

# Justification of exposure including referral criteria and exposure protocols guidelines

## GENERAL RADIOGRAPHY

Under the Ionising Radiation (Medical Exposures) Regulations 2000 no medical exposure to radiation can take place without prior justification of the exposure by a practitioner.

General radiographic exposures can be authorised by the operator if the referral complies with the enclosed guidelines and criteria which have been approved by the entitled practitioner.

Referrers should provide sufficient medical data relevant to the medical exposure requested to enable the operator who is authorising, or the practitioner, to decide whether there is a sufficient net benefit.

Radiographers, acting as operator authorising the exposure, should be satisfied that the information provided by the referrer conforms to the approved referral criteria.

Any referral not meeting the criteria should be referred to an entitled practitioner who will make a decision on the justification of the exposure.

The person authorising or justifying the exposure should be recorded on the referral and the RIS according to the IRMER Pathways charts.

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# 1. Referral Criteria for General Radiography

## Referral Criteria

Referral criteria will be based on the current version of Royal College of Radiologists (RCR) booklet entitled "Making the best use of clinical radiology services" (Version 6.03, 2007), MBUR 6<sup>th</sup> Edition.

These RCR recommendations are available on the Trust's intranet on the 'Radiology and PACS' site.

## 1.2 Exceptions to recommended referral criteria

OUH referral criteria which deviates from the RCR Guidelines (version 6).

	Referral	Action	Suggested Examination
<b>Cardio-vascular / Thoracic System</b>	Air entry decrease	Added to guidelines	CXR PA or AP
	Anaphylactic reaction if pulmonary oedema suspected	Added to guidelines	CXR PA or AP
	Aspiration	Added to guidelines	CXR PA or AP
	Chronic Cough	Added to guidelines	CXR PA or AP
	Cardiomegaly	Added to guidelines	CXR PA or AP PA preferred to see enlargement of heart
	Respiratory Tract Infection	Added to guidelines	CXR PA or AP
	Tuberculosis	Added to guidelines	CXR PA or AP

	Post CABG Days 1-5	Added to guidelines	CXR PA or AP
	Pyrexia	Added to guidelines	CXR PA or AP
	Heart murmur	Added to guidelines	CXR PA or AP
	Confusion over 65 yrs of age	Added to guidelines	CXR PA or AP
	Consolidation	Added to guidelines	CXR PA or AP
	Bronchiolitis (wheeze or stridor)	Added to guidelines	CXR PA or AP
	Collapse (excluding vaso-vagal)	Added to guidelines	CXR PA or AP
	Oxygen Sats low	Added to guidelines	CXR PA or AP
<b>Urological, Adrenal and Genitourinary Systems</b>	Renal stones	Added to guidelines	See abdomen section or paediatric section
<b>Musculo-skeletal system</b>	Spine - Degenerative change/spondylosis	Added to guidelines	AP and Lateral
	Pagets	Added to guidelines	X-ray affected area only- AP and lateral
	Shoulder – Impingement	Added to guidelines	AP only (gleno- humeral joint)
	Cervical Rib	Added to guidelines	Thoracic Inlet and CXR PA or AP

## 1.3 Contraindications to General Radiography

### The following cannot be justified for general X-ray

<b>Clinical Problem</b>	<b>Suggested Investigation</b>
<b>Musculo-Skeletal</b>	
Heel pain: Suspected plantar fasciitis	NM, US, MRI
Chronic Back Pain: Unless osteoporotic collapse	MRI
Bony Metastases	NM
Soft tissue mass	MRI
Radiolucent Foreign Body	US
Rotator cuff shoulder	US
Severs Disease (heel pain with no history of trauma)	None. Clinical management only
Sternoclavicular joints	CT
<b>Trauma</b>	
2 <sup>nd</sup> to 5 <sup>th</sup> toes: undisplaced fracture	None. Clinical management only
Coccyx #	None. Clinical management only
Nasal Bones	None. Clinical management only
Fractured Ribs	None. Clinical management only
C-spine injury over 65 years of age	CT
<b>Gastrointestinal System</b>	
Abdominal Aortic Aneurysm	US, CT, MRI
GI Bleed	CTA
Dysphagia/ Difficulty in Swallowing	Ba Swallow
Heartburn/ Hiatus Hernia	Ba Swallow/Meal

## 2. Justification Guidelines and Exposure Protocols

This is a guide for radiographers for the following:

- Justification of referrals
- An exposure guide – please see specific exposures available in each X-ray room
- Expected dose levels – an average is given as these will differ dependent on X-ray equipment
- Comments to offer tips and advice

