

# Radiology and Medical Imaging Standard

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## 1. Standard Scope and Purpose

**1.1 Scope:** This standard applies to all DoH licensed healthcare facilities and professionals providing radiology and medical imaging services in the Emirate of Abu Dhabi.

**1.2 Purpose:** This standard establishes and ensures healthcare facilities meet the minimum requirements for the provision of radiological imaging services in aims of delivering the highest levels of safety and quality of care to patients in the Emirate of Abu Dhabi.

This Standard should be read in conjunction with related UAE laws, DoH standards, policies and circulars (general and related to Radiology and Medical Imaging), FANR regulations, CBRNE, National Emergency Crises and Disaster Management Authority (NCEMA) standards and policies, DoH manuals, licensing regulations and reporting requirements, Healthcare Sector Disciplinary Regulations and all other relevant legislations.

All healthcare facilities using ionizing radiation in diagnostic medical imaging are subject to the Federal Authority for Nuclear Regulations (FANR) and this standard is not intended to replace but aid in meeting these regulations.

## 2. Abbreviations and Definitions

No.	Term / Abbreviation	
2.1	AI	Artificial Intelligence
2.2	ALARA	As Low As Reasonably Achievable
2.3	CT	Computed Tomography
2.4	CBRNE	Chemical, Biological, Radiological, Nuclear and Explosive Events
2.5	DICOM	Digital Imaging and Communications in Medicine
2.6	DoH	Department of Health Abu Dhabi
2.7	DRL	Diagnostic Reference Level
2.8	FANR	Federal Authority for Nuclear Regulation
2.9	MOHAP	Ministry of Health and Prevention
2.10	MRI	Magnetic Resonance Imaging
2.11	PACS	Picture Archiving and Communication System
2.12	PET	Positron Emission Tomography
2.13	PET-CT	Positron Emission Tomography - Computed Tomography
2.14	PM	Preventive Maintenance
2.15	PQR	Professional Qualification Requirement
2.16	QA	Quality Assurance
2.17	QC	Quality Control
2.18	SPECT	Single Photon Emission Computed Tomography
2.19	TE	Time to Echo
2.20	TR	Repetition Time

No.	Term	Definition
2.21	Addendum	The additions or corrections to the imaging report after approval of the original report.
2.22	Artificial Intelligence	The mimicking of human thought and cognitive processes to solve complex problems automatically. It includes the subfields of machine learning and deep learning.
2.23	Computed Radiology	Employing special plate technology, scanning and computer processing to produce a digital image of the patient's organ or body part.
2.24	Computed Tomography	<p>An imaging modality where ionizing radiation is used to produce axial body sectional images. Data obtained by the X-ray transmission through the patient is then computer analyzed to produce these images. The series of sectional - planar images may be manipulated to produce different planar or volumetric views of the area of interest and eliminate overlying structures such as bone.</p> <p>Manipulation of data allows for a selective view of either dense tissues such as bones or diffuse tissues such as the heart, brain, or lungs.</p>
2.25	Contrast Media	Using a substance to enhance the contrast of structures or fluids within the body in medical imaging.
2.26	Conventional Radiography (General Radiology)	The imaging of the skull, chest, abdomen, spine, and extremities produced by the basic radiographic process.
2.27	Digital Radiography	Capturing or converting radiographic images in digital format.
2.28	Federal Authority for Nuclear Regulation (FANR)	The federal authority in the UAE regulating nuclear and radiation related issues which includes the medical use of ionizing radiation. All healthcare facilities utilizing ionizing radiation in the UAE shall be licensed by FANR and abide by their regulations.
2.29	Fluoroscopy	A medical imaging technique which is used to produce real time motion images in either an instantaneous or a stored fashion.
2.30	Interventional Radiology	A clinical subspecialty where medical imaging is used to guide minimally invasive surgical procedures that diagnose, treat, and cure several medical conditions. Imaging modalities used include fluoroscopy, MRI, CT, and ultrasound.

<b>2.31</b>	Magnetic Resonance Imaging	An imaging modality that uses strong magnetic fields and radio waves to produce detailed images of the organs and tissues of the body.
<b>2.32</b>	Mammography	The use of ionizing X-ray imaging for breast examinations for screening and diagnostic purposes.
<b>2.33</b>	Medical Physics	A branch of applied physics, pursued by medical physicists, that uses physics principles, methods, and techniques in healthcare practices for the prevention, diagnosis, and treatment of diseases.
<b>2.34</b>	Nuclear Medicine	A branch of medicine that utilizes unsealed radioactive substances in the diagnosis and treatment of disease e.g., SPECT and PET.
<b>2.35</b>	People of Determination	UAE National Policy for Empowering People with Special Needs or Disabilities will be referred to as 'People of Determination' to recognize their achievements in different fields.
<b>2.36</b>	Picture Archiving and Communication System	A computer network where there is digital capture, transfer, and storage of diagnostic images. A PACS system consists of workstations for interpretation, image-producing modalities, a web server for distribution, printers for file records, image servers for information transfer and holding and an archive of off-line information.
<b>2.37</b>	Positron Emission Tomography	An imaging technique that produces a three-dimensional image of functional processes in the body based on the positron emitting agents utilized. Three dimensional images of the tracer are reconstructed by computer analysis.
<b>2.38</b>	Quality Assurance	Includes quality control techniques and quality administration procedures and is the planned and systematic actions that provide adequate confidence that a diagnostic facility will produce consistently images of acceptable quality for the intended diagnostic purposes.  QA includes all activities (planned, systemic, practice-based) that demonstrate the level of quality achieved by the output of a process.
<b>2.39</b>	Quality Control	The techniques used for the periodic evaluation of medical equipment and associated protocols to use the equipment and perform appropriately justified and optimized medical imaging ensuring its optimal performance with adequate diagnostic results. Generally, QC works on the input to a process to ensure that important elements or parameters specific to the process are correct.

