



**Sultanate of Oman
Ministry of Health**

Policy and Procedure for Intravenous Cannulation and Contrast Media Administration by Radiographers

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Acronyms:

CM	Contrast Medium
CT	Computerized Tomography
DGHSP	Director General of Health Services and Programs
DGQAC	Directorate General of Quality Assurance Center
GBCAs /GBCM	Gadolinium-based contrast agents / Gadolinium-based contrast media
ICM	Iodine-based contrast media
IR	Interventional Radiology
IV	Intravenous
MoH	Ministry of Health
MRI	Magnetic Resonance Imaging
RFT	Renal Function Test

1. Purpose

The purpose of this policy is to ensure that radiographers are competent in performing intravenous administration of contrast agents in radiological examinations/procedures, thereby minimizing risks to both patients and staff. Adherence to these guidelines ensures standardized practices, enhances patient safety, and supports the continuous professional development of radiographers in this critical aspect of radiographic imaging.

This policy is intended to be used in conjunction with existing guidelines and policies on intravenous (IV) cannulations from the Training and Staff Development, Quality Assurance and Patient Safety and Infection Prevention and Control departments within the respective hospitals.

2. Scope

This document applies to radiographers administering intravenous (IV) contrast media, including Iodine-based (ICM) and Gadolinium-based (GBCAs), for Fluoroscopy, Computed Tomography (CT), Magnetic Resonance Imaging (MRI), and Interventional Radiology (IR) for adult patients in all Ministry of Health (MoH) institutions and Private Health Establishments across the Sultanate of Oman.

3. Definitions:

- **Contrast Media (Contrast Agent):**

A substance used in medical imaging to enhance the contrast of structures or fluids within the body, making them more visible on radiographic images. Common types include iodinated and gadolinium-based agents.

- **Intravenous (IV) Contrast Administration:**

The process of delivering contrast media directly into a vein using a needle or catheter, allowing rapid distribution throughout the body.

- **Radiographer:**

A licensed healthcare professional trained to perform diagnostic and interventional imaging examinations, including the administration of intravenous contrast media under appropriate supervision and guidelines.

- **Trainee:**

An individual, either a recent graduate from a recognized radiography education program or a radiographer, who is actively engaged in supervised practical training specifically for intravenous (IV) cannulation procedures.

- **Adverse Reaction:**

Any undesired or harmful response experienced by a patient following the administration of contrast media, ranging from mild symptoms (e.g., nausea, itching) to severe reactions (e.g., anaphylaxis).

- **Informed Consent:**

The process of obtaining a patient's voluntary agreement to undergo a specific procedure after explaining the risks, benefits, and alternatives in a manner they can understand.

- **Practitioner:**

A qualified healthcare professional authorized to administer or supervise the administration of intravenous contrast media, typically including radiologists and radiographers with appropriate certification.

- **Angiographic Pressure Injector:**

A device is used in imaging procedures, particularly angiography, to deliver contrast media at high pressures and controlled flow rates. This equipment is essential for ensuring precise and consistent injection of contrast media into blood vessels, enhancing image quality for diagnostic purposes.

- **Extravasation:**

The accidental leakage of contrast media from a vein into the surrounding tissue during IV administration may cause local irritation or more severe tissue damage.

- **Pre-Procedure Assessment:**

A systematic evaluation is conducted prior to administering contrast media, including reviewing patient history, assessing for allergies, and evaluating renal function to identify potential risks.

- **Renal Function Test (RFT):**

A blood test to evaluate the kidneys' ability to filter blood and excrete waste products is often assessed through measurements such as serum creatinine and estimated glomerular filtration rate (eGFR), which are critical in determining the suitability of contrast media use.

- **Emergency Protocol:**

A predefined set of actions and procedures to follow in the event of an adverse reaction to contrast media, including the use of emergency medications and equipment.

4. Policy

4.1 Access to Training:

Trainees will have access to the theoretical and practical training components necessary to perform IV cannulations and CM administration safely.

4.2 Pre-requisite course:

Trainees must complete a pre-requisite course covering at least the following theoretical aspects:

- Injection theory and procedure
- Infection control protocols
- Anatomy and physiology of the upper limb
- Contrast agents, including types, uses, and safety considerations
- Management of potential adverse reactions
- Completion of a competency checklist

4.3 Assessment Requirements:

Trainees are required to achieve a minimum score of 80% on a theory test and complete a competency checklist. Only upon successful completion of these requirements will participants be eligible for the practical training session.

4.4 Practical Training:

Practical training will include practicing cannulation techniques on simulation units, followed by completing a practical checklist and maintaining a logbook documenting practical experiences.