**ADULTS****2.1 Justification Guidelines: Abdomen Examinations**

28 day rule applies – 12 to 55 years

Clinical Problem	Investigation	Comments
<b>Gastrointestinal System</b>		
Acute Abdominal Pain Looking for either obstruction or perforation	AP Supine (to exclude obstruction) Erect CXR (to exclude perforation see 'perforation')	
Acute Small Bowel Obstruction	AP Supine	
Acute Large Bowel Obstruction	AP Supine	
Acute Pancreatitis When non-specific acute pain	AP Supine (to exclude obstruction) Erect CXR (to exclude perforation see 'perforation')	
Chronic Pancreatitis May show calcification	AP Supine	
Constipation Maybe helpful in Geriatric/Psychiatric to show the extent of impaction	AP Supine (Specialist request only)	
Inflammatory Bowel disease Looking for toxic dilatation	AP Supine	
Palpable mass	Refer to radiologist	Possible investigation: US/CT
Perforation	LT Lateral Decubitus or Erect CXR (Erect CXR preferred)	
Toxic Megacolon	AP Supine	
<b>Urological, Adrenal and Genitourinary Systems</b>		
Renal Stones	CTKUB if no imaging in last 6 months If imaging in last 6 months AP Supine film.	
<b>Trauma</b>		
Foreign Body	AP Supine	
Stab Injury	AP supine, Erect CXR	

**2.2 Exposure Guidelines: Abdomen Views**

<b>Examination</b>	<b>Views</b>	<b>Exposure</b>	<b>Expected Dose cGycm<sup>2</sup></b>
Abdomen	AP Supine (To include diaphragm and symphysis pubis)	75 KV and both side chambers using AEC (preferred method) 75KV + 25mAs with stationary grid	➤ 150
Decubitus	LT Lateral Erect (right side up)	75KV and middle chamber using AEC upright bucky (preferred method) 75KV 25mAs With stationary Grid	

**2.3 Justification Guidelines: Chest Examinations****Please do PA erect image when possible**

Clinical Problem	Investigation	Comments
<b>Gastrointestinal System</b>		
Acute abdominal Pain	PA or AP	
<b>Chest and Cardiovascular System</b>		
Acute Chest Pain	PA or AP	
Angina (Unstable)	PA or AP	
Air Entry Decreased	PA or AP	
Anaphylactic Reaction (if pulmonary oedema)	PA or AP	
Aortic Dissection	PA or AP	to exclude other causes
Asthma	PA or AP	when patient does not respond to treatment OR suffering from pyrexia/leucocytosis or localising pain
Aspiration	PA or AP	
Bronchiectasis	PA or AP	
Bronchiolitis	PA or AP	
Cardiomegaly	PA or AP	
Chronic Cough	PA or AP	
COPD/COAD	PA or AP	
Collapse (excluding Vaso-vagal)	PA or AP	
Confusion (over 65 years)	PA or AP	
Consolidation	PA or AP	
Cystic Fibrosis	PA or AP + Lateral	
Haemoptysis	PA (+ Lateral over 50yrs)	
Haemothorax	PA or AP	
Heart Failure	PA or AP	
Heart Murmur	PA or AP	
Hypertension	PA or AP	
Lower Respiratory Tract Infection	PA or AP	
Lung Disease	PA or AP	when change in symptoms
Malignancy	PA or AP	

Myocardial Infarction	PA or AP	
Oesophageal Perforation	PA or AP	
Osteosarcoma	PA or AP + Lateral	
Oxygen Sats Decrease	PA or AP	
Perforation	PA or AP (Erect)	
Pericarditis/pericardial Effusion	PA or AP	
PICC line insertion	PA or AP	
Pleural Effusion	PA or AP (Erect)	
Pulmonary Embolism	PA or AP	
Pre-Cardiac Intervention	PA or AP	
Pneumonia	PA or AP	
Pneumonia Follow-up (usually 6 weeks time)	PA or AP	
Pneumothorax	PA or AP	Inspiration only
Post Biopsy (Lung)	PA or AP	
Post CABG	PA or AP	
Post Pace-Maker Insertion	PA or AP + Lateral	
Pyrexia	PA or AP	
Respiratory Tract Infection	PA or AP	
Shortness of Breath	PA or AP	
Sternal Fracture	PA or AP + Coned Lateral	PA preferred to see mediastinal widening
Thoracic Inlet Obstruction	Apical View Only	
Tuberculosis	PA or AP	
Valvular Heart Disease	PA or AP	
<b>Trauma</b>		
Stab Injury	PA or AP	
Foreign Body	PA or AP	
Pre-Employment/emigration (Specific jobs e.g. deep-sea diving – ask radiologist if not sure)	PA or AP	Specific paperwork required for emigration purposes
ITU CXR	AP	when change in condition
Pre-Op (Cardiac patients and patients with a # NOF and are 65 years +)	PA or AP	

## 2.4 Exposure Guidelines: Chest Views

Please refer to specific room settings

Examination	Views	Exposure	Expected Dose cGycm <sup>2</sup>
Chest	PA	FFD = 150cm 150kV + 2.5mAs (use Airgap)	< 5
Chest	AP	FFD = 100cm 85kV + 2.5mAs	< 10
Chest	Lateral	FFD = 120cm 150kV + 10mAs (use airgap)	< 20

