

## WHO Chest Radiography in Epidemiological Studies

### Remote Survey of Potential Radiology Site

#### Introduction

The use of plain radiographs as an imaging modality for epidemiological studies involving pediatric patients is popular as it is the most common method of evaluating the chest (1). Whilst plain radiography is the world's most readily available imaging modality, there is a significant lack of adequate access to reliable and safe radiology services, particularly in the developing world (1-3). The two main reasons for this are the limited resources, such as finance, technical support and trained professionals, and the lack of appropriate device procurement and planning (2).

The radiographic quality of the chest radiograph is directly proportional to the confidence in the interpretation of features related to pathological processes. For example, whilst an image of adequate quality allows for confident interpretation of endpoint pneumonia and other infiltrates, a suboptimal image will not allow confident interpretation of other infiltrates and an uninterpretable image will not allow for interpretation of either endpoint pneumonia or other infiltrates (4). The reliability of an epidemiological study involving chest radiographs will therefore be increased with high quality images. This necessitates the importance for radiology facilities to have adequate equipment and technical standards prior to study data collection.

RAD-AID is an international organization with a primary objective to improve radiology services in developing countries. The group has developed an approach titled "Radiology Readiness™", which assesses existing radiology infrastructure in addition to other processes directly affecting service delivery, thereby providing for effective planning of improvement to the service (5). This assessment is through a 16-part survey aimed at evaluating all aspects of infrastructure within a facility, with the options of tailoring the survey to suit individual needs (2).

Similarly, the survey below outlines all the necessary requirements when assessing a facility for suitability in an epidemiological study. The survey will both evaluate how operational a facility is to produce images of appropriate quality and provide an assessment for estimating the necessary funding to appropriately equip the facility. A technical review series report is the Needs Assessment for Medical Devices, published by the World Health Organization in 2001 (6). The report outlines how a country's ministry of health can calculate gaps in access to medical device technology with a purpose to assist countries to catalog their inventory with what is available (6,7). This allows the country to define their gap in care while considering their financial, human resource and infrastructure constraints (7).

Using the Radiology Readiness™ approach, it is recommended that the following actions are implemented in addition to the survey to ensure that each facility is capable of producing high quality images from the beginning (2). Firstly, identify a local partner that is to be the liaison and primary collaborator and contact all important stakeholders, including local and national government health, as well as any radiological societies. Secondly, prior to conducting the evaluation, project members are encouraged to learn about the local culture, economy, politics, and healthcare system. It may be necessary to obtain this information from selected members of the local and national health agencies (2).

**Site:**

**Date:**

**Purpose**

This survey outlines the relevant parameters, capabilities and current processes of potential radiology departments to undertake paediatric epidemiological studies. It should provide information on the radiological needs and key areas of improvement in order to be ready to participate in a study. The objective of image acquisition for the studies is that they are consistently of high quality, easily readable, and appropriately archived. Assessment of safe radiation practices to the patients, their guardians and clinical staff is also a major objective.

**Directions**

Please fill out this survey to the best of your ability. Where possible, please attach photographs when asked. **Please also include 50 examples of chest radiographic images from your site.** If you have multiple X-ray units, please fill out section 4 for each unit. If you have multiple image processing machines, please fill out section 6 for each machine.

**1. GENERAL INFORMATION AND ADDRESS OF SITE:**

Name:

Address:

District:

Code:

Name of radiologist in charge (if any):

Name of technologist in charge:

## 2. PERSONNEL

<p>Who is responsible for the acquisition of images within the department?</p>	<p>Radiographers / Technologists <input type="checkbox"/></p> <p>Radiologists <input type="checkbox"/></p> <p>Other <input type="checkbox"/></p> <p><b>Please specify:</b></p>
<p>What qualifications do those acquiring the image have?</p>	<p>Bachelor Degree in Medical Radiation <input type="checkbox"/></p> <p>Diploma in Medical Radiation <input type="checkbox"/></p> <p>Certificate in Medical Radiation <input type="checkbox"/></p> <p>Other <input type="checkbox"/></p> <p><b>Please specify:</b></p>
<p>Do those who are acquiring the image have specific training in paediatric imaging?</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>
<p>Does the department have a continuing professional development (CPD) education program in place?</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p> <p><b>If yes, please provide details of the program as well as any attendance records</b></p>
<p>Please indicate which areas the department staff have been trained in:</p>	<p>First Aid (including CPR) <input type="checkbox"/></p> <p>Emergency Evacuation <input type="checkbox"/></p> <p>Avoidance of radiation <input type="checkbox"/></p> <p>Handling infectious substances <input type="checkbox"/></p>
<p>Who holds the responsibility for patient and staff radiation safety?</p>	<p>Radiation safety officer (RSO) <input type="checkbox"/></p> <p>Radiographers / Technologists <input type="checkbox"/></p> <p>Radiologists <input type="checkbox"/></p>

	Other .... <input type="checkbox"/> <b>Please specify:</b>
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### 3. FACILITY INFORMATION:

#### 3.1 Facility Specifications

Which of the following items does the facility possess? (please tick all that apply)	Fire extinguishers <input type="checkbox"/> Emergency alarm buttons <input type="checkbox"/> Emergency first aid kit or crash trolley <input type="checkbox"/> Eye wash facilities <input type="checkbox"/> Oxygen and suction equipment <input type="checkbox"/>
How often is the emergency equipment inspected?	Never <input type="checkbox"/> Every day <input type="checkbox"/> Every week <input type="checkbox"/> Every month <input type="checkbox"/> Every 6 months <input type="checkbox"/> Every year <input type="checkbox"/>
Are all emergency exits clearly marked in local languages and scripts and kept free from obstructions?	Yes <input type="checkbox"/> No <input type="checkbox"/>
Does the facility have a formal system for recording accidents?	Yes <input type="checkbox"/> No <input type="checkbox"/>

**Please provide a floor plan of the department**

### 3.2 X-ray rooms

How many x-ray rooms are used for imaging paediatric patients?	1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5 <input type="checkbox"/>
What is the size of the X-ray rooms that will be used for paediatric imaging?	Length (m):
	Breadth (m):
	Height (m):
What are the walls of the room made of?	Brick <input type="checkbox"/> Concrete <input type="checkbox"/> Stone <input type="checkbox"/> Wood Panels <input type="checkbox"/> Iron sheets <input type="checkbox"/>
What is the floor of the room made of?	Cement <input type="checkbox"/> Cement tiles <input type="checkbox"/> Wood <input type="checkbox"/> Other <input type="checkbox"/> <b>Please specify:</b>
Is there an air-conditioner in each of the rooms?	Yes <input type="checkbox"/> No <input type="checkbox"/>
Does the access to each of the x-ray rooms cater for patients in beds and wheelchairs in addition to ambulant patients?	Yes <input type="checkbox"/> No <input type="checkbox"/>
Do each of the x-ray rooms provide infection control equipment, such as gloves, gowns and masks?	Yes <input type="checkbox"/> No <input type="checkbox"/>
Is the x-ray console (including exposure switches) for each x-ray generator located behind radiation proof barriers?	Yes <input type="checkbox"/> No <input type="checkbox"/>
If yes, do the radiation proof barriers allow an unobstructed and continual observation of the patient during exposure?	Yes <input type="checkbox"/> No <input type="checkbox"/>
Do each of the x-ray rooms have an oxygen	Yes <input type="checkbox"/>

and suction supply?	No <input type="checkbox"/>
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**Please provide photographs of all x-ray rooms**