5. Procedure

5.1 Radiographer Qualifications and Practice.

5.1.1 Qualifications and Practice Standards

5.1.1.1 Accredited Training:

Radiographers must have completed accredited training in IV cannulation and CM administration and demonstrated competence under direct supervision. Training should cover all aspects included in the previous section, including contrast media handling, administration protocols, and emergency response.

5.1.1.2 Demonstration of Competence:

Competence must be demonstrated through a structured assessment process, including theoretical exams and supervised practical application, evaluated by certified radiologists or senior radiographers.

5.1.2 Practice:

5.1.2.1 Authorization to Administer IV Contrast Agent:

Once qualified, radiographers are authorized to administer intravenous CM according to the established departmental protocols and pre-procedure assessment. This authorization is specific to the types of contrast media covered in their training and is subject to annual review to incorporate advancements in clinical practice and technology.

5.1.2.2 Documentation and Compliance:

Documentation of successful training completion and competence assessment must be maintained in the radiographer's personnel records to ensure traceability and compliance. These records are subject to be reviewed during regular compliance audits and are essential for ensuring that all practices meet institutional and regulatory standards.

5.2 Administration of Contrast Media:

5.2.1 Prescription:

All contrast media must be prescribed by a radiologist or an authorized medical practitioner according to a specific patient/examination protocol, RFT and pre-procedure assessment.

5.2.2 Supervision:

The administering radiographer must operate under the direct supervision of a radiologist, who will be available in the radiology department for consultation and assistance during the procedure. The supervising radiologist must respond to such requests immediately.

5.2.3 Existing Line Usage:

An existing intravenous line may be used for the administration of contrast media, whether manually or via a pressure injector, only if:

1. The peripheral intravenous site is of appropriate gauge and suitable for contrast media administration.
2. The patient's intravenous access is stable, well-secured, and not at risk of dislodgment or extravasation during administration.

5.2.4 Establishing Intravenous Access:

If an intravenous line is needed and no suitable access is available, the radiographer, having received accredited training in intravenous cannulation and proven their competence, may establish the line on adult patients only. This is contingent on the completion of the appropriate training and competency assessments.

5.2.5 Cannula and Site Selection Consultation:

5.2.5.1 A suitable intravenous cannula must be used to administer intravenous contrast, selected based on the type and volume of contrast media and the patient's vein condition.

5.2.5.2 If there is any doubt regarding the suitability of the cannula or the site for contrast administration, advice must be sought from the supervising medical practitioner or radiologist to ensure the correct choice is made.

5.2.6 Cannula Testing for Patency:

Before using an existing cannula for contrast administration, it must be tested for patency and correct intravenous positioning with a flush of sodium chloride. This ensures that the cannula is functional and correctly placed, minimizing the risk of extravasation or other complications.

5.2.7 Operational Hours:

Intravenous injections should ideally be administered during standard working hours whenever possible to ensure full availability of radiological support.

5.3 Documentation Following Administration of Contrast Media:

5.3.1 Inpatients:

Record on Prescription: A record of the administered contrast media must be made on the once-only prescription on the Radiology Medicine Administration Record of the ward.

5.3.2 Outpatients:

Record in Radiology Department: A record must be made on the Radiology Medicine Administration Record of the Radiology Department.

5.4 Use of an Angiographic Pressure Injector in Cross-Sectional Scanners

5.4.1 Preparation and Setup

5.4.1.1 Designated Personnel: Only designated radiographers are authorized to fill and operate the angiographic pressure injector.

5.4.1.2 Contrast Verification: Before loading the injector, the radiographer assigned to the case must verify the contrast media or other substances with the clinician overseeing the procedure or the supervising radiographer.

5.4.2 Management of Materials

Storage of Materials: All empty contrast bottles and other containers used during the procedure must be retained in a designated tray alongside any other drugs used until the procedure is completed.

5.4.3 Operation of the Pressure Injector

5.4.3.1 Air Bubble Precautions: Carefully check the system for air bubbles before activation to prevent air embolism.

5.4.3.2 Connection Checks: Ensure any connectors and connecting tubes are securely fastened to avoid leaks or disconnection during the procedure.

5.4.3.3 Compliance with Prescriptions: Confirm that the pump settings are correctly adjusted according to the specific prescription or protocol for the procedure.

5.5 Cannulating Vulnerable/Specific Populations

5.5.1 Advanced Cannulation Tools

- Employ advanced techniques or tools such as Vein Visualization Technology, AccuVein and Near-infrared (NIR) to enhance cannulation success and reduce discomfort and complications, particularly for patients with challenging venous access.