2.40	Referral Guidelines	Evidence-based guidelines used in assisting the referring physician in choosing the most appropriate diagnostic imaging modality for a specific clinical condition. Also termed 'Appropriateness Criteria in Radiology'.
2.41	Sentinel Event	An unanticipated adverse event or 'Near Miss' event in a healthcare setting resulting in death or serious physical or psychological injury to a patient or patients, not arising from the natural course of the patient's illness.
2.42	Tele-radiology	The transmission of digitized medical images by secure electronic networks for the purpose of interpretation of the transmitted images for diagnostic, treatment, educational and research purposes.
2.43	Ultrasound	An imaging modality where high frequency sound waves are utilized to determine the size and shape of internal organs based on the different rates of reflection. In addition, images may be in real time to reveal motion and can include coloration of vascular blood flow.

### 3. Standard Requirements and Specifications

#### 3.1 Healthcare Facilities Registration and Licensing Requirements

##### 3.1.1. Compliance with the general radiology and medical imaging requirements for DoH licensing and FANR-REG-24 and FANR-REG-29.

3.1.2. The radiology and medical imaging service must be licensed by the Department of Health Abu Dhabi and comply with the health regulatory procedures available on the DoH website.

3.1.3. The radiology and medical imaging service must be licensed by the Federal Authority for Nuclear Regulation to use ionizing radiation in medical imaging, ionizing radiation generators and radioactive materials. [www.fanr.gov.ae/en/services/licensing](http://www.fanr.gov.ae/en/services/licensing)

3.1.4. The healthcare facility must meet the requirements of FANR-REG-24 to ensure protection from ionizing radiation for the public, healthcare staff and patients in accordance with FANR-REG-24 and FANR-REG-007 and act accordingly.

The healthcare facility must monitor its own compliance and maintain an action plan to address any non-conformities.

## **3.2 Healthcare Professional Licensing**

### **3.2.1. The healthcare facility complies with the DoH PQR licensing requirements of healthcare professionals providing radiology and medical imaging services.**

3.2.1.1 Healthcare Professionals must be licensed to practice and must maintain their competencies and satisfy DoH requirements for continuing medical education and professional development including regular training on radiation safety.

3.2.1.2 Healthcare Professionals must comply with the DoH Standard for Clinical Privileging and Scope of Practice and must limit their practice to the skills, competencies and privileges granted within the healthcare facility and in accordance with their job description.

### **3.2.2. The radiology and medical imaging service has documented procedures and an appropriate number of competent healthcare professionals to provide the imaging services.**

3.2.2.1 The healthcare facility must have a competency framework in place for all healthcare professionals working in the radiology and medical imaging service and staff are supervised until they have attained the competency level set.

3.2.2.2 The healthcare facility must employ or have access to a qualified and licensed medical physicist with appropriate specialization in diagnostic imaging. The Medical Physicist is involved in radiation protection and optimization of medical exposure in all radiological practices including dosimetry and quality assurance and leads the requirements to meet DoH and FANR regulations.

3.2.2.3 The healthcare facility must ensure continuous access to FANR-approved service providers in radiation safety in accordance with FANR-REG-30 to ensure following regular and reasonably foreseeable irregular operating conditions which include:

3.2.2.3.1 Fitness of radiation generators and radioactive material for medical use.

3.2.2.3.2 Planning of facility's floor layout with regards to clinical use of ionizing radiation sources as well as the development and maintenance of associated safety assessments according to FANR-REG-29, and the protection and safety program according to FANR-REG-24.

3.2.2.3.3 Regular evaluation of ionizing radiation occupational exposure levels of healthcare professionals, public and patients.

3.2.2.4 The healthcare facility must have documented internal procedures and protocols for all imaging examinations undertaken.

3.2.2.5 Medical images interpretation and reporting must be done by a DoH-licensed radiologist. Name and signature of the dictating radiologist must be in the report or otherwise specified.

3.2.2.6 Each report contains the demographics of the patient, clinical data, description of the examination and if contrast media was given, image findings, conclusion, and follow-up recommendations if applicable. The final report is to be checked for typographic errors or deletes before authentication.

3.2.2.7 An addendum may be added to a finalized report if it does not contradict the original report findings and if so, the referring physician must be notified immediately, and the physician's name documented in the addendum. Preliminary reports may be given with limited information for immediate patient management in emergency settings.

3.2.2.8 For self-referred patients the diagnostic imaging result must be communicated to the patient and follow up arranged if required.

3.2.2.9 All sonographic examinations must be undertaken by clinicians with training and experience in the specific area of sonography.

Sonographers can perform the examination but cannot issue a final report on the image interpretation.

3.2.2.10 Non-radiologist DoH-licensed specialist/consultant physicians may perform ultrasound in their field of specialty provided they have received the required training and granted privileges.

However, only a DoH-licensed radiologist is authorized to issue written radiology reports. For imaging findings that might lead to intervention or surgery the report must be signed by a DoH-licensed radiologist.

### **3.3 Healthcare Facility Design Requirements**

3.3.1 Radiology and Medical Imaging services must be provided in hospitals and stand-alone radio-diagnostic centers and may be provided in outpatient settings such as polyclinics, medical centers, dental clinics and mobile health units.

The healthcare facility must display visible signage at its entrance which includes the type of services provided and the working hours.