### 3.3 Reporting / Image reading room

Is there a reporting or image reading room?	Yes <input type="checkbox"/>	
	No <input type="checkbox"/>	
What is the size of the reading room that will be used for paediatric imaging?	Length (m):	
	Breadth (m):	
Are the following reading facilities available?	Viewing box	Yes <input type="checkbox"/>
		No <input type="checkbox"/>
	Bright light	Yes <input type="checkbox"/>
		No <input type="checkbox"/>
	Computer monitor	Yes <input type="checkbox"/>
		No <input type="checkbox"/>
If there is a viewing box, are the viewing panels evenly illuminated and all of equal intensity?	Yes <input type="checkbox"/>	
	No <input type="checkbox"/>	
What is the source of ambient illumination in the reading room?	Fluorescent light	<input type="checkbox"/>
	Normal sunlight	<input type="checkbox"/>
	Light bulb	<input type="checkbox"/>
	Other (please specify)	<input type="checkbox"/>
Is there an air-conditioner in the reading room?	Yes <input type="checkbox"/>	
	No <input type="checkbox"/>	

**Please provide photographs of the image reading room**

#### 4. X-RAY EQUIPMENT SPECIFICATIONS

Are the x-ray units fixed or portable?	Fixed <input type="checkbox"/> Portable <input type="checkbox"/> Some fixed, some portable <input type="checkbox"/>
What is the manufacturer and model of each of the x-ray units? (e.g. Toshiba / Siemens / Shimadzu / Philips / GE etc)	Manufacturer: Model:
What year were the x-ray units installed?	
What is the capacity of the x-ray units?	kV mAs
What is the minimum exposure time for the x-ray units?	Less than 1ms <input type="checkbox"/> 1-2ms <input type="checkbox"/> More than 2ms <input type="checkbox"/>
Do the x-ray units use an automatic exposure control (AEC)?	Yes <input type="checkbox"/> No <input type="checkbox"/>
If yes, can the AEC be disabled to allow for manual exposure settings?	Yes <input type="checkbox"/> No <input type="checkbox"/>
Do the x-ray units contain an uninterrupted power supply (UPS)?	Yes <input type="checkbox"/> No <input type="checkbox"/>
If no, is there a reliable backup of power?	Yes <input type="checkbox"/> No <input type="checkbox"/>

<p>Are there any known voltage or frequency issues with the power supply?</p>	<p>Yes <input type="checkbox"/></p> <p><b>Please specify:</b></p> <p>No <input type="checkbox"/></p>
<p>What is the x-ray generator type?</p>	<p>High frequency / Converter <input type="checkbox"/></p> <p>Other (please specify) <input type="checkbox"/></p>
<p>How often are the x-ray units serviced?</p>	<p>Never <input type="checkbox"/></p> <p>Every 6 months <input type="checkbox"/></p> <p>Every 12 months <input type="checkbox"/></p> <p>Every 2-3 years <input type="checkbox"/></p> <p>Greater than 3 years <input type="checkbox"/></p>
<p>Are records kept of the service history?</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>
<p>Who services the x-ray units?</p>	<p>Manufacturer engineer <input type="checkbox"/></p> <p>Manufacturer affiliate engineer <input type="checkbox"/></p> <p>Other engineer <input type="checkbox"/></p>
<p>What is the usual location of the service engineers?</p>	<p>In the same city <input type="checkbox"/></p> <p>In the same country, but not city <input type="checkbox"/></p> <p>In another country <input type="checkbox"/></p>
<p>Are the x-ray units compliance tested by a radiation protection agency?</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>
<p>If yes, how often are the x-ray units compliance tested?</p>	<p>Every 6 months <input type="checkbox"/></p> <p>Every 12 months <input type="checkbox"/></p> <p>Every 2-3 years <input type="checkbox"/></p> <p>Greater than 3 years <input type="checkbox"/></p>
<p>Do the x-ray units have adjustable, working collimator leaves?</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>



