Standards for Diagnostic Imaging Services

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INTRODUCTION

Health Regulation Sector (HRS) forms an integral part of Dubai Health Authority (DHA) and is mandated by DHA Law No. (14) of 2021 amending some clauses of law No. (6) of 2018 pertaining to the Dubai Health Authority (DHA), to undertake several functions including but not limited to:

- Developing regulation, policy, standards, guidelines to improve quality and patient safety and promote the growth and development of the health sector;
- Licensure and inspection of health facilities as well as healthcare professionals and ensuring compliance to best practice;
- Managing patient complaints and assuring patient and physician rights are upheld;
- Governing the use of narcotics, controlled and semi-controlled medications;
- Strengthening health tourism and assuring ongoing growth; and
- Assuring management of health informatics, e-health and promoting innovation.

The Standards for Diagnostic Imaging Services aims to fulfil the following overarching DHA Strategic Priorities (2022-2026):

- Pioneering Human-centered health system to promote trust, safety, quality and care for patients and their families.
- Make Dubai a lighthouse for healthcare governance, integration and regulation.
- Become a global digital health hub.

ACKNOWLEDGMENT

The Health Policy and Standards Department (HPSD) developed this Standard in collaboration with Subject Matter Experts and would like to acknowledge and thank these health professionals for their dedication toward improving quality and safety of healthcare services in the Emirate of Dubai.

Health Regulation Sector

Dubai Health Authority

TABLE OF CONTENTS

EXECUTIVE SUMMARY

Dubai Health Authority (DHA) is pleased to present the DHA Standards for Diagnostic Imaging Services which represents a milestone towards fulfilling the DHA strategic objectives in providing "A world class integrated health system that ensures excellence in health and healthcare for the Emirate of Dubai and promotes Dubai as a globally recognized destination for healthcare".

This standard aims to aid Diagnostic Imaging facilities in developing their quality management systems and in assessing their own competence to ensure compliance with DHA regulatory requirements and the United Arab Emirates (UAE) federal laws. Moreover, the standard for diagnostic imaging services places an emphasis on facility design and services criteria with a focus on quality and safety of patients based on the local and federal laws in addition to the international accreditation standards.

The standard focuses on the following:

- The health care professional requirements and permitted services for clinical and diagnostic imaging
- The health facility design requirements for diagnostic imaging services aligned with the DHA Health facility guidelines, and FANR requirements.
- The policies, procedures, protocols and clinical governance that should be in place for the provision of diagnostic imaging services
- The general requirements for patient safety and image quality.

DEFINITIONS

Anatomical position is the position in which the patient is standing erect, with the face directed forward, arms extended by the sides with the palms facing forward, and the toes pointing anteriorly.

Artificial intelligence: is a field, which combines computer science and robust datasets, to enable problem-solving. It also encompasses sub-fields of machine learning and deep learning, which are frequently mentioned in conjunction with artificial intelligence. These disciplines are comprised of AI algorithms which seek to create expert systems which make predictions or classifications based on input data.

Diagnostic Imaging Services describes a variety of non-invasive methods of looking inside the body to help determine the causes of an injury or an illness, and to confirm a diagnosis. It is also used to see how well your body is responding to a treatment for an illness or a fracture.

The most common types of diagnostic imaging include the following services:

- X-ray
- Computed Tomography (CT)
- Magnetic Resonance Imaging (MRI)
- Ultrasound
- Positron Emission Tomography (PET)

Diagnostic Imaging Facility is any health facility in which a radiology and clinical imaging system(s) is used for the purpose of diagnosis or visualization, including but not limited to: Standalone diagnostic Imaging Centres, Hospitals, Day Surgical Centres, Polyclinics, Specialty clinics, General and Dental clinics as well as mobile radiology services.

Clinical research: Research in which people, or data or samples of tissue from people, are studied to understand health and disease. Clinical research helps find new and better ways to detect, diagnose, treat, and prevent disease.

Computed Radiology (CR) is the use of special plate technology, scanning and computer processing to produce a digital image of a patient's organ or body part.

Computed Tomography (CT) is the technique of employing ionizing radiation to produce axial (cross section) body section images. Data obtained by X-ray transmission through the patient are computer analyzed to produce these images. The series of sectional, planar images may be manipulated to produce different planar or volumetric view of the areas of interest and eliminate overlying structures such as bone.

Manipulations of data allows for the selective view of either dense tissues such as bones or diffuse tissues such as the heart, brain, or lung. CT is used for both head and body imaging and is applicable to diagnosis, biopsy, and therapy planning.

Contrast media (or contrast agent) is a substance used to enhance the contrast of structures or fluids within the body in medical imaging.

Contrast reaction is the mild or severe reactions to contrast media which may include nausea and/or vomiting; scattered to extensive urticaria, hypertension (isolated) with compensating tachycardia, cardiovascular collapse, convulsion and seizure.

Conventional Radiography (General Radiology) are images of the skull, chest, abdomen, spine, and extremities produced by the basic radiographic process.

Digital Radiography: is the capture or conversion of radiographic images in a digital format.

Federal Authority for Nuclear Regulation (FANR) is the UAE federal regulatory body of nuclear and radiation related issues including the medical use of ionizing radiation. All the institution and units that are involved with ionizing radiation in UAE shall be licensed by FANR and abide by their regulations.

Fluoroscopy is the technique used to produce a real time motion in either an instantaneous or stored fashion.

Healthcare professional are healthcare personnel working in health care facilities and required to be licensed as per the applicable laws in United Arab Emirates (UAE).

Interventional Radiology (IR) is the clinical subspecialty that uses fluoroscopy, CT, MRI and ultrasound to guide percutaneous procedures such as performing biopsies, draining fluids, inserting catheters, or dilating or stenting narrowed ducts or vessels.