3.3.2 Applications of medical imaging can utilize ionizing and non-ionizing radiation.

Medical imaging using ionizing radiation includes:

- General Radiography (Film, Digital Radiography and Computed Radiology)
- Portable Radiography in selected circumstances.
- Bone Densitometry (DEXA scan)
- Mammography

- Dental Radiography
- Fluoroscopy (Diagnostic and Interventional including Cath lab, Interventional radiology and lithotripsy)
- Computed Tomography
- Nuclear Medicine (Diagnostic and Therapeutic)
- Radiotherapy (Internal Radiation Therapy and External Beam Radiation)

Non-ionizing medical imaging includes:

- Ultrasonography
- Magnetic Resonance Imaging

- 3.3.3 Interventional radiology services for neurovascular and endovascular interventions under general or local anesthesia must only be provided in hospital settings with intensive care unit services. A Biplane angiography machine for neuro-interventional procedures and monoplane angiography/ C-arm machines for other vascular and non-vascular interventions must be installed in radiology suites and/or in a hybrid Operation Theatre. Equipment necessary for anesthesia care and emergency setting requirements must be readily available for the management of any complications related to the procedure (e.g., pneumothorax post-lung biopsy) in line with standard OT requirements.
- 3.3.4 For Stand-Alone Diagnostic Centers at least one full-time specialist/consultant radiologist, one full-time radiographer and registered nurse with contrast administration competency training and emergency care training and requirements must be present.
- 3.3.5 For outpatient settings where general radiography and ultrasound services are provided at least one DoH licensed full-time or part-time specialist/consultant radiologist and one full-time radiographer must be present.
- If CT/MRI services are provided at least one full-time DoH licensed specialist/consultant radiologist, one full-time radiographer with training in CT/MRI and a registered nurse with contrast administration competency and emergency care training and requirements must be present.
- 3.3.6 The healthcare facility's radiology and medical imaging service design must be in accordance with the DoH Healthcare Facilities Guidelines Part B (Medical Imaging and Nuclear Medicine) and FANR Guidelines.

### **3.4 Safety and Radiation Protection**

#### **3.4.1 The radiology and medical imaging service ensures the provision of a safe and effective service.**

3.4.1.1 The radiology and medical imaging service must have a documented operational policy and procedures which outlines the core services provided including a documented service plan for all medical imaging examinations, including the following:

- Radiation safety manual including radiation safety of pregnant staff and comforters. Recommendations: Pregnant staff must not remain in the examination room during the scan and may opt out of all scan room work during the first trimester.  
Radiation safety procedures for comforters attending with patients who are unable to undergo the examination on their own to be included in the manual. The manual must be developed to comply with FANR-REG-30 requirements using support from approved service providers in radiation safety.
- Current Techniques Chart for all medical imaging examinations.
- Procedures for the recording and reporting of imaging results including the mechanism of reporting critical findings and the time frame for reporting examinations and adding an addendum to reports.
- Policies and procedures on excluding pregnancy prior to medical imaging, imaging of pregnant women in exceptional cases and imaging of the abdomen of women of childbearing age and breast-feeding women.
- Procedure for the assessment and justification of referrals for medical imaging.
- Policy on patient informed consent, patient privacy and confidentiality and patient education.
- Procedures for patient identification (at least two identifiers e.g., name, ID, date of birth), matching patient with correct study and correct anatomical part - Correct procedure correct site protocols and mismatch event reporting and investigation.
- Patient assessment, admission and discharge including emergencies, critical findings, referrals and transfers as well as patient hand-over communications in their corresponding specialties. (medical/surgical)
- Medication management policy.
- Contrast Media policy. Single-use injection devices.
- Fall prevention program and identification of patients with higher risk of falls.
- Infection control and prevention including hand hygiene.
- Laundry and housekeeping.

- Hazardous material management.
- Hazard vulnerability analysis.
- Material safety data sheets.
- Medical waste management.
- Safe disposal of radioactive waste policy and registry.
- Fire Safety.
- Disaster Management and Emergency plans.
- Policy on incident reporting including sentinel events.
- Policy for the use of the medical imaging service's information technology systems.
- Procedure for the retention and destruction of patient records and radiological images.
- Procedure to check the accuracy and calibration of instrumentation used for the measurement of radiation and radioactive sources.
- Terms of reference of the radiation protection committee and Quality Improvement Plan.

3.4.1.2 The healthcare facility must have a posted documentation of the patients' rights and responsibilities in both Arabic and English languages.

3.4.1.3 The radiology and medical imaging service must have a currently updated and routinely reviewed documented service plan including for emergency settings.

**3.4.2 The radiology and medical imaging services are managed to protect staff, patients and visitors from harm arising from the use of ionizing radiation in accordance with DoH and FANR requirements.**

3.4.2.1 The radiology and medical imaging service must have a medical radiation protection committee and a designated radiation protection officer with training in radiation safety associated with medical use of ionizing radiation in imaging and with documented terms of reference.

Radiation Protection training must be provided to all healthcare professionals using ionizing radiation including other specialties such as Orthopedics, Urology, Cardiology and Operations Theatre Personnel.

3.4.2.2 The radiology and medical imaging service must have designated controlled and supervised areas where ionizing radiation is used with local rules set for each area. Both controlled and supervised areas must be clearly signposted.

3.4.2.3 The radiology and medical imaging service must have a quality assurance program with quality control arrangements for all equipment in the radiology and medical imaging service. Records must be maintained for all inspections and calibrations.

There must be periodic revision of the imaging protocols. Calibration certificates must be retained.

3.4.2.4 All rooms and equipment must be assessed periodically for quality and safety by a licensed medical physicist.

3.4.2.5 Conduction of periodic checks on the accuracy and calibration of instrumentation used for the measurement of radiation and radioactive sources must be completed and documented.

