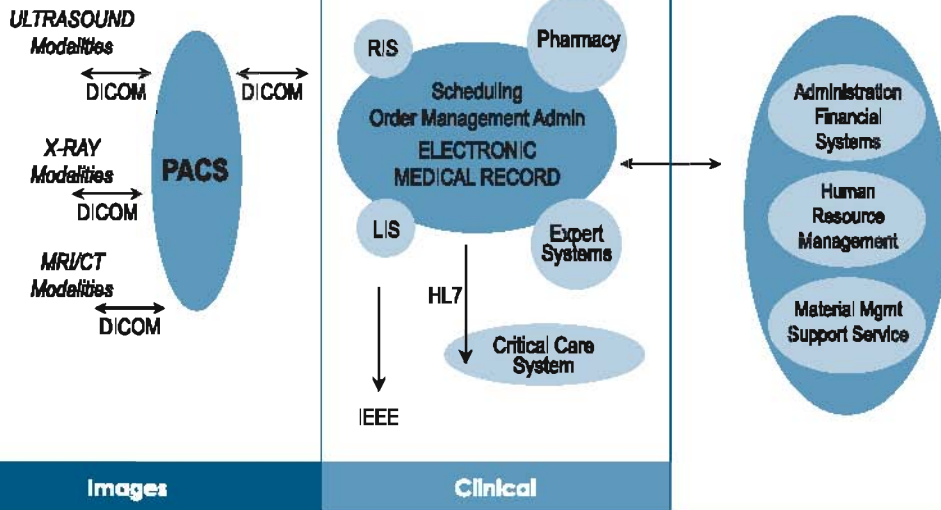


## THIS STRUCTURE



# RADIOLOGY INFORMATION SYSTEM

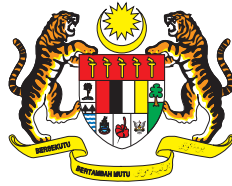
CLINICAL BASED

NON CLINICAL

## Functional Requirements Brief Hospital Information System



Health Informatics Standards  
Ministry of Health, Malaysia



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# FOREWORD

Tan Sri Dato Dr. Ismail Merican  
Director General of Health, Malaysia

Malaysia being progressive in the adoption of Information communication “Technology in Health Care” has embarked in the creation of ICT enabled facilities. The Telemedicine blueprint “Leading Healthcare into Information Age” has laid the foundation for the planning and implementation of ICT initiatives in the country. Amongst the building blocks that has been recognised as vital for interoperability was the development and adoption of Health Informatics Standards.

The Ministry of Health has played a leading role in the development of Health Informatics Standards. In collaboration with stakeholders in the public and private sector, several standards have been developed for adoption in the country. Amongst them include the “Functional Requirements Brief” that has been prepared to provide functional requirements of the core business of the hospital as an entity. The business functional model including business functions, operational policies, high level work flows and system functionalities are well documented. This document would provide the health care personnel as to how the work processes and procedures are streamlined in a computerised working environment and for the system developers, it provides an in depth understanding of the user needs.

The documents that have been developed includes the

- Person Management System
- Pharmacy Information System
- Laboratory Information System
- Radiology Information System
- Blood Bank Information System
- Oral Health Information system
- Operation Theatre Management System

I wish this document be used as a generic standard in the development and customization of hospital information system being deployed in the hospitals in the country. I take the opportunity to congratulate the expert group that has put in countless number of man hours for the preparation of the document and all members of the consensus meeting for their participation and contribution.

**TAN SRI DATUK DR. HAJI MOHAMAD ISMAIL MERICAN**  
*DIRECTOR-GENERAL OF HEALTH, MALAYSIA*



## VISION FOR HEALTH

Malaysia is to be a nation of healthy individuals, families and communities, through a health system that is equitable, affordable, efficient, technologically appropriate, environmentally-adaptable and consumer-friendly, with emphasis on quality, innovation, health promotion and respect of human dignity and which promotes individual responsibility and community participation towards an enhanced quality of life.



## MISSION OF THE MINISTRY OF HEALTH

The mission of the Ministry of Health is to build partnership for health to facilitate and support the people to :

- Attain fully their potential in health.
- Motivate them to appreciate health as valuable asset.
- Take positive action to improve further and sustain their health status to enjoy a better quality of life.



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## INTRODUCTION:-

1.1. The Diagnostic Imaging Department will provide diagnostic imaging services as well as certain invasive therapeutic procedures for inpatients, outpatients and day care patients in the hospital. These services may also be extended to patients from other clinics and hospitals as per policy of the Ministry of Health. The Department shall provide patient centric and physician centric services as follows:-

- 1.1.1. Provision of an efficient, high quality and cost-effective service.
- 1.1.2. Ensure maximum consumer satisfaction.
- 1.1.3. Provision of continuing professional development to all categories of personnel.
- 1.1.4. Conduct of research and development activities.
- 1.1.5. Improve efficiency and effectiveness of services through the use of appropriate technology.