Is there any filtration of the x-ray beam?	Yes <input type="checkbox"/> No <input type="checkbox"/>
If yes, what is the material and thickness of the filtration?	Material:  Thickness:
Are there removable anti-scatter grids?	Yes <input type="checkbox"/> No <input type="checkbox"/>
Can the x-ray units be rotated to image patients in both the supine and upright positions?	Yes <input type="checkbox"/> No <input type="checkbox"/>
If no, in which position are the patients imaged?	Upright <input type="checkbox"/> Supine <input type="checkbox"/>
Is the x-ray tube able to be angled independently from the image receptor?	Yes <input type="checkbox"/> No <input type="checkbox"/>
Is the distance between the x-ray tube and the image receptor able to be adjusted?	Yes <input type="checkbox"/> No <input type="checkbox"/>
In the event that the x-ray unit malfunctions and is unusable, is there a fully functional back-up x-ray unit (either fixed or portable)?	Yes <input type="checkbox"/> <b>If yes, please fill out section 4 for the back-up unit</b> No <input type="checkbox"/>
Do the x-ray units contain a dose-area product (DAP) meter for measuring patient doses?	Yes <input type="checkbox"/> No <input type="checkbox"/>

**Please provide photographs of all x-ray machines**

## 5. IMAGE ACQUISITION:

What is the method of chest x-ray image acquisition?	Still image (plain x-ray) <input type="checkbox"/> Fluoroscopic screening (with / without image 'grab') <input type="checkbox"/>	
How are patients identified at the beginning of examinations? (Check all that apply)	Name <input type="checkbox"/> Address <input type="checkbox"/> Date of birth <input type="checkbox"/> Hospital identification number <input type="checkbox"/> Patients are not identified <input type="checkbox"/>  <b>Please provide records of patient identification</b>	
During acquisition for chest x-rays on patients under 5-years, are the following technical features employed?	Automatic exposure control (AEC)	Yes <input type="checkbox"/> No <input type="checkbox"/>
	Anti-scatter grid	Yes <input type="checkbox"/> No <input type="checkbox"/>
	X-ray beam collimation	Yes <input type="checkbox"/> No <input type="checkbox"/>
	Additional beam filtration	Yes <input type="checkbox"/> <b>Please specify material and how much:</b>  No <input type="checkbox"/>
How are patients less than 5-years immobilized for their chest x-ray?	By the parent <input type="checkbox"/> By a staff member <input type="checkbox"/> By an immobilization device <input type="checkbox"/> By an immobilization device and a parent <input type="checkbox"/> By an immobilization device and a staff member <input type="checkbox"/> Other ..... <input type="checkbox"/> <b>Please specify:</b>	

Are there immobilization devices available for use when required?	Yes <input type="checkbox"/> <b>Please specify:</b>  No <input type="checkbox"/>
Is there an exposure technique chart available for the imaging staff?	Yes <input type="checkbox"/> No <input type="checkbox"/>
How are the X-ray images acquired in the department?	Film Processing <input type="checkbox"/> <b>Go to Section 6</b>
	Computed Radiography <input type="checkbox"/> <b>Go to Section 7</b>
	Digital Radiography <input type="checkbox"/> <b>Go to Section 8</b>

## 6. FILM PROCESSING

### 6.1 Dark room / Image processing room

What is the size of the processing room / dark room that will be used for image processing?	Length (m):
	Breadth (m):
	Height (m):
Is there an air-conditioner in the processing room?	Yes <input type="checkbox"/> No <input type="checkbox"/>
Does the room have an exhaust fan?	Yes <input type="checkbox"/> No <input type="checkbox"/>
Does the room have safety lights that can be in use when loading and unloading the cassettes with film?	Yes <input type="checkbox"/> No <input type="checkbox"/>
Is there a cabinet or 'hopper' for storage of unexposed films?	Yes <input type="checkbox"/> No <input type="checkbox"/>
Is there a working image name labeler?	Yes <input type="checkbox"/>

	No <input type="checkbox"/>
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**Please provide photographs of the image processing room**