3.4.2.6 Imaging examinations undertaken in areas other than the radiology and medical imaging department such as in operating theatres (C-arm / Biplane machine) and inpatient wards (mobile x-ray, ultrasound) should be included in the procedures document and images must be uploaded and stored in PACS and reported by a DoH-licensed radiologist. Radiation protection must meet FANR requirements.

3.4.2.7 All staff working with radiological equipment or radiation sources must wear dosimeters that are routinely assessed within intervals observing FANR-7, and values documented. Lead shields such as lead aprons and thyroid shields must be available and must have routinely documented quality controls.

3.4.2.8 Documentation of patient radiation dosages received during a procedure is mandatory and periodic audits must be done.

A comparison of typical doses received against the national or international diagnostic reference levels (DRLs) should be made and if exceeded the incident must be reported and corrective measures must be undertaken.

3.4.2.9 All requests for medical imaging must contain adequate clinical data from the referring physician and must be justifiable in accordance with the set of national or international referral guidelines and be approved by the radiologist.

Healthcare facilities are to consider implementing a vetting system by the radiologist for all CT and MRI examinations requests. Moreover, it is essential to keep detailed referral records of the imaging protocols used for retrospective assessment of the radiation dose received by patients.

The radiologist sets the imaging protocols (e.g., contrast phases) for each examination. Image acquisition must not be performed prior to radiologist's approval.

3.4.2.10 The radiology and medical imaging service procedure documentation must include a section on the imaging of pregnant or breastfeeding women and imaging of the abdomen of women of childbearing age.

The procedure also includes imaging by non-ionizing modalities, e.g. magnetic resonance imaging (MRI).

3.4.2.11 There must be poster signage warning pregnant women on the dangers of radiation to the fetus in the department in both Arabic and English languages.

**3.4.3 Procedures for undertaking safe magnetic resonance imaging (MRI):**

3.4.3.1 The healthcare facility must have a designated MRI safety officer with training in MRI safety. MR safety training must be provided to all staff entering the MRI designated areas.

3.4.3.2 The MRI scanner must be located in a controlled area and must have clearly designated MR safety zones.

3.4.3.3 The MRI scanner room must have 'low oxygen' warning alarms.

External vent pipes from the scanner must be regularly inspected and maintained.

3.4.3.4 The healthcare facility must keep an updated list of all MR safe equipment such as MR safe wheelchairs and fire extinguishers. Ancillary equipment kept in the MRI unit must be clearly labelled as MR safe.

3.4.3.5 The healthcare facility must have a documented procedure and risk screening form for assessing the ability of patients to undertake an MRI examination to identify patients with active and non-active implantable medical devices such as but not limited to:

Cardiac pacemakers or implants, artificial cardiac valves and stents, neurostimulators or deep brain stimulators, cochlear implants and hearing aids, intracranial aneurysm clips, surgical clips or staples, foreign bodies, intra-ocular, shrapnel, electrodes or wires, implanted drug pumps, IV access ports or shunts, spinal fixation devices, tattoos, others.

3.4.3.6 A wall-mounted ferromagnetic detecting system must be installed to screen patients prior to MRI examinations.

3.4.3.7 A changing room for patients undergoing MRI examinations must provide lockers for safe holding of patient's belongings. Gowns provided by the facility must not have pockets.

3.4.3.8 The healthcare facility must have a documented procedure and risk assessment screening forms for the use of gadolinium-based contrast media.

**3.4.4 Patients attending the radiology and medical imaging service shall be treated with dignity and respect upholding patients' rights and care.**

3.4.4.1 The healthcare facility must provide facilities for patients to wait comfortably which includes:

- A range of seating to allow patients with mobility problems and people of determination easy accessibility.

- Space for wheelchairs.
- Cubicles for trolleys to allow privacy.
- Good access to washrooms.
- Areas allowing privacy for patients to change into gowns.

3.4.4.2 The healthcare facility staff must treat patients attending the service with dignity and respect with awareness of cultural beliefs.

3.4.4.3 The healthcare facility must have a documented process for informed consent with a clear explanation of the procedure including the possible side effects and risks. There must be a documented list of all procedures that require patient consent.

There must be documented and stored evidence of the informed consent forms in accordance with the healthcare facility's policy on informed consent.

3.4.4.4 The healthcare facility must have documented evidence of patient identification by at least two identifiers prior to starting the medical imaging examination in accordance with the healthcare facility's policy and procedures documents.

3.4.4.5 The healthcare facility must have a written policy and procedures on the safe use of contrast media including handling and storage.

Records must be kept of all contrast media administered, including patient's name, contrast media batch number, quantity and concentration, method of administration and name of the staff administering the agent.

Screening for high-risk patients must be done prior to each examination requiring contrast administration such as but not limited to:

- Bronchial Asthma, allergies including previous contrast allergy, previous exposure to Contrast Media, Diabetes Mellitus, kidney disease, heart disease, thyroid disease, Multiple Myeloma, hypercoagulable states, medication such as Metformin, medical or implanted devices, bleeding disorders, pregnancy, and breast feeding.

A crash cart containing resuscitation equipment, medication and the provision of central oxygen or an oxygen cylinder must be available in the department. Staff must be qualified and certified in cardiopulmonary resuscitation.

Adverse reactions to contrast media require incident report documentation. Sentinel events require reporting within three days to DoH and drafting a root cause analysis and an action plan within 45 days.

3.4.4.6 The healthcare facility must have a written policy and procedures for the use of conscious sedation and anesthesia during a medical imaging examination which is only to be done in hospital settings and must comply with standard OT requirements.