## 2.5 Justification Guidelines: Upper Limb Examinations

Refer to Views and Exposure Guidelines for Specific Investigation

Clinical Problem	Investigation	Comments
<b>Musculo-skeletal System</b>		
Arthropathy	AP (affected area only)	
Bony Mass/Primary Bone Tumour	AP + Lateral	for all cases of unresolved bone pain
Bone Pain	AP + Lateral	
Diabetes – Hands Only	DP	
Osteomalacia	AP + Lateral	
Osteomyelitis	AP + Lateral	
Painful Prosthesis	AP + Lateral	
Pagets	AP + Lateral (affected area only)	
<b>Trauma</b>		
Trauma	AP + Lateral	
Trauma Follow-up (e.g. post manipulation/reduction)	AP + Lateral	
Stress Fracture	AP + Lateral	
Subluxation	AP + Lateral	
Dislocation	AP + Lateral	
Foreign Body (Radio-opaque only)	AP and Lateral and tangential view of affected area.	<ul style="list-style-type: none"> <li>Use marker to indicate site/wound</li> </ul>

		<ul style="list-style-type: none"> <li>Remove dressings</li> </ul>
Foreign Body ? bony involvement (Radio-opaque only)	AP and Lateral view of <b>Object</b>	

## 2.6 Upper Limb Views and Exposure Guidelines

Please refer to specific room settings

Examination	Views	Exposure	Expected Dose cGycm <sup>2</sup>
Fingers	DP, Lateral (45° Oblique for MCPJ)	50-52kV + 1.4-1.6mAs	< 2
Hand	DP + Oblique (lateral if #'d MC)	52-55kV + 1.6mAs (60Kv + 2mAs for lateral)	< 3
Thumb	AP + Lateral	50-52kV + 1.4-1.6mAs	< 2
Scaphoid	DP, Lateral, Oblique, 25° Axial	52-55kV + 1.5mAs – 2mAs	< 3
Wrist	DP + Lateral	DP = 55kV + 2mAs Lateral = 56kV + 2mAs	< 4
Forearm	AP + Lateral	55kV + 2.5mAs	< 5 (for both views)
Elbow	AP + Lateral	60kV + 2mAs	< 2
Humerus	AP + Lateral	65kV + 3.2mAs	< 10 (for both views)
Shoulder (Trauma)	AP+ Axial/modified axial (Lateral for proximal humerus)	AP: 64.5kV + 4mAs Lateral/axial: 75kV + 3.2mAs	< 4 < 8
Shoulder Joint (Trauma) (post manipulation and follow-up)	AP Oblique (45° to view gleno-humeral joint) + Axial/modified axial –see	AP: As above Axial: 75kV + 3.2mAs	< 6

	protocol folder for modified axial projection.		
Scapula	AP +Lateral	Same as Shoulder	Same as Shoulder
Clavicle	AP + AP 20° Cranial Deviation	65kV + 2.5mAs	< 10 (for both views)
ACJ	AP	64.5kV + 4mAs	< 4

## 2.7 Justification Guidelines: Lower Limb Examinations

Refer to Views and Exposure Guidelines for Specific Investigation

Clinical Problem	Investigation	Comments
<b>Musculo-skeletal System</b>		
Arthropathy	AP (affected area only)	
Bony Mass/Primary Bone Tumour	AP + Lateral	for all cases of unresolved bone pain
Bone Pain	AP + Lateral	
Diabetes (for osteomyelitis feet)	DP + 45° Oblique	
Loose Body (Knee)	AP + Lateral	
Knee Pain without Trauma (Arthritic/arthropathy changes may be seen)	AP + Lateral	
Osteomalacia	AP + Lateral	
Pagets	AP + Lateral (affected area only)	
Osteomyelitis	AP + Lateral	
Painful Prosthesis	AP + Lateral	
Hallux Valgus	AP + Lateral	
<b>Other</b>		
Stress Views/Weight bearing	AP + Lateral	Trauma referral only
<b>Trauma</b>		
Trauma	AP + Lateral	
Trauma Follow-up (e.g. post manipulation/reduction)	AP + Lateral	
Tibial Plateau Fracture	AP + Lateral	Both 45° obliques if cannot see fracture but see

		lipohaemarthrosis
Foreign Body (Radio-opaque only)	AP and Lateral and tangential view of affected area.	<ul style="list-style-type: none"> <li>• Use marker to indicate site/wound</li> <li>• Remove dressings</li> </ul>
Foreign Body ? bony involvement (Radio-opaque only)	AP and Lateral view of <b>Object</b>	
Dislocation	AP + Lateral	

## 2.8 Lower Limb Views and Exposure Guidelines

Please refer to specific room settings

Examination	Views	Exposure	Expected Dose cGycm <sup>2</sup>
Big Toe	DP + Lateral	60kV + 1.4mAs	< 1
Toes	DP + 45° Oblique	60kV + 1.4mAs	< 1
Foot	DP + 45° Oblique	60kV + 1.6mAs	< 2
Calcaneum	Lateral + 45° Axial (see protocols for Broden's View)	Lateral: 60kV + 2mAs Axial: 63kV + 2.5mAs	< 5 (for both images)
Ankle	AP + Lateral (See protocols for gravity stress view)	60kV + 2mAs	< 4
Tib/Fib	AP + Lateral (Obliques may be requested by Trauma)	65kV + 2.5mAs	< 8 (for both images)
Knee	AP + Lateral (HBL for Trauma)	64.5kV + 4mAs	< 15 (for both images)
Patella	AP + Lateral Knee (Skyline View may be requested by Trauma)	64.5kV + 4mAs	< 20 (for all images)