1.2. Information Communication System for Diagnostic Imaging.

The Hospitals shall be equipped with a Radiology Information System (RIS), or RIS with Picture Archiving and Communication System (RIS with PACS) or Total Hospital Information System:-

**1.2.1. Radiological Information System (RIS)**

The Radiology Information System includes order entry, receiving order requests and work list, examination management, documenting, validating and distributing of reports.

Reports will be available in the EMR for clinicians to access.

**1.2.2. Picture Archiving and Communications System (PACS)**

This system includes storage and distribution of digital images, maintenance of an inventory and retrieval of images.

Images will be available for viewing online or can be printed.

**1.2.3. Total Hospital Information System (THIS)**

This system includes a comprehensive online communication between related applications including Hospital Information System (HIS) and PACS. The HIS will include among others, functionalities of Clinical Information System (CIS), Person Management System (PMS) and RIS. This will enable a paperless and film less environment.

Schematic Representative of functions and data flow of Diagnostic Imaging Service (Refer Appendix 1).

### 1.3. PURPOSE.

The purpose of this document is to define the functional requirements of the proposed RIS. RIS (with or without PACS) is one of the core applications under the Clinical Support Services (CSS) functions of the HIS. This document will be used for communicating the RIS functions to both users as well as application developers for development of requirement specifications of the proposed RIS, which in turn will be used for detailed software design.

### 1.4. OBJECTIVE:-

#### 1.4.1. RIS:-

1.4.1.1. To provide the systematic information flow that requires end to end transmission of the physician order entry.

1.4.1.2. To provide solution to a physician oriented workflow.

#### 1.4.2. PACS:-

1.4.2.1. To provide systematic flow for the purpose of archiving, distribution & retrieval of images.

### 1.5. SCOPE:-

1.5.1. Radiology Information System will encompass the following functionalities:-

1.5.1.1. Receive subject and process order.

1.5.1.2. Exam Management.

1.5.1.3. Transcribe, Validate and Distribute Report.

1.5.1.4. Support Generation of Management Reports.

1.5.1.5. Support Administrative function.

1.5.2. System Interface is required under HIS for the following functionalities:-

1.5.2.1. Physician Order Entry.

1.5.2.2. Scheduling.

1.5.2.3. Order Tracking.

1.5.2.4. Retrieve report.

1.5.2.5. Retrieve Images.

1.5.2.6. Billing & Charges.

1.5.3. Radiologists also perform some interventional procedure on patients. These could be part of a diagnostic investigation or treatment. These procedures are considered as part of clinical care and will be documented in the EMR direct or through RIS.

## 1.6. METHODOLOGY:-

- 1.6.1. The Business Functions Model for the Radiology Information System was developed through a series of workshops with an expert team consisting of radiologists and radiographers.
- 1.6.2. The experts analysed the business functions by mapping the relationship between functions, work process and work flows. The operational policies and system functionality to support this workflow were then developed.
- 1.6.3. Based on the mapping chart, the groups then developed the Business Functions Model (BFM) as follows:-
  - 1.6.3.1. Business Functions:-
    - i. Service product / scope.
    - ii. Range.
    - iii. Type of services.
    - iv. Clients.
  - 1.6.3.2. Operational policies.
  - 1.6.3.3. High level workflow.
  - 1.6.3.4. System functionality.
  - 1.6.3.5. Assumptions.
- 1.7. The technical requirements in relation to system architectures and design were developed by an expert group consisting of users and IT personnel.
- 1.8. A consensus workshop held with the users approved the proposed BFM. This was later presented and approved after the National Consensus meeting held amongst all stakeholders in health.



2.1. NAME OF DEPARTMENT:-  
DEPARTMENT OF IMAGING

2.2. BUSINESS FUNCTION:-

2.2.1. Service product / Scope:-

- 2.2.1.1. Diagnostic imaging.
- 2.2.1.2. Therapeutic procedures.
- 2.2.1.3. Interventional procedures.

2.2.2. Range of services:-

- 2.2.2.1. General examinations.
- 2.2.2.2. Special examinations / procedures.
- 2.2.2.3. Referred cases.
- 2.2.2.4. Sub-contract.

2.2.3. Types of services:-

- 2.2.3.1. General Radiography.
- 2.2.3.2. Ultrasound.
- 2.2.3.3. Computed Tomography.
- 2.2.3.4. Fluoroscopy.
- 2.2.3.5. Intravenous Urography.
- 2.2.3.6. Mammography.
- 2.2.3.7. Magnetic Resonance Imaging.
- 2.2.3.8. Angiography.
- 2.2.3.9. Interventional Radiology.