Local Rules shall mean set of instruction for handling specific radiation equipment to ensure the maximum protection from unnecessary radiation.

Magnetic resonance imaging: use of magnetic field and computer-generated radio waves to create detailed images of the organs and tissues in the body. Most MRI are large tube-shaped magnets with magnetic field that realigns water molecules in the body and radio waves aligns atoms to produce faint signals, which are used to create cross-sectional MRI images. These produces 3D images that can be viewed from different angles.

Mammography is a modality that utilizes ionizing X-ray imaging for breast examinations.

Medical Complaint is any written or spoken expression of dissatisfaction with a healthcare service. A medical complaint can be filed by a patient affected by the actions of a healthcare provider or the service received within a health facility. A family member can also file for a medical complaint or someone acting on behalf of the patient (provided they have a power of attorney). In case the patient in question is deceased or in a coma, their next of kin can file a complaint on their behalf. If the patient is a twenty (20) years or younger, their legal guardian can file, the complaint.

Medical physics is the application of physics to healthcare; using physics for patient imaging, measurement, and treatment. Medical physicists are healthcare professionals with education and specialist training in the concepts and techniques of applying physics in medicine, competent to practice independently in on or more of the subfields of medical physics.

Nuclear Medicine is the branch of medicine that deals with the use of unsealed radioactive substances in the diagnosis and treatment of disease.

People of Determination: under the 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.

Positron Emission Tomography (PET scan) is a technique that produces a three-dimensional image or picture of functional processes in the body. The system detects pairs of gamma rays emitted indirectly by a positron-emitting radionuclide (tracer), which is introduced into the body on a biologically active molecule.

Three-dimensional images of tracer concentration within the body are then constructed by computer analysis. In modern scanners, three-dimensional imaging is often accomplished with the aid of a CT X-ray scan performed on the patient during the same session, in the same machine.

Picture Archiving and Communication System (PACS) is the digital capture, transfer and storage of diagnostic images. A PACS system consists of workstations for interpretation, image or data 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. A computer network is needed to support each of these devices.

Quality assurance is the planned and systematic actions that provide adequate confidence that a diagnostic facility will produce consistently images of adequate quality for intended diagnostic

purpose with minimum exposure of the patients and healing arts personnel. The diagnostic facility ensures adequate quality in imaging by periodically evaluating its practice against national DRL program results coordinated by FANR. The evaluation encompasses comprehensive assessment of the patient referring practice, performance of the professionals, equipment, diagnostic protocols, and local rules comparing obtained results against desired diagnostic information. Quality assurance actions include both “quality control” techniques and “quality administration” procedures.

Quality Control is the ongoing and periodic evaluation procedures of equipment, professional, procedures and local rules to ensure continued, reliable performance.

Radio-Diagnostic Centre is an independent health facility providing one or more of radiology and diagnostic imaging services with one or more radiologists working in a permanent basis.

Referral guidelines are set my MOHAP and adopted by DHA to provide evidence-based guidelines used to assist in referring physicians and other providers in making the most appropriate imaging or treatment decision for a specific clinical condition. Employing the use these guidelines to help providers enhance quality of care and contribute to the most efficacious use of radiology.

Risk Management is a logical and systematic method of establishing the context, identifying, analyzing, evaluating, treating, monitoring and communicating risks associated with any activity,

function or process in a way that will enable organizations to minimize losses and maximize opportunities.

Sentinel Event is defined as an unanticipated occurrence involving death or major permanent loss of function unrelated to the nature course of the patient illness or underlying condition; while Adverse Event is defined as unanticipated, undesirable or potentially dangerous occurrence in a health care organization.

System of Work are a set of rules governs day-to-day the practice of using medical imaging equipment.

Teleradiology: Is concerned with the transmission of digitized medical images (as X-rays, CT scans, and sonograms) over secure electronic networks with the interpretation of the transmitted images for diagnostic, treatment, education and research purposes.

The anatomical position: is the position in which the patient is standing up straight, with the face directed forward, arms extended by the sides with the palms facing forward, and the toes pointing anteriorly.

Ultrasound are high frequency sound waves are utilized to determine the size and shape of internal organs based on the differential rates of reflection. In addition, images can be observed in real time to reveal motion, and can include coloration of arterial and venous blood flow. Cyst aspiration and fluid removal are also procedures done with the ultrasound modality.

ABBREVIATIONS

ACLS	:	Advanced Cardiac Life Support
AI	:	Artificial Intelligence.
ALARA	:	As Low As Reasonably Achievable
BLS	:	Basic Life Support
CPR	:	Cardiopulmonary Resuscitation
CT	:	Computed Tomography
DHA	:	Dubai Health Authority
DICOM	:	Digital Imaging and Communications in Medicine
DM	:	Dubai Municipality
DET	:	Department of Economy and Tourism
DRL	:	Diagnostic Reference Level.
FANR	:	Federal Authority for Nuclear Regulation
HRS	:	Health Regulation Sector
MOHAP	:	Ministry of Health and Prevention.
MRI	:	Magnetic Resonance Imaging
PACS	:	Picture Archiving and Communication System
PET	:	Positron Emission Tomography

PM	:	Preventive Maintenance
QC	:	Quality Control
RN	:	Registered Nurse
TE	:	Time to Echo
TR	:	Repetition Time

1. BACKGROUND

Diagnostic imaging describes various techniques of viewing the inside of the body to help figure out the causes of an illness or injury and confirm a diagnosis. Diagnostic imaging is roughly equivalent to radiology, the branch of medicine that uses radiation to diagnose and treat diseases. However, other technologies such as ultrasound, which employs sound waves to visualize tissues, and endoscopy. Another type of diagnostic imaging is nuclear magnetic resonance, which creates images of thin slices of the body using very-high-frequency radio waves. Many imaging tests are non-invasive, easy and painless.