Femur	AP + Lateral	70kV + AEC centre chamber (16mAs with Grid)	< 15
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## **2.9 Justification Guidelines: Pelvis and Hip Examinations**

28 day rule applies – 12 to 55 years

<b>Clinical Problem</b>	<b>Investigation</b>	<b>Comments</b>
<b>Musculo-skeletal System</b>		
Arthropathy	AP Pelvis	
Avascular Necrosis	AP Pelvis	
Bone Pain	AP Pelvis and Lateral	
Hip Pain	AP Pelvis + Lateral	
Osteomyelitis	AP + Lateral	
Osteomalacia	AP + Lateral	
Painful Prosthesis	AP + Lateral	
Post op – THR, ETS (All prosthesis must be included; DHS patients should have had X-rays in theatre)	AP Pelvis (Top of cassette at ASIS for hips) + HBL Lateral	
Primary Bone Tumour	AP + Lateral	
Sacroiliac Pain	AP Pelvis	
Pagets	AP Pelvis(affected area only)	
<b>Trauma</b>		
Trauma	AP Pelvis + (HBL Lateral for Hip, Judet views for acetabular)	
Trauma Follow-up (Post reduction)	AP + Lateral	
Acetabular Fixation/Fracture	Judet Views	
Fall	AP Pelvis + HBL Lateral	
Injury to pelvic ring	Inlet and Outlet	Trauma referral only

### 3.0 Pelvis and Hip Views and Exposure Guidelines

Please refer to specific room settings

Examination	Views	Exposure	Expected Dose
Pelvis	AP	Use AEC both side chambers or stationary grid 85kV (+ 32mAs)	< 100
Pelvis	Judet (45° Oblique pelvis)	Use AEC all 3 chambers or stationary grid 90kV ( + 40mAs)	< 200
Pelvis	Inlet (30° down)	Use AEC all 3 chambers or stationary grid 95kV (40-50mAs)	<200
Pelvis	Outlet (40° up)	Use AEC all 3 chambers or stationary grid 95kV (40-50mAs)	< 200
Hip	Horizontal Beam Lateral	85kV + 85mAs with stationary grid	< 350
Hip	AP or Turned Lateral	Use AEC centre chamber or stationary grid 80kV (+ 25mAs)	< 100
SIJ	AP – 15 degrees cranial PA – 15 degrees caudal		

**3.1 Spine Examinations****3.2 Justification Guidelines: Cervical Spine**

<b>Clinical Problem</b>	<b>Investigation</b>	<b>Comments</b>
<b>Musculo-Skeletal System</b>		
Atlanto-Axial Subluxation (To identify congenital or structural abnormalities)	Lateral	
Atlanto-occipital Subluxation	Lateral	
Brachialgia	Refer to radiologist	MRI
Degenerative change/spondylosis	AP + Lateral	
Nerve Compression	Refer to radiologist	MRI
<b>Trauma</b>		
Suspected Ligamentous Injury	Flexion + Extension (movement undertaken by referrer)	Trauma referral only
Trauma	AP, Peg, Lateral – swimmers if C7/T1 is not visualised	
Unconscious Trauma	Refer to radiologist	CT
Foreign Body	Lateral or tangential Views (dependent on location)	
Neck Pain/Injury with Neurological Deficit	AP, Peg, Lateral - swimmers if C7/T1 is not visualised	CT If patient over 65 years of age

**3.3 Justification Guidelines: Thoracic Spine**

<b>Clinical Problem</b>	<b>Investigation</b>	<b>Comments</b>
<b>Musculo-Skeletal System</b>		
Degenerative change/spondylosis	AP + Lateral	
Osteoporotic Collapse	Lateral	
Spondyloarthropathies	AP + Lateral	
<b>Trauma</b>		
Trauma	AP + Lateral	
Trauma with neurological deficit	AP + Lateral	

**3.4 Justification Guidelines: Lumbar Spine**

28 day rule applies – 12 to 55 years

Clinical Problem	Investigation	Comments
<b>Musculo-Skeletal System</b>		
Acute Back Pain	Refer to radiologist	MRI
Degenerative change/spondylosis	AP + Lateral	
Osteoporotic Collapse	Lateral	
Spondyloarthropathies	AP + Lateral	
<b>Trauma</b>		
Trauma	AP + Lateral	
Trauma with neurological deficit	AP + Lateral	

**3.5 Spine Views and Exposure Guidelines**

Please refer to specific room settings

Examination	Views	Exposure	Expected Dose cGycm <sup>2</sup>
Cervical	AP	65kV + 5mAs (no grid)	< 20 (for all views)
	Peg	65kV + 5mAs (no grid)	
	Lateral	65kV + 12mAs (no grid)	
	Swimmers	Use AEC centre chamber or set exposure 85- 90kV (+ 150-300mAs)	< 50
Thoracic	AP	Use AEC centre chamber or stationary grid 80kV (+ 30mAs)	< 100 (for both views)
	Lateral	Use AEC centre chamber or stationary grid 80kV (+ 40- 50mAs)	