2.2.4. Clients:-

- 2.2.4.1. Internal patients – within the hospital and enterprise.
- 2.2.4.2. External patients:-
  - i. Hospitals / Health Centres in the Ministry of Health outside the enterprise.
  - ii. Other government agencies.
  - iii. Private hospitals.

**3.1. SERVICE STANDARDS:-**

- 3.1.1. General radiographic examinations will be carried out on the same day.
- 3.1.2. Images or radiographs, with or without reports, will be made available to the requesting doctor as per local policy.
- 3.1.3. Special procedures will be done on a scheduled basis.
- 3.1.4. All special examinations will be reported.
- 3.1.5. All general radiographic examinations performed shall be reported subject to local policy.

**3.2. SERVICE HOURS.**

Refer to local policy.

**3.3. SYSTEM ACCESS:-**

- 3.3.1. Radiologists, Radiographers, Radiology Medical Officer and Radiology Nurse shall be allowed access to RIS application according to privilege.
- 3.3.2. Radiologists, Radiographers, Radiology Medical Officer and Radiology Nurse shall be allowed access to CIS application according to privilege.
- 3.3.3. Limited access to RIS application shall be given to Imaging Department ancillary staff.

**3.4. SCHEDULING:-**

- 3.4.1. Examination shall be performed according to priority of cases:-
  - 3.4.1.1. Urgent radiological examination shall be done as soon as possible according to urgency of cases.
  - 3.4.1.2. Elective radiological examinations shall be placed in the next available appointment date or placed in an available requested date.
- 3.4.2. Clinicians shall be allowed to make appointment / scheduling according to predetermined criteria by the type of examination and condition.
- 3.4.3. Patients shall have to be adequately prepared and 'screened' for the radiological procedure.
- 3.4.4. Patients scheduled for more than one examination / procedure on the same day shall be coordinated by the counter staff.
- 3.4.5. Requests shall be made by doctor through CIS or request form for radiological examinations where applicable.
- 3.4.6. Special examinations / procedures shall be requested only by specialist. However, MO may make orders upon consultation with specialist.
- 3.4.7. Inappropriate requests or requests with incomplete clinical information may be rejected by the radiologist.
- 3.4.8. Registration and order entry for offline request shall be done by imaging personnel.

- 3.4.9. External patients shall be registered and categorized separately.
- 3.4.10. The appointment to radiological request shall be given to the patient before leaving the clinic or upon discharge from the ward.

### **3.5. RESCHEDULING:-**

- 3.5.1. Patients who are scheduled but present late on the same day or on the wrong day may be rescheduled.
- 3.5.2. Patients who have not been adequately prepared or do not fulfil certain conditions shall be rescheduled.
- 3.5.3. The requesting doctor/clinic shall be informed about the rescheduled examinations.
- 3.5.4. Radiologist / Radiographer shall be allowed to make changes / modify / cancel examination request based on predetermined rules / logic agreed by both parties.

### **3.6. QUEUE MANAGEMENT:-**

- 3.6.1. Urgent cases and designated patients shall be given priority in accordance with Ministry of Health policy.
- 3.6.2. Separate queue number will be assigned to ambulatory and non ambulatory cases. This will be based on predetermined criteria on patient status and will be triaged.

### **3.7. GENERAL RADIOGRAPHY EXAMINATION:-**

- 3.7.1. All examinations will be done on the same day unless request is made for a future date.
- 3.7.2. Instructions and medication to be taken prior to examination will be made available to the order request in CIS.
- 3.7.3. Examination for patients from various departments shall be performed at designated locations in accordance with the design of the hospital or health centres.
- 3.7.4. After office hours, examination shall be done in accordance with local policy.
- 3.7.5. Examinations shall be done according to the order of presentation to the registration counter. However, priority will be given to urgent requests and designated patients (refer 3.6).

### **3.8. SPECIAL EXAMINATIONS / PROCEDURES (CT, MRI, ANGIOGRAMS, ULTRASOUND, MAMMOGRAPHY, IVU):-**

- 3.8.1. All special examinations shall be scheduled.
- 3.8.2. Scheduling will be coordinated and managed by imaging personnel. The appointment date will be made known to the requesting location.
- 3.8.3. The requesting clinician shall be responsible for informing and preparing the patient prior to the scheduled examination.

- 3.8.4. Vetting of request shall be done by radiologist.
- 3.8.5. Consent for non-invasive radiological procedures, when required shall be taken by the requesting doctor. A hard copy of the consent form shall accompany the patient for the procedure.
- 3.8.6. Requests for urgent special examinations to be performed by radiologists shall be arranged by the requesting doctor after consultation with the specific radiologist-in-charge.
- 3.8.7. Request for urgent special examination after office hours shall be in accordance with predetermined criteria:- by type, condition of patient and availability of resources.