The notion of clinical or diagnostic imaging began in 1895 with the invention of the X-ray by a German professor of physics, Wilhelm Rontgen. X-ray was based on the principle of ionizing radiation passing through the body with a photosensitive plate placed behind it to project the images.

In recent decades, diagnostic imaging services has experienced a technological revolution and the effectiveness of diagnostic imaging services is greatly dependent on the quality of the health care provided. The existences of well-trained healthcare professionals are essential, as well as the implementation of quality assurance programs, are essential for obtaining accurate diagnoses. Diagnostic imaging services are performed by radiographers. The role of radiographers, medical physicists and radiologists is focused on providing benefit with early diagnostic interventions to patients while maintaining their safety at all times.

2. SCOPE

2.1. Diagnostic imaging services in DHA licensed health facilities.

3. PURPOSE

3.1. To assure provision of the highest levels of safety and quality diagnostic imaging services in Dubai Health Authority (DHA) licensed health facilities.

4. APPLICABILITY

4.1. DHA licensed healthcare professionals and health facilities providing diagnostic imaging services.

5. STANDARD ONE: REGISTRATION AND LICENSURE PROCEDURES

5.1. Health facilities aiming to provide diagnostic imaging services shall comply with the DHA licensure and administrative procedures available on the DHA website https://www.dha.gov.ae, and FANR requirements that may include obtaining regulatory decisions on planning clinical use of ionising radiation, associated facilities, and commissioning the clinical use of ionising radiation.

5.2. Licensed health facilities opting to add diagnostic imaging services submit an application to HRS through the Sheryan system to obtain permission to provide the required service.

5.3. The facility shall notify FANR of their intention to use ionising radiation by registering with FANR online E-licensing System to obtain the necessary FANR approvals at https://www.fanr.gov.ae/en/services/elicensing

5.4. Diagnostic Imaging services can be provided in a variety of health facilities including:

5.4.1. Hospitals,

5.4.2. Standalone Diagnostic Centres with other diagnostic specialties, and

5.4.3. Outpatient care facilities such as polyclinics, specialty and dental clinics.

5.5. Interventional imaging should only be performed in a hospital-based setting, or could also be performed in a standalone diagnostic centre.

5.6. Outpatient Care facilities shall provide specific range of diagnostic imaging services within the premises, such as ultrasound, conventional radiography (general radiology), Computer Tomography (CT), or Magnetic Resonance Images (MRI).

5.7. FANR is exclusively responsible for licensing the use of ionizing radiation in health facilities, Radiation safety protection requirements shall be incorporated into the specifications and the building plans and must comply with FANR Nuclear laws and regulations

5.8. The Federal Authority for Nuclear Regulation (FANR) was established in 2009 to be the regulatory body for the nuclear sector in the UAE in accordance with Federal Law by Decree No 6 of 2009.

5.9. The health facility shall follow with Health Facility Licensing Requirements.

5.10. The health facility shall:

5.10.1. Have trained healthcare professionals to manage cases as per scope of service.

5.10.2. Install and operate equipment required for provision of the proposed services in accordance to the manufacturer's specifications.

5.10.3. Display appropriate signage with the type of service and working hours, clearly visible at the entrance of health facility.

5.11. The health facility shall ensure it has in place adequate lighting and utilities, including the following:

5.11.1. Temperature controls.

5.11.2. Water taps, sinks and drains.

5.11.3. Medical gases.

5.11.4. Lighting.

5.11.5. Electrical outlets.

5.11.6. Communications.

5.12. DHA health facilities providing Diagnostic Imaging Services shall comply with the requirements in the following authorities:

5.12.1. The Department of Economy and Tourism (DET).

5.12.2. Federal Authority Nuclear Regulation (FANR).

5.12.3. Ministry of Health and Prevention (MOHAP).

5.13. In case of application rejection, a detailed list of issues will be provided for corrective action and the applicant is required to re-submit a new application with applicable fees.

5.14. Policies and procedures on imaging pregnant females or females of child bearing age should be available.

5.15. Procedures should be in place for allowing the presence of comforters in cases when the patient is not able to undergo the required radiology procedure on their own.

5.16. The health facility providing diagnostic imaging services must develop and implement a policy to ensure that all patients are correctly identified when rendering a diagnostic imaging service by:

5.16.1. Matching a patient to their request; at least two ways to identify a patient, such as the patient's name, identification number, birth date, a bar-coded wristband, or other ways from the time the patient presents and through all stages of the diagnostic imaging service and when transferring responsibility of care;

5.16.2. Correctly matching patients with their intended diagnostic imaging service and the anatomical site and side (if applicable) of the diagnostic imaging procedure; and

5.16.3. Reporting, investigating, and responding to patient care mismatching events when they occur and implementing changes, where relevant, to reduce the risk of future incidents.

5.17. The health facility shall have a radiation protection and safety program tailor made for the facility's practice that addresses present and potential safety risks and hazards.

5.17.1. The program addresses safety practices and prevention measures for radiology and diagnostic imaging staff, other staff, and patients.

5.18. All healthcare professionals providing diagnostic imaging services shall be trained regularly on radiation safety.

5.19. The radiation safety program requirements include:

5.19.1. Written radiation policies and procedures that support compliance with all applicable local and federal regulations.

5.19.2. Written policies and procedures for handling and disposal of infectious and hazardous materials.

a. A register shall be kept on the safe disposal of all radioactive waste.

b. FANR should receive updates on radioactive waste disposal as per FANR requirements.