## 6.2 Film Processor Description

What is the method of film processing currently used?	Manual (tanks) <input type="checkbox"/> Automatic darkroom <input type="checkbox"/> Automatic daylight <input type="checkbox"/>
What is the manufacturer and model of the film processor?	Manufacturer:  Model:
What year was the processor installed in your department?	
What is the capacity of the processor (in litres)?	
What is the film cycle time (in seconds)?	
How often is the processor(s) serviced?	Never <input type="checkbox"/> Every 6 months <input type="checkbox"/> Every 12 months <input type="checkbox"/> Every 2-3 years <input type="checkbox"/> Greater than 3 years <input type="checkbox"/>
Who services the processor?	Manufacturer engineer <input type="checkbox"/> Manufacturer affiliate engineer <input type="checkbox"/> Other engineer <input type="checkbox"/>
What is the usual location of the service engineers?	In the same city <input type="checkbox"/> In the same country, but not city <input type="checkbox"/> In another country <input type="checkbox"/>
Are there any current issues with the image processor?	None <input type="checkbox"/> Some minor issues <input type="checkbox"/> Major issues <input type="checkbox"/>

Please indicate any problems that have been encountered	

### 6.3 Dark room processing components:

Do you employ a darkroom technologist?	Yes <input type="checkbox"/>	
	No <input type="checkbox"/>	
Indicate the number of cassettes available for chest imaging	Size 24 x 30cm	
	Size 35 x 35cm	
	Size 35 x 43cm	
What is the manufacturer for the cassette screens?		
What are the speeds of the cassette screens in use for chest x-rays on patients less than 5-years?	100	<input type="checkbox"/>
	200	<input type="checkbox"/>
	250	<input type="checkbox"/>
	320	<input type="checkbox"/>
	400	<input type="checkbox"/>
	800	<input type="checkbox"/>
How often are the cassette screens cleaned and checked for artefacts?	Never	<input type="checkbox"/>
	Once a week	<input type="checkbox"/>
	Once a month	<input type="checkbox"/>
	Once every 6 months	<input type="checkbox"/>
	Once a year	<input type="checkbox"/>
	Greater than once a year	<input type="checkbox"/>
How often are the optical densities of fog and film base checked?	Weekly	<input type="checkbox"/>
	Monthly	<input type="checkbox"/>
	Yearly	<input type="checkbox"/>

	Never <input type="checkbox"/>
If checked, are the optical densities consistently below $D=0.25$ ?	Yes <input type="checkbox"/> No <input type="checkbox"/>
What are the amounts of chemicals currently in store?	Fixer Litres: Expiry date:
	Developer Litres: Expiry date:
Where are the chemicals currently stored?	Darkroom <input type="checkbox"/> X-ray room <input type="checkbox"/> Other <input type="checkbox"/> <b>Please specify:</b>

#### 6.4 Digital conversion of images

Does the site have access to a digital scanner for film images?	Yes <input type="checkbox"/> No <input type="checkbox"/>
If yes, what is the manufacturer and model of the scanner?	Manufacturer: Model:
How many films can be scanned per day?	
What format are the images stored and sent in?	JPG <input type="checkbox"/> PNG <input type="checkbox"/> GIF <input type="checkbox"/> TIFF <input type="checkbox"/>

	RAW <input type="checkbox"/> BMP <input type="checkbox"/> DICOM <input type="checkbox"/>
Are image file sizes compressed during digitization or transfer?	Yes <input type="checkbox"/> No <input type="checkbox"/>

**Please provide photographs of any digital scanners**

## 7. COMPUTED RADIOGRAPHY (CR)

### 7.1 Equipment Description

What is the manufacturer and model of the CR system?	Manufacturer:  Model:
What year was the CR system installed in your department?	
Does the CR system have specific paediatric image algorithms?	Yes <input type="checkbox"/> No <input type="checkbox"/>
Does the CR system have appropriate post-processing capabilities?	Yes <input type="checkbox"/> No <input type="checkbox"/>
How often is the processor(s) serviced?	Never <input type="checkbox"/> Every 6 months <input type="checkbox"/> Every 12 months <input type="checkbox"/> Every 2-3 years <input type="checkbox"/> Greater than 3 years <input type="checkbox"/>
Who services the processor(s)?	Manufacturer engineer <input type="checkbox"/> Manufacturer affiliate engineer <input type="checkbox"/>