5.5.2 Cancer Patients:

- **Assessment of Vein Condition:** Special attention must be given to assessing the condition of veins, as cancer patients may have compromised venous access due to repeated use or the effects of chemotherapy.
- **Infection Control:** Adhere to stringent infection control practices given the immunocompromised status of many cancer patients, ensuring all equipment is sterile and procedures are performed under aseptic conditions.

5.5.3 Elderly or Patients with Chronic Illnesses:

- **Gentle Technique:** Use a gentle technique, as these patients may have fragile veins. Slow and steady cannulation, using the smallest possible cannula, can reduce the risk of vein damage.
- **Patient Comfort and Communication:** Ensure continuous communication with the patient to gauge comfort levels and responsiveness to the procedure, adjusting techniques as necessary.

5.5.4 Patients with Cognitive Impairments

- **Clear Instructions:** Communicate procedures using simple, reassuring language.
- **Support Presence:** Allow a caregiver or family member to be present for reassurance.

5.5.5 Patients with Physical Disabilities

- **Accessible Positioning:** Adjust patient positioning to accommodate mobility restrictions.
- **Equipment Adaptation:** Use specialized equipment if necessary to facilitate access.

5.5.6 Patients with Known Allergies or Multiple Comorbidities:

- **Allergy Assessment and Precautions:** Before proceeding with cannulation, verify any known allergies, especially to contrast media or local anaesthetics used during the procedure.
- **Readiness for Adverse Reactions:** There must be protocols in place for immediate management of adverse reactions, including readily available emergency equipment and medications.

Note: For asthmatic patients, ensure the availability of inhalers during the procedure.

5.6 Emergency Protocols:

5.6.1 Immediate Assistance:

In case of any adverse reactions or complications during contrast media administration, the radiographer **must** immediately seek assistance from the supervising radiologist.

5.6.2 Immediate Response:

The supervising radiologist **must** respond immediately and appropriately to all requests for assistance, ensuring patient safety and effective management of any complications according to the related institutional protocol.

6. Responsibilities

6.1 Radiographers/Trainees:

- **Code Compliance:** Adhere to the Code of Practice for the Administration of Intravenous Medicines and Infusion Fluids in clinical areas.
- **Patient Identification:** Verify the correct patient according to the MoH's protocols.
- **Patient Communication:** Clearly explain the procedure to the patient and obtain verbal consent prior to commencing. Provide prior, during and after care for all patients.
- **Medical History Assessment:** Determine whether the patient has a history of asthma, diabetes, renal failure, or prior adverse reactions to medications or contrast media. If any such conditions exist, inform and consult with the supervising medical practitioner/radiologist to decide on the next steps.
- **Cannulation Attempts:** Limit cannulation attempts to a maximum of two. Seek assistance if unable to establish access successfully.
- **Cannula Use During Procedure:** Keep the cannula in place throughout the examination for radiographic contrast media unless otherwise instructed.
- **Side Effect Awareness:** Inform the patient about potential side effects and provide details on whom to contact if they experience any issues after the procedure.
- **Emergency Preparedness:** Be knowledgeable about seeking urgent medical help by contacting the Cardiac Arrest Team in case of a severe contrast reaction.

- **BLS Certification:** Maintain a validated Basic Life Support (BLS) certification from a recognized institution.

Additional requirements:

- **Contrast Agent Verification:** Whenever possible, ensure a second qualified staff member is available to verify the type, strength, and dose of the contrast agent prior to administration.
- **Written Prescription:** Confirm there is a written prescription for every patient before administering any contrast agents.
- **Patient Supervision:** Never leave a patient unattended during the first five minutes after the injection of contrast media.
- **Protocol Adherence for CT and MRI:** Verify that prescriptions comply with the appropriate protocols for CT and MRI procedures.

Note: For asthmatic patients, ensure the availability of inhalers during the procedure.

6.2 Supervising Radiographers:

Supervisors must ensure safe and effective administration of contrast agents through the following actions:

- **Operational Oversight:** Oversee the preparation and administration of contrast media, ensuring adherence to safety standards and departmental protocols.
- **Training and Competency:** Provide ongoing training and mentorship to radiographers to support their acquisition and maintenance of technical skills and procedural knowledge.
- **Mentor Allocation:** Ensure sufficient mentors are available to assess staff /trainees completing their training or logbooks/checklists.
- **Equipment Management:** Ensure the availability, maintenance, and proper storage of all necessary equipment.
- **Documentation and Communication:** Act as a liaison between radiographers and radiologists, ensuring effective communication and accurate documentation before and after the procedure.