5.19.3. Identified radiation safety risks are addressed by specific processes or devices that reduce safety risks (such as lead aprons, radiation badges, etc).

5.19.4. Radiology and diagnostic imaging staff are oriented to safety procedures and practices and receive education for new procedures and hazardous materials.

5.20. For radiation shielding requirement, it is governed and regulated by FANR (Federal Authority for Nuclear Regulation).

5.21. A separate application and approval must be sought directly with FANR using appropriate deliverable obtained from the FANR registered or licensed service provider.

5.22. The health facility providing diagnostic imaging services should follow the DHA Emergency Medication Policy aligning with the health facility's scope and based on patient needs.

6. **STANDARD TWO:** HEALTH FACILITY REQUIREMENTS

6.1. The health facility shall meet the health facility requirement as per the DHA Health Facility Guidelines (HFG) below:

6.1.1. Health Facilities Guidelines Part B Medical Imaging (General)

6.1.2. Health Facility Guidelines Part B Nuclear Medicine (PET)

6.2. The health facility shall install and operate equipment required for provision of the proposed services in accordance to the manufacturer's specifications, and according to the technical advice delivered by the FANR registered or licenses service provider contracted with the facility.

6.3. The health facility shall ensure easy access to treatment areas for all patient groups including People of Determination. For further details refer to the Standard for People of Determination.

6.4. The facility shall maintain fire extinguishers and fire protection equipment and devices as per the Dubai Civil Defence requirements.

6.5. The health facility shall maintain documented evidence of the following:

6.5.1. Transfer of critical or complicated cases when required.

6.5.2. Patient discharge.

6.5.3. Performed diagnostic protocols with information sufficient to reconstruct and estimate each dose received by a patient during imaging.

6.5.4. Hazard Vulnerability Analysis.

6.5.5. Fire Safety, emergency plans, security,

6.5.6. Equipment maintenance services.

6.5.7. Laundry services.

6.5.8. Medical waste management as per Dubai Municipality (DM) requirements (if required).

6.5.9. Housekeeping services.

6.6. General Design Considerations:

6.6.1. Portable radiographic and fluoroscopic equipment should be used in selected instances for imaging of patients.

6.6.2. Diagnostic imaging services performs examinations and produces images from non-invasive or minimally invasive procedures performed on patients in specially equipped examination rooms.

6.6.3. The imaging modalities associated with the diagnostic imaging services include medical applications of ionizing and non-ionizing radiation.

6.6.4. Non-Ionizing Imaging includes: Magnetic Resonance Imaging (MRI) and Ultrasound.

6.6.5. Ionizing Imaging includes:

a. Radiography: Film Radiography, Computed Radiography (CR), Digital Radiography (DR)

b. Mammography

c. BoneDensitometry

d. Dental X-rays (Intra-Oral X-rays, Panoramic X-rays, Cephalometric X-rays and I-CAT Scanner)

6.6.6. Fluoroscopy-Based applications includes:

a. Diagnostic Fluoroscopy (Diagnostic Imaging).

b. Interventional Cardiology (CathLab),

c. Interventional Radiology

d. Lithotripsy

e. Computed Tomography (CT) Scanning

6.6.7. Nuclear Medicine includes:

a. Nuclear Imaging

b. Radionuclide Therapy (Treatment of Thyroid Cancer and non-malignant Thyroid Diseases such as hyperthyroidism)

6.6.8. Radiotherapy includes:

a. External beam radiation (teletherapy)

b. Internal radiation therapy (Intra-cavitary therapy and Interstitial therapy)

6.6.9. In-Vitro Applications includes laboratory analysis of patient's biological samples by means of low-level radioactivity.

6.7. For anaesthesia care provision the following equipment shall be provided:

6.7.1. Reliable oxygen source with back up tank.

6.7.2. Airway equipment: appropriately sized oral airways, endotracheal tubes, laryngoscopes, normal masks and laryngeal masks.

6.7.3. Defibrillator

6.7.4. Double tourniquets if the practice performs Bier blocks

6.7.5. Pulse oximeter

6.7.6. Electrocardiographic (ECG) monitor

6.7.7. Temperature monitoring system for procedures lasting more than 30 minutes

6.7.8. Blood pressure apparatus with different size cuffs

6.7.9. Suction apparatus

6.7.10. Emergency crash cart

6.8. List of emergency medical equipment required in the diagnostic imaging service provider:

6.8.1. Defibrillator

6.8.2. Emergency Cart with Emergency medicines

6.8.3. Resuscitation Kit + Cardiac board + Oral airways

6.8.4. Diagnostic set

6.8.5. Patient trolley with IV stand

6.8.6. Nebulizer

6.8.7. Refrigerator for medication storage

6.9. Storage areas for general medical, emergency supplies, medications and equipment shall be under staff control and out of the path of normal traffic.

6.10. Outsourcing Diagnostic Imaging Services requirements:

6.10.1. Diagnostic imaging services and/or reporting and interpreting services shall be provided within the Diagnostic imaging premises, or by written agreement with outside provider.

6.10.2. Outsourced diagnostic imaging services provider shall be convenient for the patient to access, and reports are received in a timely way that supports continuity of care.

6.10.3. The outsourced facility shall meet the following:

a. A contractual agreement (or similar) shall be available.

b. The image and report shall be transferred in way to ensure the diagnostic image quality of confidentiality of the report, a variety of technologies, such as picture archiving and communication systems (PACS) or teleradiology, shall be required to augment service provision.

c. Individual patient records must be maintained by both the initiating and providing sites and exchanged within clinically relevant timeframes.