### **3.9. BEDSIDE RADIOLOGICAL EXAMINATION:-**

- 3.9.1. Bedside radiological examination shall be provided at the point of care according to condition of patient, subject to adequate provision of radiation protection and safety.

### **3.10. PATIENT CARE:-**

- 3.10.1. The transfer of patient to and from imaging department shall be in accordance with local policy.
- 3.10.2. Ill patients and those requiring special attention shall be accompanied by appropriate clinical personnel.
- 3.10.3. Sedation of patients, if required, shall be the responsibility of the requesting clinician. Patient should be referred for GA if sedation fails.

### **3.11. REPORTING AND DISTRIBUTION OF IMAGE / RADIOGRAPH / FILM:-**

- 3.11.1. General Radiography:-
  - 3.11.1.1. Reporting shall be made upon request. Priority will be given to urgent examinations.
  - 3.11.1.2. For examinations that are not reported by radiologists, images / radiograph will be made available upon completion to the requesting clinicians.
- 3.11.2. Special Examinations (CT, MRI, Angiograms, Ultrasound, Mammography etc.):-
  - 3.11.2.1. Ultrasound reports shall be made available immediately upon completion of examination.
  - 3.11.2.2. All special examinations involving in-patients shall be reported within 2 working days, unless requested otherwise.
  - 3.11.2.3. All special examinations involving out-patients shall be reported within 7 working days, unless requested otherwise.
  - 3.11.2.4. All special examination requests made from Accident & Emergency Department shall be reported as soon as possible.
  - 3.11.2.5. Reports for ERCP cases shall be made on request only. Set protocol for ERCP shall be prepared and made available to the clinicians.

- 3.11.2.6. Images / Films shall be distributed to requesting clinician / location according to local policy.
- 3.11.2.7. Name and designation of reporting radiologist shall appear in every report.
- 3.11.2.8. It shall be the responsibility of the attending clinician / management team to view / read the report / results of the examination.

3.11.3. Prefetching:-

- 3.11.3.1. Previous images shall be prefetched for purpose of comparison with the current examination.

**3.12. IMAGES/ FILM/ RADIOGRAPHS ARCHIVING AND RETRIEVAL:-**

- 3.12.1. Images shall be archived for all patients either online, near line or offline based upon archiving policy.
- 3.12.2. Radiographs and films shall be archived per local policy.
- 3.12.3. For external patients, hardcopy of the image /radiographs will be given to the requesting facility.
- 3.12.4. For ultrasound examinations performed outside Imaging Department, images selected for archival will be sent to the Imaging Department to be archived.
- 3.12.5. For examinations performed outside the imaging department, the images shall be archived by the radiographer or the radiologist.
- 3.12.6. Retrieval of images shall be determined in accordance with local policy.
- 3.12.7. Back up support of archive shall be provided.
- 3.12.8. All functions shall conform to the latest DICOM standards.

**3.13. REQUESTS FROM OTHER HOSPITALS / HEALTH CLINICS:-**

- 3.13.1. Requests from other hospitals/clinics under Ministry of Health will be accepted in the following situations:-
  - 3.13.1.1. A service e.g. MRI, is not available in the referring hospital.
  - 3.13.1.2. Equipment breakdown in the referring hospital.
  - 3.13.1.3. At patient's request. In this situation, prior approval from the head of department is required.
- 3.13.2. Requests from hospitals/clinics from other government agencies and private sectors shall be in accordance with Ministry of Health policy/ local policy.

**3.14. EXAMINATION CHARGES:-**

- 3.14.1. Charges shall be made upon completion of examination and in accordance with the Fees Act.

**3.15. EMERGENCIES IN THE DIAGNOSTIC IMAGING DEPT. (Including Contrast Media reactions):-**

3.15.1. After initial management and resuscitation of medical emergencies in the Diagnostic Imaging Department, all in-patients shall be returned to the respective wards for further management and all out-patients shall be sent to the Accident & Emergency Dept. for further management.

**3.16. DOWNTIME:-**

3.16.1. Contingency plan during downtimes and recovery procedures shall be in accordance with local procedure/ policy.

**3.17. CONTINUOUS MEDICAL EDUCATION & QUALITY ASSURANCE ACTIVITIES:-**

3.17.1. Inter-departmental conference/case discussions shall be organized according to local requirements.

3.17.2. Quality Control as well as Quality Assurance activities shall be carried according to the Ministry of Health requirements and guidelines.

3.17.3. The department will engage actively in activities of CPD and R&D at departmental, hospital as well as at national level.

3.17.4. Continuous training shall be provided using PACS and RIS.

**3.18. RADIATION PROTECTION AND SAFETY:-**

3.18.1. Imaging personnel shall adhere to regulations and guidelines regarding the use of ionizing radiation e.g. Akta 304 LPTA, BSS 1988, MS 838.