The policy specifies the provision of anesthesia care by a DoH-licensed specialist/ consultant anesthesiologist, age of the patients, the drugs (including nitrous oxide) and routes used, monitoring process, anesthesia equipment including resuscitation and emergency settings, staff competency, patient assessment, and the pre- and post-sedation instructions.

If services are being offered for children and young patients under the age of 16 years, there must be staff with specialized pediatric anesthetic and resuscitation skills available.

3.4.4.7 The healthcare facility must provide pamphlets with information written in both Arabic and English languages for patients informing them about the imaging examination and the preparations that may be needed and includes any post procedure instructions.

### **3.5 Diagnostic Image Quality**

#### **3.5.1 The radiology and medical imaging service follows national and international standards of Diagnostic Reference Levels (DRLs) and ALARA principles in medical image acquisition.**

**3.5.1.1** The radiology and medical imaging service must document the amount of radiation exposure for every patient undergoing a medical imaging examination using ionizing radiation with adjustments of parameters when required for achieving optimization and by selecting equipment and imaging techniques for procedures sufficient to provide the required clinical information.

**3.5.1.2** Each radiological image must contain the patient's demographic information including the name of the patient, date of birth, age, gender, MRN identification number, date and time of the image acquisition and healthcare facility.

**3.5.1.3** Depending on the type of imaging scan there must be the following documentation:

For sectional imaging the patient's orientation must be in normal anatomic position.

The image view should show the superior anatomy on the top. The patient's right side should be on the viewer's left side.

- Acquisition Matrix
- Number of Image and Sequence
- Slice level and Slice Thickness
- Phase of Contrast if contrast was given (Arterial, Porto venous, Delayed)
- Field of View (FOV) covering all the view of the concerned organ
- Image Projection and Side (Lateral/Oblique/Right / Left)
- If any special maneuvers were used during the examination

- For CT scan the voltage in Kilo Volt (kV) and electricity in milli Amperes (mA)
- Dose Length Product (DLP), Computed Tomography Dose Index (CTDI)
- For MRI the Time to Echo (TE) and Repetition Time (TR) values

3.5.1.4 The radiology and medical imaging service must perform routine audits on the diagnostic image quality and imaging protocols.

### **3.6 Equipment Management and Quality Assurance**

#### **3.6.1 The radiology and medical imaging service routinely maintains their equipment and information technology systems.**

3.6.1.1 All medical imaging equipment must be installed and operated in accordance with the manufacturer's instructions and specifications. A copy of the operator safety manual must be kept. Equipment inventory must contain the name of the item, manufacturer, and serial number.

3.6.1.2 The radiology and medical imaging service must have planned preventative maintenance and replacement programs for all available equipment. All equipment must be tagged mentioning the test date, due date, inventory number and safety checks.

3.6.1.3 The quality assurance program must include routine and periodic quality control testing of equipment including annual testing and inspection by an authorized service provider approved by FANR / licensed medical physicist in accordance with FANR-REG-30 guidelines. In addition to services provided at the initial installation or following major maintenance or repair before recommencing clinical use. Equipment not meeting the QA criteria must be rectified or taken out of service.

3.6.1.4 The quality assurance program must include the assessment of radiation doses the patients receive from different radiological examinations and the quality of the resulting images, ensuring adherence to the ALARA principles.

3.6.1.5 The radiology and medical imaging service must have an internal policy illustrating the use of the imaging service's information technology systems (Picture Archiving and Communication System) which is aligned with the facility's information technology governance, risk management and patient confidentiality.

The policy must include the procedure for the retention and destruction of radiological images whether digital or hard copies.

All patient data must be stored in UAE in accordance with the federal laws on the use of information and communication technology.

3.6.1.6 The healthcare facility must have a secure storage area for general medical and emergency supplies, for patient records, hard copy images and calibration equipment.

### **3.7 Interventional Radiology**

#### **3.7.1 The radiology and medical imaging service has documented procedures for undertaking safe interventional imaging.**

3.7.1.1 The interventional radiology service must have a documented internal policy and procedures on the core services provided.

3.7.1.2 All Interventional imaging procedures must be performed in a room that is equipped with cardiac monitoring, resuscitation equipment and sterile infection control measures in accordance with standard OT requirements.

A post-procedure recovery room must be available.

3.7.1.3 All interventional procedures must be undertaken by a DoH-licensed specialist/consultant interventional radiologist with specific training on the procedure.

For other specialties performing interventional procedures such as in Cardiology (Cath lab) and Urology the procedures must be undertaken by a specialist/consultant DoH licensed physician in their corresponding specialties in accordance with their scope of practice and granted privileges.

3.7.1.4 The interventional radiology service must have a documented procedure for evaluation and justification of the selection of interventional imaging techniques for every patient in preference to more invasive procedures.

3.7.1.5 The interventional radiology service must have documented procedures for the preparation of patients undergoing an interventional imaging procedure.

3.7.1.6 Special attention is given to risk factors such as allergic predispositions to contrast media, local anesthetics, antibiotics and radiation risk exposure must be documented in the consent form.

3.7.1.7 The interventional imaging service must document a Surgical Safety Checklist when undertaking interventional procedures and follow the Correct procedure correct Site protocols in accordance with standard OT requirements.

3.7.1.8 The interventional imaging service must have a documented procedure for handling biological specimens (biopsy) taken during an interventional procedure.

3.7.1.9 Post-procedure care instructions must be provided to the patient in Arabic and English Languages in accordance with the healthcare facility's policy.

3.9.1.10 The interventional radiology service must have a documented procedure detailing how to notify and investigate instances of high radiation skin doses resulting from interventional procedures and cardiac catheterizations, along with a plan for subsequent follow-up.