Lumbar	AP	Use AEC centre chamber or stationary grid 90kV (+ 40 mAs)	< 300 (for both views)
	Lateral	Use AEC centre chamber or stationary grid 95kV(+50mAs)	

### 3.6 Justification Guidelines: Facial Bone Examinations

Clinical Problem	Investigation	Comments
<b>Trauma</b>		
• Blunt Injury	OM +OM 30	
• Middle Third of Face	OM +OM 30	
• Mandibular Trauma	OPG + PA Mandible	
• Dislocation	OPG + PA Mandible	
• Subluxation of TMJ	OPG	
• Foreign Body	Tangential Views	
• Orbits	Orbit Views	
<b>ENT/Head and Neck</b>		
Abscess	OPG	
Dental Reasons	OPG	
Impacted 8'S	OPG	
<b>Other</b>		
Pre-Op valve replacement ? tooth decay	OPG	

### 3.7 Facial Bone Views and Exposure Guidelines

Please refer to specific room settings

Examination	Views	Exposure	Expected Dose cGycm <sup>2</sup>
Facial Bones	OM	Use AEC centre chamber or skull unit 85kV (+ 12mAs)	< 20

	OM 30	Use AEC centre chamber or skull unit 85kV (+ 16mAs)	< 20
Mandible	OPG	65kV + 12mA + 8sec	
	PA	Use AEC centre chamber or skull unit 75kV (+ 12mAs)	< 15
	Obliques	Use AEC centre chamber or skull unit 80KV (+ 16mAs)	< 20

### 3.8 Justification Guidelines: Skull Examinations

Clinical Problem	Investigation	Comments
Trauma		
Foreign Body	Tangential View	
Trauma	Refer to radiologist	CT

### 3.9 Skull Views and Exposure Guidelines

Examination	Views	Exposure	Expected Dose cGycm <sup>2</sup>
Foreign Body	Tangential View	60 KV and 2mAs	>2

**4. PAEDIATRICS****4.1 Justification Guidelines: Abdomen Examinations**

28 day rule applies 12 years +

<b>Clinical Problem</b>	<b>Investigation</b>	<b>Comments</b>
<b>Gastrointestinal System</b>		
Abdominal Pain	Supine	
Constipation	Supine	Requested by Paed. Specialist
Distention	Supine	
GI bleeding (If necrotising enterocolitis or intussusception is suspected)	Supine	
Paediatric Transit Study (Image taken on day 5 post ingestion of pellets)	Supine	See local protocol in Children's Radiology Dept.
Obstruction	Supine	
Perforation	Supine AXR and Erect AP/PA Chest Neonatal = decubitus abdomen	Show abdomen X-ray first to radiologist.
Position of epidural Baclofen pump	Supine AXR and lateral thoraco-lumbar spine is requested	Pump sits in iliac fossa with lead entering spinal canal.
<b>Urological, Adrenal and Genitourinary Systems</b>		
Renal Stones	Ultrasound and Supine Abdomen if requested by radiologist  Larger children for CTKUB	Ultrasound first  Discuss with Paed radiologist if unsure
Stent Position	Supine	
<b>Trauma</b>		
Ingested Foreign Body which is Sharp, >1 magnet, or Battery	Supine Abdomen and PA/AP Chest	

## **4.2 Justification Guidelines: Chest Examinations**

In addition to those stipulated in the adult section

Please refer to local protocol (protocol folder) for guidance for when to do AP/PA/Sitting/Standing in accordance with age of patient

<b>Clinical Problem</b>	<b>Investigation</b>	<b>Comments</b>
<b>Chest and Cardiovascular System</b>		
Acute Chest Infection	PA/AP	
Cystic Fibrosis	PA/AP and lateral	Annual Review Abdominal U/S also required
Perforation	PA/AP Erect AP/PA Erect Chest Neonatal = decubitus abdomen	
PH Probe Position	PA/AP <b>Lateral only if requested by Mr Grant</b>	Mr Grant's request = Lateral only
PICC Line Insertion	PA/AP - to include appropriate arm if brachial insertion	
Post Pace-Maker Insertion	PA/AP Views as requested by cardiologist	May not always require a lateral view
Pulmonary Metastases	PA/AP and Lateral	
<b>Trauma</b>		
Inhaled Foreign Body	PA/AP to include neck	
Foreign Body (Radio-opaque only)	AP + Lateral (affected area only)	
Ingested Foreign Body (Radio-opaque only)	PA/AP (Abdomen not needed)	
Ingested Foreign Body which is Sharp, >1 magnet, or Battery	PA/AP and Supine Abdomen	