	Other engineer <input type="checkbox"/>
What is the usual location of the service engineers?	In the same city <input type="checkbox"/> In the same country, but not city <input type="checkbox"/> In another country <input type="checkbox"/>
Indicate the number of image receptors available for chest imaging	Size 24 x 30cm Size 35 x 35cm Size 35 x 43cm
How often are the image receptor screens cleaned and checked for artefacts?	Never <input type="checkbox"/> Once a week <input type="checkbox"/> Once a month <input type="checkbox"/> Once every 6 months <input type="checkbox"/> Once a year <input type="checkbox"/> Greater than once a year <input type="checkbox"/>

**Please provide photographs of all CR processors**

## 8. DIGITAL RADIOGRAPHY (DR)

### 8.1 Equipment Description

What is the manufacturer and model of the DR system?	Manufacturer: Model:
What year was the DR system installed in your department?	
Is the DR system wired or wireless?	Wired <input type="checkbox"/> Wireless <input type="checkbox"/>
Does the DR system have specific paediatric image algorithms?	Yes <input type="checkbox"/> No <input type="checkbox"/>
Does the DR system have appropriate post-processing capabilities?	Yes <input type="checkbox"/> No <input type="checkbox"/>



Who services the DR system?	Manufacturer engineer <input type="checkbox"/> Manufacturer affiliate engineer <input type="checkbox"/> Other engineer <input type="checkbox"/>
What is the usual location of the service engineers?	In the same city <input type="checkbox"/> In the same country, but not city <input type="checkbox"/> In another country <input type="checkbox"/>
Indicate the number of image receptors available for chest imaging	Size 24 x 30cm Size 35 x 35cm Size 35 x 43cm
What is the detector matrix for the detectors?	

## 9. IMAGE ARCHIVING

Are all images stored in a single location?	Yes <input type="checkbox"/> No <input type="checkbox"/>
Is there adequate space (either physical space or computer memory space) for image storage?	Yes <input type="checkbox"/> No <input type="checkbox"/>
Are images printed onto a hard copy (e.g. film)?	Yes <input type="checkbox"/> No <input type="checkbox"/>
What are the modes of image storage? (Check all that apply)	Films <input type="checkbox"/> CD-ROM / USB <input type="checkbox"/> DICOM / PACS <input type="checkbox"/> Digital scanned image <input type="checkbox"/>

<p>How are the images archived?</p>	<p>By name <input type="checkbox"/></p> <p>By image number <input type="checkbox"/></p> <p>By date <input type="checkbox"/></p> <p>Other ..... <input type="checkbox"/></p> <p><b>Please specify:</b></p>
<p>What format are the digital images stored and sent in?</p>	<p>JPG <input type="checkbox"/></p> <p>PNG <input type="checkbox"/></p> <p>GIF <input type="checkbox"/></p> <p>TIFF <input type="checkbox"/></p> <p>RAW <input type="checkbox"/></p> <p>BMP <input type="checkbox"/></p> <p>DICOM <input type="checkbox"/></p>
<p>Are images compressed for storage?</p>	<p>Yes <input type="checkbox"/></p> <p>If yes, please indicate the compression type and ratio:</p>    <p>No <input type="checkbox"/></p>
<p>What information technology (IT) support is available to assist in resolving issues with image archiving?</p>	<p>On-site support <input type="checkbox"/></p> <p>Support from within your city <input type="checkbox"/></p> <p>Support from within your country but not city <input type="checkbox"/></p>

**10. RADIATION PROTECTION AND MONITORING**

## 10.1 Safety signage

Are there visible signs warning visitors to the department that some rooms use radiation?	Yes <input type="checkbox"/> No <input type="checkbox"/>
Are there radiation warning lights in each room to indicate when an exposure is taking place?	Yes <input type="checkbox"/> No <input type="checkbox"/>
Are there signs to indicate that entry to the imaging area is limited to authorized personnel?	Yes <input type="checkbox"/> No <input type="checkbox"/>
Are there pregnancy warning notices displayed for parents?	Yes <input type="checkbox"/> No <input type="checkbox"/>
If yes, are they available in a range of languages and scripts relevant to the population of the region?	Yes <input type="checkbox"/> No <input type="checkbox"/>