3.18.2. For women of childbearing age, the guidelines laid down by the Ministry of Health will be adhered to. KPK (2) dlm. KKM-153 (13/3) Bhg. 9 1998.

Imaging of pregnant women shall follow 'Procedur Kualiti Untuk Perkhidmatan Pengimejan Diagnostik Ke Arah Perlaksanaan MS ISO:- 9002' document.

3.18.3. It shall be the responsibility of the requesting clinicians to 'screen' patients for risk factors prior to the examination. (MRI check list, allergy/asthmatic checklist).

3.18.4. Radiation Protection Committee should be set up at hospital level.

**3.19. HEALTH AND SAFETY:-**

3.19.1. The management shall be responsible to provide and ensure a safe and healthy environment in the department.

3.19.2. INFECTION CONTROL POLICY is as per hospital infection control policy.

3.19.3. SINGLE USE ITEM POLICY is as per manufacturer recommendation.

3.19.4. Management of deceased in imaging department is as per Hospital Policy.



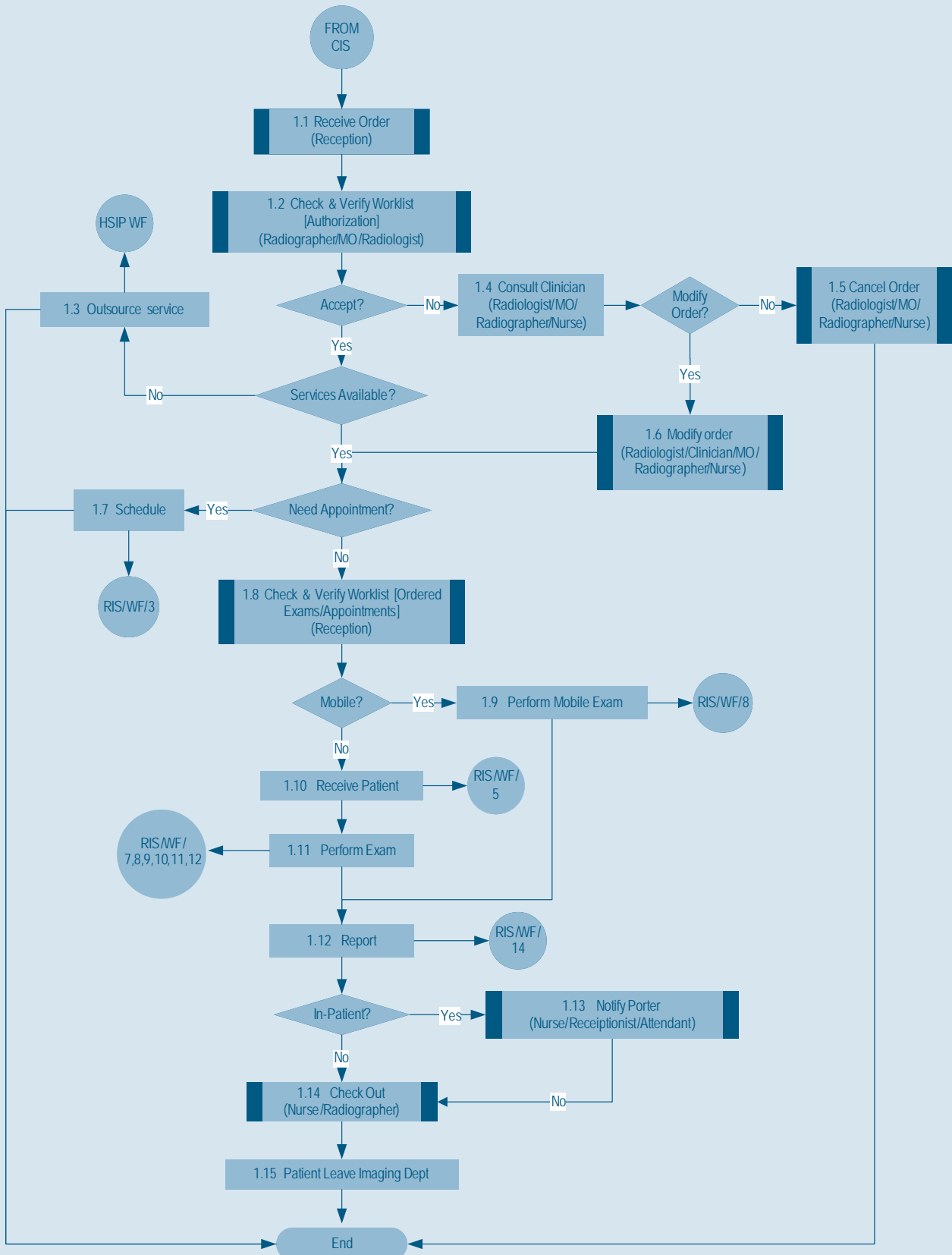
### 3.20. SUBCONTRACT SERVICES:-

- 3.20.1. If the required service is not available within the facility, the imaging department shall make arrangements with third party as per local policy.
- 3.20.2. In case of equipment failure, the imaging department shall make arrangements for urgent examination to a third party as per Hospital Specific Imaging Plan (HSIP). Arrangement to transport the patient shall be done by the requesting clinician.
- 3.20.3. For cases sent to third party, the retrieving of film and report shall be the responsibility of the requesting clinician. Film / hard copy is archived as per local policy.