### 4.3 Justification Guidelines: Lower and Upper Limb Examinations

Clinical Problem	Investigation	Comments
<b>Musculo-Skeletal System</b>		
Bone Age	Left Hand and Lt Wrist DP	Must include complete hand /wrist and thumb - to include tips of phalanges and soft tissues - fingers just not touching, not spread out.
Rickets	DP/AP 1 joint only	Even if both have been requested
Bone Pain (including ?Osgood Schlatter's Disease on referral)	AP and Lateral of Affected Bone	Looking for bone tumour or infection
Referrals from Plastics Clinic	Views as requested by operating team	
<b>Trauma</b>		
Trauma	AP and Lateral of Affected Area	
? FB (other than inhaled or ingested) Radio-opaque only	AP and Lateral of affected area using marker to indicate site/wound	<ul style="list-style-type: none"> <li>• See chest for inhaled or ingested</li> <li>• Remove dressings</li> </ul>
Foreign Body ? bony involvement (Radio-opaque only)	AP and Lateral view of <b>Object</b>	

### 4.4 Justification Guidelines: Pelvis and Hip Examinations

28 day rule applies 12 years +

Clinical Problem	Investigation	Comments
<b>Musculo-Skeletal System</b>		
DDH (Developmental Dysplasia of Hips)	AP pelvis	
Change of Plaster (Hip Spica) – for treatment of DDH	AP Pelvis	<ul style="list-style-type: none"> <li>• Patient needs to go to plaster room to have plaster cut first.</li> </ul>

		<ul style="list-style-type: none"> <li>Remove top section and X-ray child whilst still in posterior section of cast.</li> <li>Child needs to be immobilised in cast for X-ray.</li> <li>Replace anterior section and bandage in place for transfer back to ward.</li> </ul>
Limping Child-request to X-ray whole leg	AP Pelvis and AP and lateral limb bones as directed by clinical team	Gonad protection not to be used on 1 <sup>st</sup> image but should be used on subsequent imaging.
Limping Child ?Irritable Hip	AP pelvis if requested by radiologist	U/S first
Perthes/Avascular necrosis	Frog Legs Lateral only	
SUFE (Slipped Upper Femoral Epiphysis) – Approx. age 10-16 yrs	Frog Legs Lateral only	
<b>Trauma</b>		
Trauma	AP pelvis and HBL lateral	

#### **4.5 Justification Guidelines: Spine Examinations**

28 day rule applies for L-Spine 12 years +

<b>Clinical Problem</b>	<b>Investigation</b>	<b>Comments</b>
<b>Musculo-Skeletal System</b>		
Post Scoliosis Repair	AP and Lateral Thoracic and Lumbar Spine Standing AP and Lateral views may be requested	Images must overlap and include whole T and L Spine Images may be requested whilst

		patient is sitting in their own wheel chair
Spinal vertebral Anomalies	AP and Lateral Lumbar/Sacral Spine	
Constipation with suspected underlying spinal cause	AP Lumbar/sacral Spine Review with Paed. Radiologist as a lateral may also be required	Vertebral anomaly may affect nerve supply to bowel hence causing constipation. Often can't see on AP due to constipation but this is view of choice.
Chronic Back Pain	Refer to Radiologist	
Spondylolisthesis	Lateral Lumbar/Sacral Spine and review with Paed. Radiologist	Often presents in sporty children
C-Spine Instability/Subluxation	As requested May need Flexion and Extension Views. A Lateral may suffice	<b>Must be performed in presence of referring clinician</b>
<b>Trauma</b>		
Trauma	AP and Lateral of Effected Area Peg view for C-spine injury	

#### **4.6 Justification Guidelines: Skull and Facial Bone Examinations**

<b>Clinical Problem</b>	<b>Investigation</b>	<b>Comments</b>
<b>Musculo-Skeletal System</b>		
Craniosynostosis (premature fusing of sutures)	AP, Townes and Lateral	With copper ruler on edge of image
Post Cranio-Facial Surgery. Frontal Advancement	Views as requested by cranio-facial team.	May ask for both laterals
<b>ENT/Head and Neck</b>		
Cochlear Implants	Coned AP	<ul style="list-style-type: none"> <li>Centre through EAMs</li> </ul>

		<ul style="list-style-type: none"> <li>• Only need to see position of leads in cochlea</li> <li>• No need to include the external component attached to head</li> <li>• Most patients have bilateral</li> </ul>
Post Nasal Space for enlarged adenoids	Lateral Face	Ideally with "Sniffing In" Collimate to avoid eyes
Shunt Insertion – to show position of Ventroperitoneal (VP)Shunt	VP Shunt Series: Lateral Skull to include neck PA/AP chest to include lower neck Supine Abdomen to include lung bases to symphysis pubis	VP shunt drains from ventricles in the brain into the peritoneum Treatment for hydrocephalus Important to get overlap of the images to ensure that there are no breaks in the shunt
<b>Trauma</b>		
Facial Trauma	OM and OM30°	If unsure speak to Consultant Paediatric
Head Trauma (18mths and under)	AP/PA and Lateral, (even if CT requested)	If unsure speak to Consultant Paediatric Radiologist