### **3.8 Dental Radiography**

#### **3.8.1 Dental radiographic imaging includes:**

- Intra-oral radiography (peri-apical, bitewing and occlusal views).
- Panorama OPG, Cephalometry.
- Cone- Beam Computed Tomography (CBCT), Others.

#### **3.8.2 The operator must be trained in dental radiation protection and in operating the machines.**

#### **3.8.3 Dental imaging examinations must be justifiable, selecting the most appropriate imaging modality with optimization of the radiological techniques in image acquisition and in using film or electronic image processing techniques.**

#### **3.8.4 Intra-oral imaging equipment must not be used for other general radiological imaging.**

#### **3.8.5 The healthcare facility must maintain records of all dental radiographic images.**

### **3.9 Teleradiology and Outsourcing of Medical Imaging Services.**

#### **3.9.1 Teleradiology.**

##### **3.9.1.1 Healthcare facilities opting to utilize teleradiology must comply with the DoH Standard on Tele-Medicine and complete the licensing requirements.**

##### **3.9.1.2 Teleradiology services must not compensate for any radiologist's shortage or absence from the healthcare facility. Teleradiology transmitting sites must have a full-time licensed radiologist and radiographer and have IT certified personnel who are responsible for the technological infrastructure.**

The radiologist is responsible for the selection of the images that will be transmitted.

##### **3.9.1.3 The teleradiology receiving site must employ a licensed radiologist in UAE for reporting the diagnostic medical images. The radiologist must be trained in providing teleradiology services.**

##### **3.9.1.4 Documentation of all types and specifications of the transmission elements must be done by the transmitting site.**

##### **3.9.1.5 There must not be any diagnostic loss in images during the transmission and the digital data received must have no loss of clinically significant information and should contain the patient demographics, image labeling, site information and measurement data without any significant errors and must have error checking capabilities.**

##### **3.9.1.6 Basic categories of teleradiology equipment guidelines include:**

**For small matrix size** images from CT, MRI, ultrasound, nuclear medicine, digital fluorography, and digital angiography. The transmitted data must provide a minimum of 512 x 512 matrix size with a minimum of 8-bit pixel depth for any processing with no significant

loss of matrix size or bit depth at display.

**For large matrix size** images from digital radiography and digitized radiographic films. The images must be digitized to a matrix size equal to 2.5 lp/mm or larger which is measured in the original detector plane and be digitized to a minimum 10-pixel byte depth.

- 3.9.1.7 **For direct image acquisition:** DICOM standard should be used with all data sets including the image matrix and pixel byte depth obtained by a digital modality transferred to the teleradiology system.

**For secondary image capture:**

**Small matrix images:** Each image must be digitized to a matrix size equal to or greater than the original image by the imaging modality with images digitized to a minimum of 8 bits pixel depth.

Film digitization or video frame grab systems with the above specifications are also acceptable.

**Large matrix images:** Images must be digitized to a matrix size of 2.5 lp/mm or greater measured in the original detector plane and to a minimum of 10 bits pixel depth.

- 3.9.1.8 Image Annotations must include the patients name, MRN or ID number, date and time of examination, name of the facility of acquisition, the type of examination, the anatomic orientation (right, left, superior, inferior) and a short patient medical history.
- 3.9.1.9 Size and method of compression of the provided data using reversible or irreversible techniques must be under the supervision of a qualified radiologist ensuring satisfactory image quality.
- The radiologist at the receiving site must have access to uncompressed and lossless images as necessary.
- 3.9.1.10 Quantifications of the personnel in both transmitting and receiving sides must be identical and must be documented.
- 3.9.1.11 The type and specifications of the transmission devices used, and the specification of the receiving site monitors used for the interpretation must meet the aims of teleradiology.

### **3.9.2 Outsourcing of Medical Imaging Services.**

- 3.9.2.1 Outsourcing of radiology and medical imaging services requires a contractual agreement between both parties. The service must provide image reports in a timely fashion and reports be accessible to patients in support of continuity of the patient care.
- 3.9.2.2 Image and report transfer using PACS or teleradiology must maintain the image quality and patient's confidentiality.
- 3.9.2.3 Records must be kept by both the initiating and the providing sites.

### **3.10 Artificial Intelligence.**

3.10.1 Healthcare facilities opting to use artificial intelligence in the course of providing medical imaging services must comply with the terms and requirements of the policy on the Use of Artificial Intelligence (AI) in the Healthcare Sector of the Emirate of Abu Dhabi.

AI applications must remain under the responsibility and supervision of a DOH-licensed radiologist and require continuous monitoring and training.

All patient data must be stored in the UAE as per federal laws concerning the Use of Information and Communication Technology in Health Fields.

## **4.Key stakeholder Roles and Responsibilities**

### **4.1. Department of Health:**

4.1.1. Ensure this Standard remains current with the latest advances in the knowledge and technology utilized in medical imaging.

4.1.2. Enforce the compliance of all concerned stakeholders with this Standard.

### **4.2. Healthcare Facilities:**

4.2.1. Ensure the availability of the necessary arrangements implied in this Standard.

4.2.2. Adopt an internal monitoring mechanism to ensure full compliance with this Standard.

4.2.3. Apply the latest reliable clinical guidelines relevant to the subject of this Standard.

4.2.4. Maintain healthcare professional's competency in the field of medical imaging.

4.2.5. Ensure clinically required training programs are accredited by the relevant Medical Education Authority.

### **4.3. Healthcare Professionals:**

4.3.1. Healthcare professionals offering radiology and medical imaging services must work within their scope of practice and granted privileges.

4.3.2. Continue to maintain the appropriate skills and knowledge to provide their services in accordance with relevant UAE laws and DOH regulations and standards.

