are being considered for cytoreductive surgery.
	MRI	None	Specialised investigation	MRI of the abdomen and pelvis is useful when enhanced CT is contraindicated when the patient is pregnant or for problem solving.
	PET-CT	☢ ☢ ☢ ☢	Specialised investigation	PET-CT is indicated in difficult management situations, and assessment of distant and local spread.
Follow-up	CT	☢ ☢ ☢	Indicated	Clinical examination and serum CA125 measurement are used to detect recurrent disease. CT of the abdomen and pelvis is used to assess treatment response. CT can establish the extent of disease recurrence, but not normal imaging does not exclude recurrence.
	MRI	None	Specialised investigation	MRI of the abdomen and pelvis is useful for surgical planning and problem solving.
	PET-CT	☢ ☢ ☢ ☢	Specialised investigation	PET-CT is useful when concentration of CA125 is increasing but when CT and/or MRI are normal or inconclusive.
Uterus: Cervix				
Diagnosis	MRI	None	Indicated only in specific circumstances	Usually a clinical diagnosis, MRI may assist in complex cases.

Staging	MRI	None	Indicated	MRI provides better indication of tumour and local extent than CT and can detect pelvic nodal metastases. Para-aortic nodes and ureters may also by examined.
	CT	☢☢☢	Indicated	CT may be used for staging of disease in the thorax and abdomen
	PET-CT	☢☢☢☢	Specialised investigation	PET-CT for the detection of lymph node metastases in clinical early-stage cervical cancer is being assessed.
Relapse	MRI	None	Specialised investigation	MRI provides better information in the abdomen and pelvis than CT. Biopsy (e.g., of nodal mass) is easier with CT..
Uterus: Body				
Diagnosis	US MRI	None None	Indicated	MRI can give valuable information about benign and malignant lesions.
Staging	MRI	None	Indicated	MRI is the optimum technique for combined local and pelvic nodal stating of endometrial carcinoma.
	CT	☢☢☢	Indicated	CT is of limited value for local staging and therefore is unlikely to affect surgical management. CT may be useful for lymph node evaluation.
Lymphoma				
Diagnosis	CT US	☢☢☢ None	Indicated	Diagnosis typically follows excision biopsy of a lymph node. CT and US are used to guide needle biopsy when excision biopsy is not thought to be suitable.
Staging	CT	☢☢☢	Indicated	CT of the chest, abdomen and pelvis is the routine staging procedure at the time of diagnosis. Head and neck CT may also be indicated.
	US MRI	None None	Indicated only in specific circumstances	US/MRI may be useful in staging specific organs. MRI is indicated for suspected CNS disease and may establish the extent of bone marrow involvement. US is useful for imaging of the neck, thyroid, tests, and peripheral soft tissue masses.
	PET-CT	☢☢☢☢	Specialised investigation	PET-CT may be used for initial staging if follow-up with PET-CT is planned.

Follow-up	CXR	☢	Indicated	Initial assessment of response in bulky thoracic disease by a CXR is appropriate. It may also be used for long-term follow-up after completion of treatment- for example, after mantle radiotherapy
	CT	☢ ☢ ☢	Indicated	Nodal size on CT is used as a measure of response during treatment. A residual mass may be a visible on CT at completion of treatment. If complete remission is established, repeat imaging should be directed by clinical presentation and likelihood of relapse.
	PET-CT	☢ ☢ ☢ ☢	Specialised investigation	There is evidence that PET-CT can be used for interval assessment during therapy to predict outcome. It is also useful in the assessment of residual masses.
	MRI	None	Indicated only in specific circumstances	MRI is useful for assessment of CNS disease.
Musculoskeletal tumours (see also Musculoskeletal section)				
Diagnosis	XR	☢	Indicated	Plain XR is the initial investigation for suspected bony tumour and is useful in establishing the need for biopsy.
	MRI	None	Indicated	MRI is a sensitive technique for assessment of marrow involvement, skip lesions, and soft tissue spread of bony tumours. It is also useful for assessment of bony involvement by presumed soft tissue lesions.
	US	None	Indicated	US has a role in the initial assessment of extra-osseous masses that may or may not be associated with an underlying bony lesion. May be useful for establishing the need for biopsy
	NM	☢ ☢	Indicated	Bone scan is useful in the identification of osteoblastic skip lesions in bone and in multifocal or metastatic bone tumour.
	CT	☢ ☢ ☢	Indicated	CT is used to assess calcification associated with bony and soft tissue tumours. It may assist in pre-biopsy evaluation.
	PET-CT	☢ ☢ ☢ ☢	Specialised investigation	PET-CT has a role in establishing the grade of malignancy and in directing biopsy.
	MRI CT	☢ None	Specialised investigation	MRI is best for the assessment of local spread and extent; CT chest is used to detect lung metastases.

	PET-CT	☢ ☢ ☢	Specialised investigation	PET-CT is sensitive in the detection of metastases.
Metastases from unknown primary tumour				
Diagnosis	CXR	☢	Indicated	Occult lung primary is common.
	CT	☢ ☢ ☢	Specialised investigation	CT of the chest, abdomen and pelvis is the most helpful investigation in determining the primary site. It may enable effective treatment-e.g., for lung cancer, and palliation. It allows entry into clinical trials.
	PET-CT	☢ ☢ ☢ ☢	Specialised investigation	PET-CT is a sensitive method for detecting primary tumours and is widely used in head and neck and thoracic a malignancy. Some centres use MRI.
	US	None	Indicated only in specific circumstances	US is indicated in cases in which thyroid or testicular cancer are suspected from the pattern of metastatic disease.
	Mammography	☢	Indicated only in specific circumstances	Even in the presence of metastases, diagnosis of an occult breast primary is worthwhile since treatment decisions may be affected by pathology.
	MRI	None	Indicated only in specific circumstances	MRI of the breast may show primary breast carcinoma with axillary lymph node metastases despite normal mammogram and US.