**Appendix 1**

**Summary of Study Recommendations**

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| **Domain / Process** | **Area** | **Recommended requirement** | **Measurement** | **Rationale** |
| 1. Personnel
 | Staff Experience | * 5-years experience
* 6-month certificate
 | * Documentation of training and experience
* Assessment of some images
 | Radiographs require a high level of technical skill and knowledge. Experienced operators produce more reliably high quality films than those with no experience or supervision |
| Radiation Exposure | Use of radiation monitoring badges | Availability and regular use of radiation monitoring badges | Ensures safe level of radiation exposure for staff |
| 1. Infrastructure
 | Indoor climate | * 15°C - 28°C
* 80% humidity
 | Use of thermostat and regular monitoring of temperature and humidity | Assists in protection of solid-state circuits used for X-ray production |
| X-ray examination rooms | * Minimum area 18m2
* Ceiling height minimum 2.5m
* Level floor
* Unobstructed view of patient
* Oxygen and suction
* Gloves and gowns
 | Physical measurement of dimensions | * Allows appropriate access for patients
* Allows for full angulation of X-ray arm swivel
* Allows appropriate movement of X-ray unit
* Provides appropriate care to patients and reduces risk of infection
 |
| Darkroom | * Lightproof
* Minimum area 6m2 or 8m2 with a darkroom attendant
* Ceiling height minimum 3m
 | * Light leakage test (Part C – Quality Control)
* Physical measurement of dimensions
 | * Allows unprocessed films to be loaded and unloaded into cassettes without fogging
* Allows for adequate space for the processor, consumables and to achieve the required work
 |
| Viewing room / office | * Minimum area 10m2
* Entrance not through X-ray examination room
 | Physical measurement of dimensions | * Allows for adequate working space for administrative and image-viewing duties
* Prevents the X-ray examination room from being used as a thoroughfare
 |
| Consumable storage | * Viewing room or office is suitable
* As per manufacturer guidelines
 | Site assessment | Appropriate storage avoids damage to consumables and ensures their function is optimized |
| Power supply | * Constant and reliable
* Sufficient back-up supply
* Symmetrical 3-phase mains
 | Document of electrical specifications and testing history | A reliable power supply is essential to the function of the X-ray unit and associated image processing units |
| 1. Equipment
 | X-ray | * Stationary X-ray unit is the primary unit
* 12-pulse, high frequency generator
* Efficient mobile or stationary back-up X-ray unit
 | * Equipment acquisition documentation
* Manufacturer manuals
* Maintenance (Part C – Quality Control)
 | * The equipment specifications are the minimum required to ensure efficient image acquisition
* The generator should enable shorter exposure times and high voltages, which are required in paediatric imaging
 |
| Processing | * Minimum processor is an automatic processor
* Computed or digital radiography preferred but not essential
 | * Equipment acquisition documentation
* Manufacturer manuals
* Maintenance (Part C – Quality Assurance)
 | * For the most optimal image quality, image processing is as important as image acquisition
* Inferior processing methods are too unreliable
 |
| Servicing and maintenance | * Annual servicing by qualified personnel
* Other maintenance as per Part C – Quality Control
 | * Documented service records
* Documented maintenance procedures
 | * Regular equipment servicing and maintenance maintains the quality of imaging
 |
| 1. Identification and image labelling
 | Patient identification | * Clinical procedure is followed
 | Documentation of patient identification | All patients should be properly identified prior to imaging to ensure that the correct patient and study match the required imaging |
| Image annotations | * Patient ID
* Date of examination
* Side marker
* Acquisition method
 | Image assessment by staff and readers | Annotations provide information about the patient so that they can be easily identified and how the image was acquired so that it be easily reproduced |
| 1. Chest X-ray Imaging recommendations
 | Patient positioning | * AP chest
* Erect if facility performs this daily
* Otherwise supine
* Patient appropriately immobilized
 | Image assessment by staff and readers | Appropriately positioned patients will ensure efficient reading of images can occur |
| Technical factors | * Double emulsion film with 3-5μm crystal size
* 200-400 speed intensifying screens
* 2.5mmAl inherent filtration
* No anti-scatter grid
* No automatic exposure control
* High kV
* Low exposure time
* 125cm SID
* X-ray beam angled 10° caudal
* X-ray beam collimated to area of interest
 | * Site assessment
* Image assessment
* Documentation of standard technical factors
 | * Film and screen types maximise the receptor’s efficiency for chest imaging
* Filtration removes the lower energy radiation that would be absorbed by the patient
* Anti-scatter grids require an unnecessary increase in radiation exposure for chest imaging
* Automatic exposure control devices are too unreliable for patients of this size
* High kV settings result in lower skin dose to the patient
* Low exposure times minimize the risk of movement artefact
* SID allows appropriate restriction on heart magnification without the need for an increased exposure
* Beam angle ensures that the chest is displayed in the appropriate AP position
* Collimation restricts the X-beam, thereby optimizing the dose to the patient and maximizing the image quality
 |
| Other requirements | * Remove unnecessary artefacts
* Acquire image on inspiration
 | Image assessment | * Artefacts obscure parts of the image, decreasing the image’s diagnostic value
* Images acquired in full inspiration allow for adequate assessment of lung fields
 |
| The final image | * Appropriately positioned
* Adequate image quality
* Artefacts removed
* Correct annotations
 | Image critique and assessment feedback form | The quality of the image forms the basis of the study. A high quality image will result in a higher reliability of study results  |
| 1. Image archiving
 | Image storage | * Hard copy images digitized
* Stored in digital format
* PACS preferred but not essential
 | Site assessment | All images are required to be in digital format for epidemiological studies, which will prevent problems associated with the potential loss of hard-copy images |
| Digitizing and transporting images  | * Minimal loss of image quality
* Maximum compression ratio is 50:1
* Transferred as DICOM or JPEG images
* Similar sized images
* Images identified from study ID requirements only
 | Assessment of images by study readers | * Digitized images that accurately represent the original image will ensure higher reliability of assessment
* Similar sized images from a single site indicates no issues in transferral process
* Images need to be identified by researchers without patients being able to be identified
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