6.3 Clinicians/Radiologists:

Clinicians and radiologists are responsible for ensuring the safe and effective administration of contrast agents through the following actions:

- **Procedural Approval and Supervision:** Assess and decide on continuing contrast injections for patients with adverse medical histories or identified risk factors and supervise the administration directly in such cases.
- **Emergency Response:** Be readily available to respond immediately to any queries or emergencies raised by radiography staff during the procedure.

- **Post-Procedural Monitoring:** Remain in the department for at least 15 minutes after the injection of contrast media to monitor for adverse reactions and ensure patient safety.
- **Risk Management:** Assume ultimate responsibility for administering contrast agents, particularly in high-risk scenarios.
- **Consent Documentation:** Ensure patient consent is appropriately documented in the medical records before the procedure.
- **Decision-Making in Risk Scenarios:** Make all decisions regarding the administration of contrast agents in the presence of risk factors as the supervising radiologist.
- **Guideline Compliance:** Ensure radiographers adhere to the related the MoH's guidelines, policies and standards of operating procedures.

7. Document History and Version Control

Document History and Version Control		
Version	Description	Review Date
01	Initial Release	September 2021
02	VERSION 2	September 2024
03	VERSION 3	February 2028

8. References:

Title	Author(s)	Year of Publication	Link
Contrast media safety: update on recent ESUR-Contrast Media Safety Committee publications	Clement O, Romanini L, van der Molen AJ; On behalf ESUR Contrast Media Safety Committee.,	2024	https://doi.org/10.1007/s00330-024-10725-4
ACR Manual on Contrast Media	ACR Committee on Drugs and Contrast Media	2024	https://www.acr.org/-/media/ACR/Files/Clinical-Resources/ContrastMedia.pdf
Intravenous Therapy Manual	Ministry of Health, Center for Continuing Professional Development	2016	Ministry of Health, Center for Continuing Professional Development
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CNSA Vascular Access Devices: Evidence-Based Clinical Practice Guidelines Version 2	Cancer Nurses Society of Australia	2024	https://www.cnsa.org.au/practiceresources/vascular-access-guidelines
Intravenous cannulation and administration of contrast media by radiographers: a literature review to guide the training and practice in Zambia	Bwanga, O., Kayembe, R. M., & Sichone, J. M.	2022	https://doi.org/10.4314/ahs.v22i2.72
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9. Annexes

Appendix1: PRACTICAL SAFETY CONSIDERATIONS

PRACTICAL SAFETY CONSIDERATIONS

The following safety considerations are essential for the safe administration of intravenous contrast media:

- **Staff Presence:** Whenever possible, ensure two staff members are present in the scanning suite during cannulation and contrast injection by a radiographer.
- **Emergency Preparedness:** Staff must be equipped with the knowledge to seek urgent medical help by contacting the Cardiac Arrest Team in the event of a severe contrast reaction.
- **Risk-Based Decisions:** The supervising radiologist must decide whether to administer contrast media for patients with identified risk factors.
- **Preventing Dehydration:** Patients should avoid dehydration prior to contrast administration to reduce the risk of contrast nephrotoxicity.
- **Treatment Facilities:** Ensure facilities and equipment for managing acute adverse reactions are readily available and undergo regular checks to confirm functionality.
- **Post-Injection Supervision:** Patients must not be left unattended for the first five minutes following the injection of contrast media.
- **Observation Period:** Patients should remain within the Imaging Department for at least 15 minutes after the injection, as most severe reactions occur during this time. For patients at higher risk of adverse reactions, extend the observation period to 30 minutes.
- **Reaction Documentation:** Document all contrast reactions in detail, including their nature, severity, and the contrast agent used, in both the radiological report and the patient's medical record.

Appendix2: Key Safety Practices for IV Contrast Administration

Key Safety Practices for IV Contrast Administration

Pre-Injection



Review patient history



Record baseline vital signs



Ensure hydration



Verify inhalers for asthmatic patients

Intra-Procedure



Observe the patient during the injections



Watch for adverse reactions



Check the cannula site for issues

Immediate Post-injection



Supervise for the first 5 minutes



Monitor for hypersensitivity



Be ready to contact the emergency team

Extended Observation



Keep the patient in the department for 15-30 minutes



Record symptoms



Extend time for high-risk patients

Post-Procedure



Inform about side effects

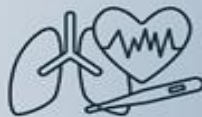


Provide emergency contact details



Arrange follow-up if needed

Documentation



Record vital signs and symptoms



Document adverse reactions



Note contrast agent used