7. **STANDARD THREE:** HEALTHCARE PROFESSIONALS REQUIREMENTS

7.1. All healthcare professionals shall hold an active DHA professional license and work within their scope of practice.

7.2. The health facility management shall ensure that availability of appropriate and sufficient numbers of healthcare professionals on duty to plan, supervise and perform the diagnostic imaging procedures.

7.3. In Standalone Diagnostic Imaging Centres, must have the following DHA licensed healthcare professionals:

7.3.1. At least one full time Consultant/Specialist radiologist shall be available to supervise and manage the diagnostic imaging services provided.

7.3.2. At least one full time radiographer shall be in the facility.

7.3.3. If mammography services provided, a full-time female radiographer must be available.

7.3.4. If diagnostic imaging with contrast media use is provided in the facility, at least one full time Registered Nurses (RN) on duty to provide and supervise patient care during contrast provision.

7.4. In Outpatient Care facilities must have the following DHA licensed healthcare professionals:

7.4.1. If only Ultrasound and/or Conventional Radiography service available, at least one licensed Consultant/Specialist Radiologist must supervise the services on part time or full-time basis and at least one full time DHA licensed radiographer.

7.4.2. Where CT/MRI services are provided in Outpatient Care facilities, the following shall be met:

a. At least one licensed Consultant/Specialist Radiologist must be available to supervise the services on full time basis and to provide reports.

b. At least one full time licensed radiographer with training in CT/MRI must be available in the facility to provide and assist in the services provision.

c. A Registered Nurse (RN) or a physician with contrast media administration competencies (if provided).

7.5. MRI safety training shall be provided to all healthcare professionals and staff involved in patient management inside the MRI area.

7.6. At least one licensed healthcare professionals (Radiologist/radiographer) must maintain valid training/certification in basic Cardiopulmonary Resuscitation (CPR) or Basic Life Support (BLS) or Advanced Cardiac Life Support (ACLS).

7.7. DHA licensed Registered Nurse (RN) providing services in the diagnostic imaging service shall be trained and competent to provide the emergency care needed. Examples of emergency nurse competencies are:

7.7.1. Patient Triage

7.7.2. ECG Recording

7.7.3. Pulse Oximetry

7.7.4. Oxygen Administration

7.7.5. Intravenous cannulation

7.7.6. Medication administration

7.8. A designated healthcare professional as "radiation safety officer" shall be responsible for radiation safety program in the facility.

7.8.1. The Radiation Safety program shall include but not limited to the use and monitoring of personal protective devices in accordance with FANR applicable laws and regulations.

7.8.2. In larger health facilities, the radiation safety committee shall meet periodically to ensure the high standards of radiation safety are reached and obstacles are overcome.

7.9. If Mobile Radiology Services such as Ultrasounds, Mammography, healthcare professional's allocation shall meet the following:

7.9.1. At least one licensed Consultant/Specialist Radiologist must be available onsite to supervise the mobile services, to discuss radiological findings and provide reports.

7.9.2. At least one licensed radiographer shall be available to assist in the diagnostic mobile services provision (excluding ultrasound services).

7.9.3. If mammography provided as mobile services, the licensed radiographer must be a female radiographer.

7.9.4. The reporting of mobile radiology reports shall be conducted by licensed radiologist.

7.9.5. Radiation protection shall meet FANR requirements; the mobile unit shall be licensed by FANR.

7.10. Some diagnostic procedures require administration of light, moderate sedation or even general anaesthesia, such procedures necessitate close monitoring.

7.10.1. Anaesthesia procedures shall be conducted only in hospital based diagnostic imaging facility.

7.11. Consultant/Specialist anaesthetist licensed by DHA shall be available during the provision of anaesthetic care.

7.11.1. Registered Nurse (RN) assisting in the anaesthetic care shall be competent in:

a. Insertion of Intravenous (IV) lines.

b. Assessment and monitoring patients under sedation.

c. Pain assessment and management.

d. Medicine preparation and administration which includes understanding of pharmacology of the agents that are administered, as well as the role of pharmacological antagonists for opioids and benzodiazepines.

7.11.2. Physicians and nurses providing anaesthetic care shall hold an active Basic Life Support (BLS), Advanced Cardiac Life Support (ACLS) training if dealing with adults or Paediatric Advanced Life Support (PALS) if dealing with children.

7.12. Pregnant healthcare professionals may continue to work in a Diagnostic Imaging Facility, with the following recommendations:

7.12.1. Pregnant healthcare professionals should not remain in examination rooms during scanning;

7.12.2. Pregnant healthcare professionals should opt out of all scan room work during the first trimester.

7.13. The following non-radiologists can report radiology exams:

7.13.1. Licensed Consultant/Specialist physicians can perform ultrasound limited to their specialty scope only if they hold specialized certificate/training course in ultrasound. For example, cardiologist can provide Echocardiography services if he or she completed a successful program or dedicated training courses in Echocardiography. The following criteria shall be met:

a. Consultant/Specialist physicians cannot provide radiology report independently. Only DHA licensed radiologist is authorized to issue written radiology reports.

b. If the ultrasound diagnosis performed by Consultant/Specialist physicians carries the chance of intervention or surgery, the ultrasound report should be countersigned by licensed Consultant/Specialist Radiologist.

7.13.2. Licensed radiographers can perform ultrasound procedures independently; however, they cannot report or interpret ultrasound images.

7.13.3. Professionals authorize to interpret plain X-ray images shall meet the following criteria:

a. Consultant/Specialist physicians can interpret plain X-ray images limited to their specialty scope only.

b. General Practitioners can interpret chest and extremities plain X-ray images only, they are not permitted to interpret and report other diagnostic images.

c. DHA licensed Osteopath and Chiropractor practitioners can interpret plain X-ray images for osteopathy or chiropractic purposes.