- 4.1. RIS/WF/1 – General Workflow For Radiological Examination (Internal Patient)
- 4.2. RIS/WF/2 – General Workflow For Radiological Examination (External Patient)
- 4.3. RIS/WF/3 – Workflow For Scheduling Radiological Examination (Internal Patient)
- 4.4. RIS/WF/4 – High Level Workflow For Scheduling Radiological Examination (External Patient)
- 4.5. RIS/WF/5 – Workflow For Patient Movement In Imaging Department
- 4.6. RIS/WF/6 – Workflow For Patient Queuing For Radiological Examination In Imaging Department
- 4.7. RIS/WF/7 – Workflow For Performing General Radiography Examinations
- 4.8. RIS/WF/8 – Workflow For Mobile Examination (General, US, C-ARM)
- 4.9. RIS/WF/9 – Workflow For Satellite Static Fluoroscopy Examination
- 4.10. RIS/WF/10 – Workflow For Performing Special Procedures (USG, CT, MRI, FLUO, IVU)
- 4.11. RIS/WF/11 – Workflow For Performing Mammography Examination
- 4.12. RIS/WF/12- Workflow For Performing Angiography And Interventional Procedure.
- 4.13. RIS/WF/13- Workflow For Emergencies In Radiology Department.
- 4.14. RIS/WF/14- Workflow For Image Reporting.
- 4.15. RIS/WF/15- Workflow For Image Reporting/ Referral Consultation
- 4.16. RIS/WF/16- Pacs Workflow (Radiology)
- 4.17. RIS/WF/17- Workflow For Hard And Soft Copy
- 4.18. RIS/WF/18- Workflow For Digitizing Image