#### 4.7 Justification Guidelines: Skeletal Surveys

NAI		
Must be discussed with Paediatric Consultant Radiologist	<ul style="list-style-type: none"> <li>• Abdomen to include Pelvis</li> <li>• Chest to include all ribs</li> <li>• Oblique Ribs to include all ribs</li> <li>• Lateral C-spine</li> <li>• Lateral thoraco-lumbar Spine</li> <li>• Skull AP and Lateral – lateral to include mandible</li> </ul> <p>Separate AP views on both:</p> <ul style="list-style-type: none"> <li>• Feet</li> <li>• Femurs</li> <li>• Tib/Fib</li> <li>• Humeri</li> <li>• Rad/Ulna</li> <li>• Hands</li> </ul> <p>Additional views as directed by Consultant Paediatric Radiologist</p>	<p><b>Please see specific folder in Paediatric Hospital or Level One</b></p> <ul style="list-style-type: none"> <li>• For live children arrange a mutually convenient time with the patient's nurse and the radiologist</li> <li>• Make sure the patient has had a good feed and/or sleep and comes to the dept with a dummy if they have one</li> <li>• 2 people will be required to immobilise the patient. Ensure that neither are pregnant before they come to the dept</li> <li>• If parent is assisting please ensure they know why the examination is being carried out before arrival to the X-ray Dept</li> </ul>
General		
	As directed by radiologist	Protocol for each individual patient

**5.0 Paediatric Views and Exposure Guidelines****5.1 Computed Radiography (CR) Views and Exposure Guidelines****Please refer to specific room settings**

<b>Examinations</b>	<b>Views</b>	<b>Exposure</b>	<b>Expected Dose cGycm<sup>2</sup></b>
<b>Based on CR method</b>			
<b>Chest</b>			
Chest 0 - 6 months	Supine	60 – 63kV + 1 - 2mAs 180 FFD	1
Chest 6 months – 5 years	AP Sitting	65kV + 1.6 – 3.2mAs 180cm FFD	1-2
Chest 5 years +	AP/PA Standing	65-77KV + 2 – 3.2 180cm FFD	1-5
Lateral Chest < 5 years	Lateral Sitting or Standing	70KV + 3.2mAs 180cm FFD	3
Lateral Chest > 5 years	Lateral Sitting or Standing	73KV + 4- 5mAs 180cm FFD	5-8
<b>Abdomen/Pelvis</b>			
Abdomen or Pelvis Baby	Supine	60KV + 1-2 mAs 100cm FFD	1 -2
Abdomen or Pelvis 1- 10 years	Supine	No Grid 65kV -75KV + 2-10 mAs 100cm FFD	2-11
Abdomen or Pelvis 10 + years	Supine	Use AEC, both side chambers 75kV (+16- 25mAs with stationary grid) 100cm FFD	<150

<b>Spine</b>			
<b>C-Spine</b>			
	Lateral	65-70KV + 6mAs 180cm FFD	Whole series (no swimmers) <20
	AP	60KV + 4mAs 100cm FFD	
	Peg	60KV + 4mAs 100cm FFD	
	Swimmers	75-80KV + AEC centre chamber or manual exposure of 80-120mAs 110cm FFD	Whole series (with swimmers) < 150
<b>T-Spine</b>			
<10 years	Lateral	65-75KV 10-16mAs 180cm FFD (no Grid – use air gap)	Whole Series < 25
<10 years	AP	60-70KV + 6-10mAs (no grid)	
>10 years	Lateral	70-80KV AEC centre chamber 100cm FFD	Whole Series < 200
>10 years	AP	65-75KV + AEC centre chamber (10-16 mAs with stationary grid)	

<b>L-Spine</b>			
<10 years	Lateral	70-75KV + 14-18mAs 180cm FFD (no Grid – use air gap)	Whole Series < 30
<10 years	AP	65-75KV 10- 12mAs (no grid)	
>10 years	Lateral	75-85KV + AEC centre chamber 100cm FFD	Whole Series < 500
>10 years	AP	70-80KV + AEC centre chamber (18-25mAs with stationary grid)	
<b>Skull</b>			
<10 years	AP	60-70KV + 2.5-4mAs (no Grid)	Whole Series < 20
<10 years	Lateral	60-70KV + 2.5-4mAs (no Grid)	
>10 years	AP	70KV + AEC centre chamber (10-16mAs with Grid)	Whole Series < 80
>10 years	Lateral	65KV + AEC centre chamber (10mAs)	
<b>Facial Bones</b>			
<10 years	OM	60-70KV + 2.5-4mAs (no Grid)	Whole Series < 20

<10 years	OM 30°	60-70KV + 2.5-4mAs (no Grid)	
>10 years	OM	70KV + AEC centre chamber (10-16mAs with Grid)	Whole Series < 80
>10 years	OM 30°	70KV + AEC centre chamber (10-16mAs with Grid)	
<b>Upper and Lower Limbs</b>			
Hands	DP + Oblique (lateral if #'d MC)	50-55KV + 1mAs	<2
Fingers	DP, Lateral (45° Oblique for MCPJ)	50-55KV + 1mAs	<2
Thumb	AP + Lateral	50-55KV + 1mAs	<2
Feet	DP + Oblique	50-55KV + 1.6mAs	<2
Toes	DP + Oblique	50-55KV + 1mAs	<2
Long Bones + Joints (Humeri, tib/fib, radius/ulna, femora, elbow,)	AP + Lateral (Scaphoid does not appear till about 10 years of age)	55-60KV + 2mAs	<5
Shoulder (Trauma)	AP and review Axial/modified axial (Lateral for proximal humerus)	55-60KV + 2mAs	<5
Scapula (Trauma)	AP + Lateral	55-60KV + 2mAs	<5