8. **STANDARD FOUR:** DIAGNOSTIC IMAGE QUALITY

8.1. The department shall have a protocol for imaging following standard international references in radiology. The department should follow standard diagnostic reference level in imaging (DRL).

8.2. The department shall develop a mechanism of accepting, declining, or referral of radiology requests based on clinical indication as per DHA referral guidelines.

8.2.1. The radiologist must justify the imaging protocol for each patient in consultation with the referring medical practitioner as appropriate.

8.2.2. The radiographer shall not perform imaging protocols that are not requested by the radiologist.

8.3. The examination report should mention the amount of radiation exposure.

8.4. The radiologist is responsible to manage the adjustments of image exposure and resolution accordingly.

8.5. The demographic information about the patient should be clearly seen on the images including the following:

8.5.1. Patient full name

8.5.2. Date of birth

8.5.3. Age

8.5.4. Patient identification number

8.5.5. Exam date, time, and location

8.6. The following details should be included depending on type of scan:

8.6.1. The number of sequence and image

8.6.2. If contrast has been used

8.6.3. Field of view

8.6.4. Slice thickness

8.6.5. Slice level

8.6.6. Image should state projection (oblique, lateral, etc.) and side (right/left)

8.6.7. Acquisition matrix

8.6.8. Type of phase (arterial, venous, etc.)

8.7. The following additional details should be included in CT scans:

8.7.1. Amount of voltage in Kilovolts (kV), and

8.7.2. The amount of electricity current that has been used in Amperes (A).

8.8. The following additional detail should be included in MRI scans:

8.8.1. The value of TE and TR in the image.

8.9. The image should include any additional information such as cases where the patient is instructed to perform a maneuver during the scan (e.g. straining).

8.10. X-ray image field of view shall cover the concerned organ in a well oriented normal anatomical position.

8.10.1. The radiologist shall ensure the whole organ is visible in the X-ray study. Cases where the visibility of the whole organ it is not required should be clearly stated to the radiologist interpreting the image.

8.11. During CT and MRI scans, the view shall be oriented as the patient face the viewer in an anatomic position. The patient's right side should be on the viewer's left.

8.11.1. The image view orientation shall include the superior anatomy aspect on the top.

8.12. The diagnostic imaging health facility should undergo routine auditing of the images to ensure quality.

9. **STANDARD FIVE:** DENTAL RADIOGRAPHY

9.1. Dental radiographic procedures include:

9.1.1. Intra-oral radiography: periapical, bitewing and occlusal views,

9.1.2. Panoramic radiography,

9.1.3. Cephalometry,

9.1.4. Radiography using specialised dental CT equipment,

9.1.5. Other forms of radiography of the complete skull or certain parts of the dentomaxillofacial region

9.2. Healthcare professionals operating dental X-ray modalities shall receive appropriate training on machine operation and dental radiation safety principles.

9.3. Healthcare professionals operating dental X-ray equipment must ensure that radiological examinations are carried out properly at all times during the course of dental treatment.

9.3.1. This responsibility covers the following components of the examination:

a. Determination of clinical need for the examination

b. Selection of the most appropriate method of examination

c. Optimising radiographic techniques and ensuring radiation protection

d. The use of optimal film or electronic image processing techniques

e. Interpretation of dental radiographs

f. Maintenance of radiographic records

9.4. Dental hygienists and dental assistants can perform Intra-oral radiography' periapical, bitewing and occlusal views.

9.5. Equipment designed for intra-oral radiography must not be used for any other type of radiographic examination.

9.6. Radiography of the mandible, including temporomandibular joints, must be conducted only on general purpose medical X-ray equipment or on special purpose equipment designed for such examinations.

10. STANDARD SIX: TELERADIOLOGY

10.1. Teleradiology provides a significant support to healthcare and allows a continuous education beside an instant interpretation of the images and a possibility for a second opinion.

10.2. Diagnostic Imaging facilities providing teleradiology services shall comply with the DHA Standards for Telehealth Services for registration and licensing requirements.

10.3. The use of teleradiology shall not compensate radiologist shortage or absence from the diagnostic imaging facility.

10.4. Teleradiology transmitting site should comprise of at least one full time radiologist, one radiographer and a system manager with informatics certification.

10.5. The types and specifications of the transmission elements should be documented by the transmitting site.

10.5.1. Diagnostic loss in the images should not be acceptable at the receiving site.

10.5.2. Patient demographics, site information, labels and measurement data should all be transmitted without errors.

10.5.3. The selection of the images that will be transmitted is the responsibility of the radiologist at the transmitting site.

10.6. Equipment guidelines cover two basic categories of teleradiology:

10.6.1. Small matrix size (e.g., CT, MRI, ultrasound, nuclear medicine, digital fluorography, and digital angiography). The data set should provide a

minimum of 512 x 512 matrix size at a minimum 8-bit pixel depth for processing or manipulation with no loss of matrix size or bit depth at display.

10.6.2. Large matrix size (e.g., digital radiography and digitized radiographic films). These images should be digitized to a matrix size corresponding to 2.5 lp/mm or greater measured in the original detector plane. These images should be digitized to a minimum 10-pixel byte depth.

10.7. Acquisition or Digitization equipment can either:

10.7.1. Direct image acquisition:

a. All the data set including the image matrix and pixel byte depth that is obtained by a digital modality should be transferred to the teleradiology system.

b. DICOM standard should be used.