## 5. Monitoring and Evaluation

A monitoring and evaluation framework is in place to evaluate the effectiveness, outcomes, and impact of this Standard, and where necessary adopt changes to ensure continuous improvement within the health system in line with emerging new developments in healthcare sciences, medical practices, and healthcare education and training.

## 6. Enforcement and Sanctions

Healthcare Providers must comply with the terms and requirements of this Standard, the DoH Standard Provider Contract and the DoH Data Standards and Procedures.

DoH may impose sanctions in relation to any breach of requirements under this Standard in accordance with the Healthcare Sector Disciplinary Regulations.

## 7. Relevant Reference Documents

No.	Reference Date	Reference Name	Relation Explanation / Coding / Publication Links
1		Federal Authority for Nuclear Regulation. Basic Safety Standards for Facilities and Activities involving Ionizing Radiation other than in Nuclear Facilities. (FANR-REG-24) Version 1.	<a href="https://www.fanr.gov.ae/en/Documents/REG-24-English.pdf">https://www.fanr.gov.ae/en/Documents/REG-24-English.pdf</a>
2		Federal Authority for Nuclear Regulation. Regulation on Technical Services Related to Radiation Safety, (FANR-REG-30) Version 0.	<a href="https://www.fanr.gov.ae/en/Documents/FANR-REG-30%20V0%20for%20website%20English.pdf">https://www.fanr.gov.ae/en/Documents/FANR-REG-30%20V0%20for%20website%20English.pdf</a>
3	2019	MOHAP Federal law No. 2, on the Use of The Information and Communication Technology (ICT) In Health Fields.	<a href="https://mohap.gov.ae/app_content/legislations/php-law-en-77/mobile/index.html#p=1">https://mohap.gov.ae/app_content/legislations/php-law-en-77/mobile/index.html#p=1</a>
4	2020	Abu Dhabi Department of Health. Standard on Patient Healthcare Data Privacy. (DOH/SD/SS/PHDP/0.9)	<a href="https://www.doh.gov.ae/-/media/2958402CDBE24607A0FC39D92BB4EE3B.ashx">https://www.doh.gov.ae/-/media/2958402CDBE24607A0FC39D92BB4EE3B.ashx</a>
5	2020	Abu Dhabi Department of Health. Policy on the Abu Dhabi Health Information Exchange. (DOH/POL/STR/HIE/1.1/2020)	<a href="https://www.doh.gov.ae/-/media/A78104416DF2440E89AC90FB75F11055.ashx">https://www.doh.gov.ae/-/media/A78104416DF2440E89AC90FB75F11055.ashx</a>

6		Federal Authority for Nuclear Regulation. Radiation Safety (FANR-RG-007). Version 1.	<a href="https://fanr.gov.ae/Regulatory-Guides">Regulatory Guides (fanr.gov.ae)</a>
7	2018	Ministry of Health and Prevention MOHAP. Hospital Regulations.	<a href="https://mohap.gov.ae/assets/download/1204a1/Hospital%20Regulation.pdf.aspx">https://mohap.gov.ae/assets/download/1204a1/Hospital%20Regulation.pdf.aspx</a>
8	2017	Abu Dhabi Department of Health. Healthcare Providers Manual.	<a href="https://www.doh.gov.ae/-/media/7EA6916C486A4D6BBA">https://www.doh.gov.ae/-/media/7EA6916C486A4D6BBA</a>
9	2009	World Health Organization, Implementation Manual, Surgical Safety Checklist.	<a href="https://www.cirse.org/education/standards-of-practice/ir-patient-safety-checklist/">https://www.cirse.org/education/standards-of-practice/ir-patient-safety-checklist/</a>
10	2021	Cardiovascular and Interventional Radiological Society of Europe. Clinical Practice Manual. Andreas H. Mahnken, Esther Boulloua Seoane, Allesandro Cannavale, Michiel W. de Haan Rok Dezman Roman Kloeckner Gerard O'Sullivan, Anthony Ryan, Georgia Tsoumakidou.	<a href="https://www.cirse.org/education/standards-of-practice/ir-patient-safety-checklist/">CIRSE Clinical Practice Manual - PMC (nih.gov)</a>
11	2021	Medicines and Healthcare products Regulatory Agency (UK): Safety Guidelines for Magnetic Resonance Imaging Equipment in Clinical Use.	<a href="https://www.mhra.gov.uk/publishing/service.gov.uk">MHRA (publishing.service.gov.uk)</a>
12	2017	Ministry of Health and Prevention MOHAP. Diagnostic Imaging Regulation.	<a href="https://mohap.gov.ae/assets/download/806f50f/Diagnostic%20Imaging%20Regulation.pdf.aspx">https://mohap.gov.ae/assets/download/806f50f/Diagnostic%20Imaging%20Regulation.pdf.aspx</a>
13	2023	Dubai Health Authority. Standards for Diagnostic imaging Services.	<a href="https://dha.gov.ae/Standards-for-Diagnostic-Imaging-Services2023331877.pdf">Standards for Diagnostic Imaging Services2023331877.pdf (dha.gov.ae)</a>
14	2022	ACR Appropriateness Criteria. American College of Radiology.	<a href="https://www.acr.org/Clinical-Resources/ACR-Appropriateness-Criteria">https://www.acr.org/Clinical-Resources/ACR-Appropriateness-Criteria</a>
15	2022	Diagnostic Imaging Center of Excellence – ACR Accreditation. American College of Radiology.	<a href="https://www.acraccreditation.org/-/media/ACRAccreditation/Documents/DICOE/DICOE_Program_Requirements.pdf">https://www.acraccreditation.org/-/media/ACRAccreditation/Documents/DICOE/DICOE_Program_Requirements.pdf</a>
16		Diagnostic Imaging Accreditation Scheme published by the Department of Health and Aging – Australia.	<a href="http://www.health.gov.au/internet/main/publishing.nsf/Content/diagnosticimagingaccred2">http://www.health.gov.au/internet/main/publishing.nsf/Content/diagnosticimagingaccred2</a>
17	2022	International Basic Safety Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources. International Atomic Energy Agency.	<a href="http://www-pub.iaea.org/mtcd/publications/pdf/ss-115-web/pub996_web-1a.pdf">http://www-pub.iaea.org/mtcd/publications/pdf/ss-115-web/pub996_web-1a.pdf</a>
18	2022	Medical Physics. European Federation of Organizations for Medical Physics.	<a href="https://www.efomp.org/index.php?r=pages&amp;id=public">https://www.efomp.org/index.php?r=pages&amp;id=public</a>