The system shall have the ability to perform the following functionalities:-

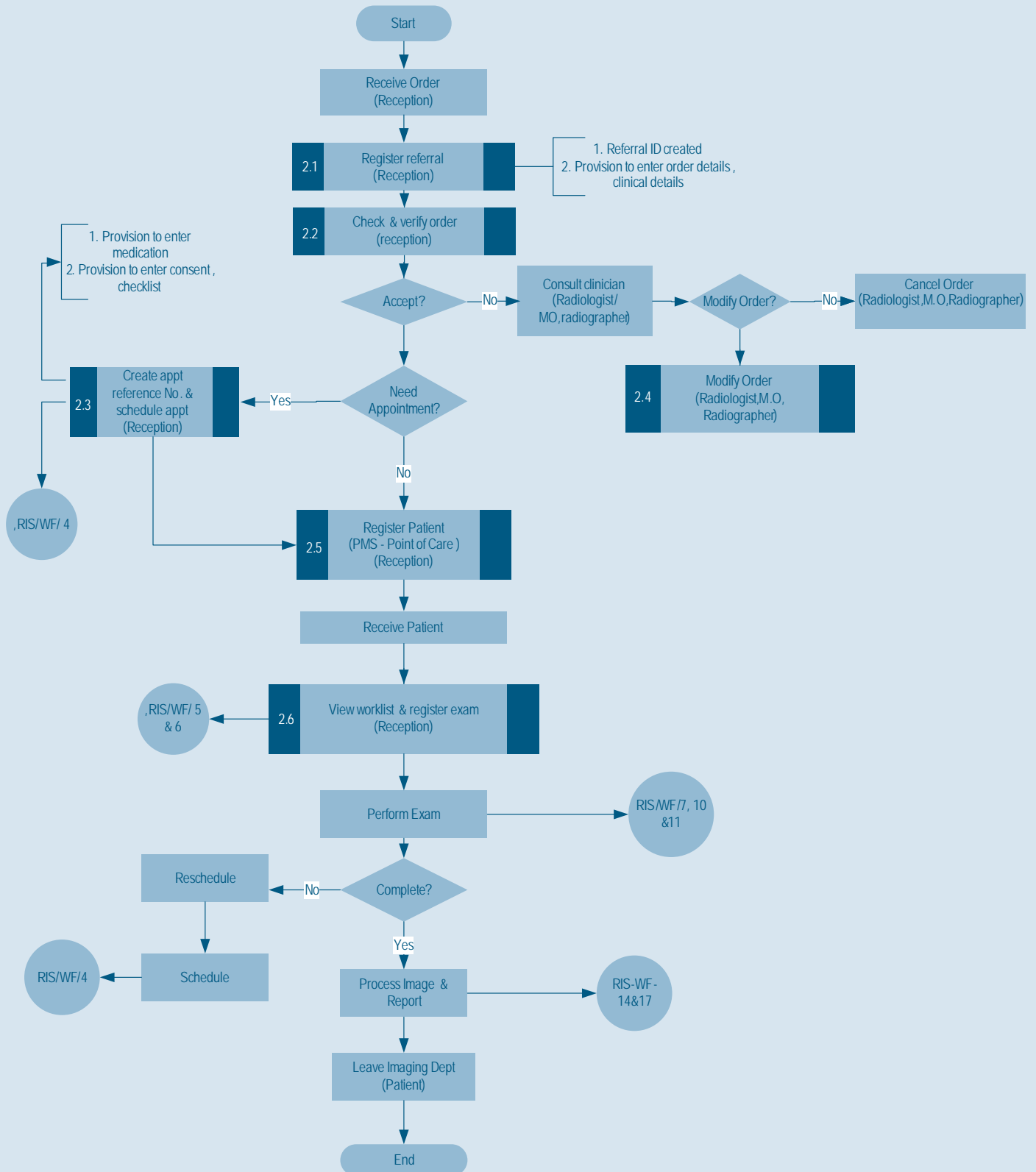
# GENERAL WORKFLOW FOR RADIOLOGICAL EXAMINATION (INTERNAL PATIENT) RIS/WF/1



## WORK PROCEDURE FOR RADIOLOGICAL EXAMINATION (INTERNAL PATIENT) RIS/WP/1

1. This work procedure is applicable for receiving and processing orders for radiological examination for patients within the hospital and enterprise. This work procedure is not applicable for patients referred from outside the enterprise.
2. The clinician upon making a decision that a radiological examination has to be performed will make an order online through CIS (Order Management) to the imaging department. The system will verify the completeness of the order based on set guidelines and subsequently transfer the order to RIS.
3. At the reception counter of the imaging department, imaging personnel at the counter will receive the order and subsequently check and verify to confirm whether examination requested can be accepted or not. The imaging personnel may include radiologist, MO & radiographer depending upon the resources available. The decision to accept imaging orders will be guided by local policy and procedures.
4. Upon making a decision not to accept an order, the imaging personnel will contact the requesting clinician by phone. If the requesting clinician agrees to the modification to the examination as suggested by the imaging personnel, the radiologist, MO or radiographer, will modify the order in RIS, which will also be transmitted, to the CIS. For those cases where the clinician needs to review the examination ordered, they will be required to modify the order through CIS. If the examination is not required then the order is cancelled.
5. Upon making a decision to accept the order, the imaging personnel will check whether the requested examination requires appointment. If an appointment is required, refer to RIS/WF/3 (Scheduling for Internal Patients).
6. For those examinations that do not require an appointment, the radiographer would proceed to perform the examination by viewing the worklist. Refer to RIS/WF/7 (General Radiography), RIS/WF/8 (Mobile Radiography), RIS/WF/10 (Special), RIS/WF/11 (Mammo), RIS/WF/12 (Angio Interven)
7. Upon completing the examination, the patient will leave the examination room.
8. The radiologist will view the image/film and make a report/diagnosis through RIS. Refer RIS/WF/14 (Image Reporting), RIS/WF/16 (PACS) This report will then be distributed through CIS to the requesting clinicians. If the examination could not be completed the case shall be rescheduled. Refer RIS/WF/3 (Scheduling For Internal Patients).
9. For patient of unknown identity, the system should automatch the patient information and images once the identity is made known from the HIS.
10. For services not available within the hospital or due to equipment failure the hospital shall buy services from outside as per local policy.