10.7.2. Secondary image capture:

a. Small matrix images.

i. Each individual image should be digitized to a matrix size as large or larger than that of the original image by the imaging modality.

ii. The images should be digitized to a minimum of 8 bits pixel depth.

iii. Film digitization or video frame grab systems conforming to the above specifications are acceptable.

b. Large matrix images.

i. These images should be digitized to a matrix size corresponding to 2.5 lp/mm or greater, measured in the original detector plane.

ii. These images should be digitized to a minimum of 10 bits pixel depth.

10.8. The system shall include the following:

10.8.1. Annotation capabilities including patient name, identification number, date and time of examination, name of facility or institution of acquisition, type of examination, patient or anatomic part orientation (e.g., right, left, superior, inferior),

10.8.2. Amount and method of data compression,

10.8.3. The capability to record a brief patient history is desirable.

10.9. The type and specifications of the transmission devices used will be dictated by the environment of the studies to be transmitted.

10.9.1. In all cases, for official interpretation, the digital data received at the receiving end of any transmission must have no loss of clinically significant information.

10.9.2. The transmission system shall have adequate error- checking capability.

10.10. Teleradiology receiving site shall employ radiologist licensed in the country the service is provided.

10.10.1. Such radiologists should be certified in teleradiology.

10.11. The specification of the receiving site monitors used for the interpretation should meet the aims of teleradiology.

10.12. Centres providing teleradiology shall have information technologists and technicians who will be responsible for the computer systems and infrastructure.

10.13. The quantifications of the personnel in the receiving site should be identical to those of the transmitting site.

10.13.1. All the quantifications should be documented.

10.14. Use of Artificial Intelligence (AI) in Radiology:

10.14.1. Use of AI in radiology practice shall always be under the responsibility and supervision of a radiologist.

10.14.2. The supervising radiologist shall ensure the quality of the reports and safety of the environment are adhered as per the standard.

10.14.3. All health facilities providing teleradiology services with the use of AI should sign an agreement with the provider built upon the ethical practice of AI, and ethical codes should develop accordingly. These codes should emphasize on:

a. Transparency.

b. Protection of patients and their rights.

c. Safe control of data and the algorithm.

10.14.4. The health facility providing AI services shall have evidence of:

a. Continuous monitoring of AI tools, and

b. Trainings conducted.

10.15. All patient data shall be stored in the UAE as per Federal Law No. 2 of 2019 Concerning the Use of Information and Communication Technology (ICT) in Health Fields.

11. STANDARD SEVEN: EQUIPMENT MANAGEMENT

11.1. All equipment used to conduct diagnostic imaging services shall be regularly inspected, maintained, and calibrated, and appropriate records are maintained for these activities.

11.2. Equipment used to acquire or print images for diagnostic imaging procedures must be safe and appropriate for its intended use.

11.2.1. All equipment shall be installed and operated in accordance with manufacturer specifications.

11.3. Health Facilities providing radiology and diagnostic imaging services must maintain a current equipment inventory.

11.3.1. A current equipment inventory should include information relating to name of item, manufacturer, and serial number.

11.4. The diagnostic imaging facility shall maintain effective Preventive Maintenance (PM) as per the manufacturer recommendations using FANR registered or licensed service provider as appropriate; the PM shall include both preventive and corrective aspects.

11.5. Following the manufacturer's recommended procedures for cleaning and maintenance of the equipment, and regular inspection and replacement of switches and parts that routinely wear out or fail.

11.6. A copy of operator and safety manuals of all medical equipment and inventory list with equipment location shall be maintained.

11.7. A written policy for tagging medical equipment shall be maintained which includes:

11.7.1. PM with testing date and due date

11.7.2. Inventory number

11.7.3. Safety Checks

11.8. Each Diagnostic imaging facility shall implement sufficient hardware and software security measures to ensure that patient information stored in and transmitted by its computer system, handheld or other devices will be protected from inappropriate external and internal disclosure.

11.9. Electronic data and information management systems shall meet the diagnostic imaging facility needs and support the delivery of quality care and service; it shall ensure the timely availability of diagnostic imaging study results.

11.10. X-ray film and other supplies

11.10.1. The organization should identify cassettes, films, chemicals and other supplies necessary to regularly provide radiology and diagnostic imaging services to its patients.

11.10.2. A process to order or to secure essential films, chemicals, and other supplies should be effective.

11.10.3. All supplies are stored and dispensed according to defined procedures that incorporate the manufacturers' recommendations.

11.10.4. The periodic evaluation of reagents according to manufacturers' recommendations ensures accuracy and precision of results.

11.11. FANR must be formally informed of any new, old or replaced or shifted X-ray modality.

11.12. Health facilities providing diagnostic imaging shall have an active radiation safety program that includes all components of the diagnostic imaging services provided by the facility; (including radiation oncology and the cardiac catheterization laboratory).

11.13. Radiologists, medical physicists, radiologic technologists, and all supervising physicians have a responsibility to minimize radiation dose to individual patients, to staff, and to society as a whole, while maintaining the necessary diagnostic image quality. This concept is known as “as low as reasonably achievable (ALARA).

11.14. Each licensed Diagnostic Imaging Facility shall maintain a documented quality assurance program that includes quality control protocols for the equipment as follows:

11.14.1. Monitoring and evaluating the effective management, safety, and proper performance of all imaging equipment.

11.14.2. Comply with minimum frequencies of testing as defined by the written facility policies and procedures of the facility and with the manufacturers’ guidelines when appropriate.

11.14.3. Equipment performance should be monitored by a qualified medical physicist who is commonly supported by a qualified technologist.

11.14.4. Daily/ Weekly quality control testing shall be conducted and reviewed on a quarterly or annual basis, as directed, by a Medical Physicist.