Clavicle/ACJ (Trauma)	AP only	55-60KV + 2mAs	<5
<b>Skeletal Survey</b>			
As per individual protocol and using views and exposures above			<35 total for small baby

## 5.2 Digital Radiography (DR) Views and Exposure Guidelines

**Please refer to specific room settings**

<b>Based on DR (Children's Hospital)</b>			
<b>Chest</b>			
Chest 0 - 6months	Supine (through table)	60-63KV + 1-2mAs 120cm FFD	1
Chest 6 months – 5 years	AP Sitting	65KV + 2-3.2mAs (or AEC both side chambers) 180cm FFD	1-2
Chest 5 years +	AP/PA Standing	65-77KV Use AEC, both side chambers, 180cm FFD	1-5
Lateral Chest < 5 years	Lateral Sitting or Standing	70KV + 3.2 mAs 180cm FFD	3
Lateral Chest > 5 years	Lateral Sitting or Standing	73KV, Use AEC centre chamber 180cm FFD	5-8
<b>Abdomen/Pelvis</b>			
Abdomen or Pelvis Baby	Supine	60KV + AEC centre chamber 110cm FFD	1 -2

Abdomen or Pelvis 1- 10 years	Supine	No Grid 65kV-75KV + AEC both side chambers 110cm FFD	2-11
Abdomen or Pelvis 10 + years	Supine	Use AEC with Grid both side chambers 75kV 110cm FFD	<150
<b>Spine</b>			
<b>C-Spine</b>			
	Lateral	65-70KV + AEC centre chamber 180cm FFD	<10 for whole series
	AP	65-70KV +AEC centre chamber 110cm FFD	
<b>T-Spine</b>			
<10 years	Lateral	65-70KV AEC centre chamber 110cm FFD	<10 for whole series
<10 years	AP	65-70KV AEC centre chamber 110cm FFD	
>10 years	Lateral	65-70KV AEC centre chamber using Grid 110cm FFD	<30 for whole series
>10 years	AP	65-70KV AEC centre chamber 110cm FFD	

<b>L-Spine</b>			
<10 years	Lateral	65KV -75KV AEC centre chamber 110cm FFD	<20 for whole series
<10 years	AP	65-75KV AEC centre chamber 110FFD	
>10 years	Lateral	65KV -75KV AEC centre chamber with grid 110cm FFD	<150 for whole series
>10 years	AP	65-75KV AEC centre chamber 110FFD	
<b>Skull</b>			
<10 years	AP/PA	63-75KV AEC Centre chamber 110cm FFD	<15
<10 years	Lateral	63-75KV AEC Centre chamber 110cm FFD	<15
>10 years	AP/PA	63-75KV AEC Centre chamber with Grid 110cm FFD	<15
>10 years	Lateral	63-75KV AEC Centre chamber with Grid 110cm FFD	<15
<b>Facial Bones</b>			
<10 years	OM	63-75KV AEC Centre chamber	<15

		110cm FFD	
<10 years	OM 30°	63-75KV AEC Centre chamber 110cm FFD	<15
>10 years	OM	63-75KV AEC Centre chamber with Grid 110cm FFD	<15
>10 years	OM 30°	63-75KV AEC Centre chamber with Grid 110cm FFD	<15
Post nasal space	Lateral	63-75KV AEC Centre chamber 110cm FFD	<10
<b>Upper and Lower Limbs</b>			
Hands	DP + Oblique (lateral if #'d MC)	60KV + 1.25mAs directly onto detector 110cm FFD	<2
Fingers	DP, Lateral (45° Oblique for MCPJ)	60KV + 1.25mAs directly onto detector 110cm FFD	<2
Thumb	AP + Lateral	60KV + 1.25mAs directly onto detector 110cm FFD	<2
Feet	DP + Oblique	60KV + 1.25mAs directly onto detector 110cm FFD	<2

Toes	DP + Oblique	60KV + 1.25mAs directly onto detector 110cm FFD	<2
Long Bones + Joints (Humeri, tib/fib, radius/ulna, femora, elbow,)	AP + Lateral (Scaphoid does not appear till about 10 years of age)	60KV + AEC Centre Chamber 110cm FFD	<5
Shoulder (Trauma)	AP and review Axial/modified axial (Lateral for proximal humerus)	60KV + AEC Centre Chamber 110cm FFD	<5
Scapula (Trauma)	AP + Lateral	60KV + AEC Centre Chamber 110cm FFD	<5
Clavicle/ACJ (Trauma)	AP only	60KV + AEC Centre Chamber 110cm FFD	<5
<b>Skeletal Survey</b>			
As per individual protocol and using views and exposures above		Directly onto detector where possible	<35 total for small baby