19	2022	Medical Physics. Australasian College of Physical Scientists & Engineers in Medicine.	<a href="https://www.acpsem.org.au/Meet-Our-Members/MedicalPhysics#:~:text=Medical%20Physics%20is%20a%20branch,applies%20it%20">https://www.acpsem.org.au/Meet-Our-Members/MedicalPhysics#:~:text=Medical%20Physics%20is%20a%20branch,applies%20it%20</a>
20	2017	Justification of radiographic examinations: What are the key issues? Journal of Medical Radiation Sciences. Vom. J et al.	<a href="https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5587654/">https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5587654/</a>
21	2021	Magnetic Resonance Imaging. Mayo Clinic.	<a href="https://www.mayoclinic.org/tests-procedures/mri/about/pac-20384768">https://www.mayoclinic.org/tests-procedures/mri/about/pac-20384768</a>
22	2022	Standards for the Reporting and Interpretation of Imaging Investigations. The Royal College of Radiologists.	<a href="https://www.rcr.ac.uk/clinical-radiology/publications-and-standards">https://www.rcr.ac.uk/clinical-radiology/publications-and-standards</a>
23	2016	UAE Federal Law no. (4) of 2016 Concerning Medical Liability.	<a href="https://www.dha.gov.ae/uploads/112021/d759f988-571f-43b3-87ab877e770b31ca.pdf20">https://www.dha.gov.ae/uploads/112021/d759f988-571f-43b3-87ab877e770b31ca.pdf20</a>
24	2014	UAE Federal Law no. (14) of 2014 concerning the control of communicable diseases.	<a href="https://www.dha.gov.ae/uploads/112021/54c9cedb-8988-454a-ba04-0e727f6153.pdf21">https://www.dha.gov.ae/uploads/112021/54c9cedb-8988-454a-ba04-0e727f6153.pdf21</a>
25	2020	ACR Manual on MR Safety. Safety Screening Form for MR Procedures. American College of Radiology.	<a href="#">Q&amp;S MRI Safety Manual Form_F2.indd (acr.org)</a>
26	2023	ACR Manual on Contrast Media. ACR committee on Drugs and Contrast Media. American College of Radiology.	<a href="#">contrast_media.pdf (acr.org)</a>
27	2012	Abu Dhabi Department of Health, HAAD Standard for Adverse Events Management and Reporting. (HAAD/AEMR/SD/1.1)	<a href="https://www.doh.gov.ae/-/media/DC27FE2E2CAD45279341A428ECE1622B.ashx">https://www.doh.gov.ae/-/media/DC27FE2E2CAD45279341A428ECE1622B.ashx</a>
28	2018	Abu Dhabi Department of Health Policy: Use of Artificial Intelligence (AI) in the Healthcare Sector of the Emirate of Abu Dhabi (Policy/AI/0.9).	<a href="https://www.doh.gov.ae/-/media/E9C1470A575146B18015DEBE57E47F8D.ashx">https://www.doh.gov.ae/-/media/E9C1470A575146B18015DEBE57E47F8D.ashx</a>
29	2019	Abu Dhabi Department of Health Standard: Health Facility Guidelines Part B – Health Facility Briefing & Design 260 Medical Imaging Unit.	<a href="https://stem.doh.gov.ae/HealthFacilityGuidelines/Guidelines/Index/Health-Facility-Briefing-and-Design">https://stem.doh.gov.ae/HealthFacilityGuidelines/Guidelines/Index/Health-Facility-Briefing-and-Design</a>
30	2020	Abu Dhabi Department of Health Standard on Telemedicine. (DOH/SA/TLM/0.9/2020).	<a href="https://www.doh.gov.ae/-/media/0272CB2B824D41D6B4A2A5C78EBD94F9.ashx">https://www.doh.gov.ae/-/media/0272CB2B824D41D6B4A2A5C78EBD94F9.ashx</a>

31	2009	Federal Law by Decree No 6 of 2009 Concerning Peaceful Uses of Nuclear Energy.	<a href="https://www.fanr.gov.ae/ar/-/layouts/15/DownloadHandler.aspx?attachmentUrl=https://www.fanr.gov.ae/ar/Lists/LawOfNuclear/Attachments/1/NuclearLawNo6.pdf">https://www.fanr.gov.ae/ar/-/layouts/15/DownloadHandler.aspx?attachmentUrl=https://www.fanr.gov.ae/ar/Lists/LawOfNuclear/Attachments/1/NuclearLawNo6.pdf</a> <a href="#">Scan 2 (fanr.gov.ae)</a>
32	2024	Department of Health Accreditation Standards for Healthcare Facilities (Hospitals).	<a href="https://www.doh.gov.ae/-/media/CEAEB3597E1C4EB8A18A12BF36B263FA.ashx">https://www.doh.gov.ae/-/media/CEAEB3597E1C4EB8A18A12BF36B263FA.ashx</a>