11.14.5. Using a modality specific FANR prescribed set of quality control protocols FANR registered or licensed service provider shall perform quality control testing and compliance testing upon the installation of all new equipment, and

at specified times thereafter, or after maintenance of the equipment, and FANR shall be informed of the results using FANR e-licensing system.

11.14.6. The contracted service provider shall perform quality control protocols to ensure the quality of modes and parameters of the machines.

11.14.7. Controls, policies and procedures relating to radiology procedures shall be included in the overall quality control and improvement program.

12. STANDARD EIGHT: PATIENT SAFETY AND MANAGEMENT

12.1. The diagnostic imaging facility must ensure that all patients provided with safe care and services by focusing efforts on reducing harm to patients and staff; including but not limited to:

12.1.1. Patient identification (minimum two identifiers)

12.1.2. Performance of correct procedure at correct body site

12.1.3. Improving hand hygiene to prevent health care-associated infection

12.1.4. Communication during patient hand-over

12.1.5. Single use of injection devices

12.2. Health facilities providing diagnostic imaging services shall maintain a system for the services to meet the patient needs and clinical services offered in the facility including services required for emergencies.

12.3. Diagnostic imaging procedures shall be undertaken only where there is an identified clinical need and:

12.3.1. Upon receipt of a request from a licensed physician requesting the services after performed justification from the radiologist; or

12.3.2. Where the physician interpreting the image is permitted to self-determine the service according to the generic justification criteria as part of referral practice.

12.3.3. Using national or international referral guidelines for medical diagnostic imaging.

12.4. The written or electronic request for diagnostic imaging services should provide sufficient information to demonstrate the medical necessity of the examination and allow for its proper performance and interpretation.

12.4.1. The facility shall accept a justified request for referring patients and have in place an internal policy for referrals.

12.5. A sample of requests or records documenting the clinical need for the diagnostic imaging procedures shall be maintained at the health facility.

12.6. Prior to a diagnostic imaging procedure being rendered, except in cases of emergency, the diagnostic imaging practice must ensure that:

12.6.1. Patients have access to information about the diagnostic imaging procedure, such information shall be available at the health facility.

12.6.2. Risks are advised to the patient or substitute decision maker;

12.6.3. Patient's health status and relevant information about individual patient risk factors are obtained; this includes but limited to:

a. Asthma,

b. Previous exposure to intravenous contrast,

c. Allergies,

d. Medical conditions such as diabetes, kidney disease or heart disease,

e. Thyroid disease,

f. Multiple myeloma-hypercoagulable state,

g. Bleeding tendency,

h. Pregnancy status,

i. Breastfeeding,

j. Medications such as metformin hydrochloride,

k. Medical devices and implanted devices such as intra- cranial aneurysm clips, cardiac pacemaker, coronary stents, intra ocular foreign bodies and cochlear implants.

12.7. Prior to MRI scanning, all patients shall be screened for possible contraindications which include, but are not limited to:

12.7.1. The presence of cardiac pacemakers, ferromagnetic intracranial aneurysm clips, certain neurostimulators, certain cochlear implants, and certain other ferromagnetic foreign bodies or electronic devices.

12.7.2. Possible contraindications should be listed on a screening questionnaire.

12.8. Diagnostic imaging facility using ionizing radiation must ensure that patient radiation exposure is kept As Low As Reasonably Achievable (ALARA) by selecting equipment

and techniques for diagnostic imaging procedures sufficient to provide the required clinical information.

12.9. A technique chart, consistent with the ALARA principle, for each unit of radiographic equipment shall be maintained.

12.9.1. The facility local rules shall be followed.

12.9.2. Evidence of regular submission of the record to FANR should be provided.

12.10. Documentation of patient care shall be performed by the supervising anaesthetist administering the sedative or general anaesthesia agents.

12.11. Diagnostic imaging facilities must have an infection control and prevention program to identify and reduce the risks of acquiring and transmitting infections among patients, healthcare personnel, and visitors.

12.12. Requirements for proper hand hygiene shall include but not limited to:

12.12.1. Conveniently located hand wash basins, used only for washing purpose with hands free operating taps.

12.12.2. Wall mounted non-refilling liquid soap dispenser next to each hand wash basin.

12.12.3. Wall mounted paper towel in use.

12.12.4. Staff education on hand washing technique.

12.12.5. Regular audits of hand hygiene compliance.

12.13. Use and safe storage of antiseptics and disinfectant solutions must be according to manufactures instructions.

12.14. Material Safety Data Sheets (MSDS) shall be available for all chemical agents and disinfectants solutions used in the facility.

12.15. The health facility shall have in place a Falls Management Program for fall prevention.

12.15.1. Falls prevention information shall be provided to staff, patients and patient's family/patient representative.

12.15.2. Patients at risk of falls shall be identified. Patients 'at risk' include but not limited to:

a. Pediatric patients

b. Elderly

c. Orthopedic patients

d. Patients undergoing invasive procedures.

12.16. The health facility shall maintain charter of patients' rights and responsibilities posted at the entrance of the premise in two languages (Arabic and English) as per the DHA Policy for Patient Rights and Responsibilities.

12.17. The health facility shall develop the following policies and procedures including but not limited to:

12.17.1. Disaster management.

12.17.2. Emergency action plan.

12.17.3. Incident reporting.

12.17.4. Sentinel events.

12.17.5. Medication management.

12.17.6. Patient acceptance criteria.

12.17.7. Patient assessment and admission.

12.17.8. Patient discharge.

12.17.9. Patient referral or transfer.

12.17.10. Quality improvement plan.

12.17.11. Management of healthcare information.

12.17.12. Patient education and Informed consent.

12.17.13. Patient privacy.

12.17.14. Staff job description, qualification and education.

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