## 10.2 Radiation safety equipment

Are there lead gowns available for assistants who are holding the patients for imaging?	Yes <input type="checkbox"/> No <input type="checkbox"/>
If yes, are they large enough for the local population?	Yes <input type="checkbox"/> No <input type="checkbox"/>
What is the thickness of the lead / lead equivalence gowns?	Less than 0.25mm <input type="checkbox"/> 0.25mm <input type="checkbox"/> 0.5mm <input type="checkbox"/> More than 0.5mm <input type="checkbox"/>
How often are the lead gowns used by assistants?	Never <input type="checkbox"/> For some patients <input type="checkbox"/> For most patients <input type="checkbox"/> For all patients <input type="checkbox"/>

<p>How often are the lead gowns assessed for faults?</p>	<p>Never <input type="checkbox"/></p> <p>Once every 6 months <input type="checkbox"/></p> <p>Once a year <input type="checkbox"/></p> <p>Greater than once a year <input type="checkbox"/></p> <p><b>Please provide records of lead assessment</b></p>
<p>Do the operators wear radiation-monitoring badges?</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>
<p>If yes, is there a radiation protection agency that regularly assesses the monitoring badges?</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p>
<p>How often are these badges assessed for operator radiation dose?</p>	<p>Never <input type="checkbox"/></p> <p>Once every 6 months <input type="checkbox"/></p> <p>Once a year <input type="checkbox"/></p> <p>Greater than once a year <input type="checkbox"/></p> <p><b>Please provide a sample of operator radiation dose records</b></p>

### 10.3 Patient Doses

<p>Are patient doses routinely measured and recorded?</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p> <p><b>If yes, please provide a sample of patient dose measurements</b></p>
<p>Are national or international dose reference levels (DRL) routinely used to benchmark the radiation exposures?</p>	<p>Yes <input type="checkbox"/></p> <p>No <input type="checkbox"/></p> <p><b>If yes, please indicate which country's DRLs are used</b></p>

## 11. QUALITY ASSURANCE

## 11.1 Quality Control (QC) systems

Does the department have a QC system in place?	Yes <input type="checkbox"/> No <input type="checkbox"/>
Does the department have a QC test protocol manual?	Yes <input type="checkbox"/> No <input type="checkbox"/>
<b>Please complete the details of the current QC tests that are performed in your department in Appendix 1</b>	
List any QC tools that you have in your department	
List any regular audits that take place in your department	

## 11.2 Image evaluation

Are there specific criteria for image critique that is followed to determine if an image is diagnostic?	Yes <input type="checkbox"/> No <input type="checkbox"/> <b>If yes, please provide an example</b>
Are repeat images acquired if an image is deemed unacceptable or non-diagnostic?	Yes <input type="checkbox"/> No <input type="checkbox"/>
Does the department have an established reject analysis system in place?	Yes <input type="checkbox"/> No <input type="checkbox"/>
If yes, are written reports generated as a	Yes <input type="checkbox"/>

result of the reject analysis?	No <input type="checkbox"/> <b>If yes, please provide an example</b>
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## 12. Other Information

Is there a continuous water supply?	Yes <input type="checkbox"/> No <input type="checkbox"/>
Is the water a clean supply?	Yes <input type="checkbox"/> No <input type="checkbox"/>
If no, is there an alternate source of water?	Yes <input type="checkbox"/> No <input type="checkbox"/>
Is there reliable internet service available?	Yes <input type="checkbox"/> No <input type="checkbox"/>



## References

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7. Shah N (2014) Access to Imaging Technology in the Developing World. In Mollura DJ, Lungren MP (ed) *Radiology in Global Health: Strategies, Implementation and Applications*, Springer, p 13-18