## GENERAL WORKFLOW FOR RADIOLOGICAL EXAMINATION (EXTERNAL PATIENT) RIS/WF/2

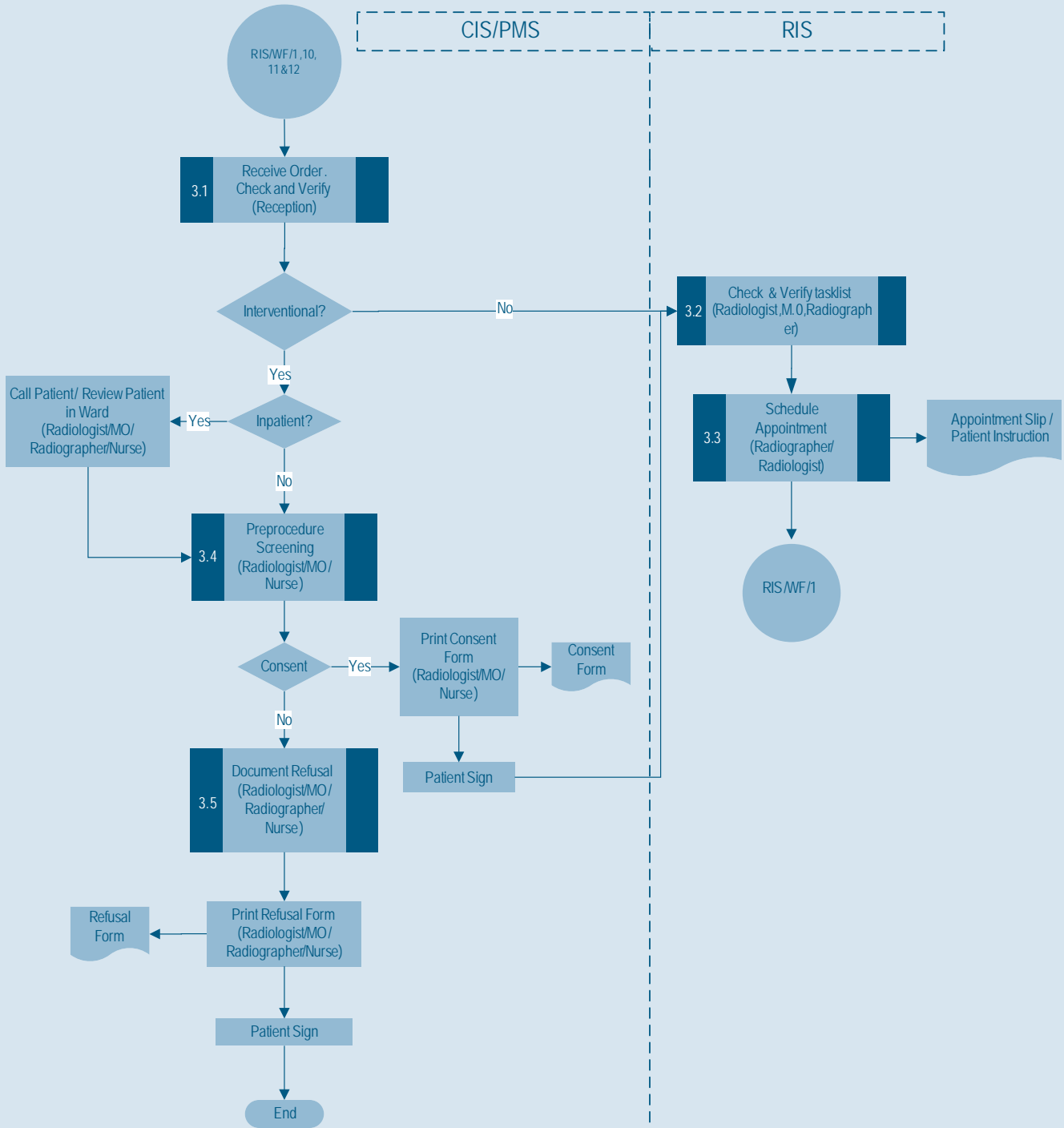


## WORK PROCEDURE FOR RADIOLOGICAL EXAMINATION (EXTERNAL PATIENT) RIS/WP/2

1. This work procedure is applicable for orders for radiological examinations for patients referred from outside the enterprise.
2. The clinician upon making a decision that a radiological examination has to be performed will make a request manually to the imaging department.
3. The imaging personnel will receive and register the order (referral). The order will be checked and verified to confirm if the examination ordered can be accepted or not. The imaging personnel may include the radiologist, MO or radiographer, depending upon the resources available. The decision to accept examination request will be guided by local policy and procedures.
4. Upon making a decision not to accept an examination ordered, the imaging personnel will check to see whether modification to the examination can be made or not. If the order can be modified, the imaging personnel will modify the order. If the examination is not required then the order is cancelled.
5. Once the order is accepted, the case shall be preregistered at point of care as per PMS Registration Module using Radiology Registration Number. The order will be executed in the RIS as per CIS Order Module.
6. When the patient arrives on the day of examination, the receptionist shall acknowledge patient arrival and this shall match the PID to be issued.
7. For examination requiring appointment, the case shall be scheduled. Refer to RIS/WF/4 (Scheduling For External Patients). For examination that does not require an appointment, the radiographer shall view the worklist in order to perform the examination. Refer to RIS/WF/7(Gen), RIS/WF/10 (Special), RIS/WF/11(Mammo)
8. Upon completing the examination, the radiologist will view the film and make a diagnosis in the RIS. The report will be printed and distributed together with the film to the requesting clinicians. Refer RIS/WF/14 (Image Reporting), RIS/WF/17 (Hard & Soft Copy) For cases referred from private clinic/hospital, the patient have to settle the charges at the main registration counter and evidence of payment is required before films and report is released to the patient.



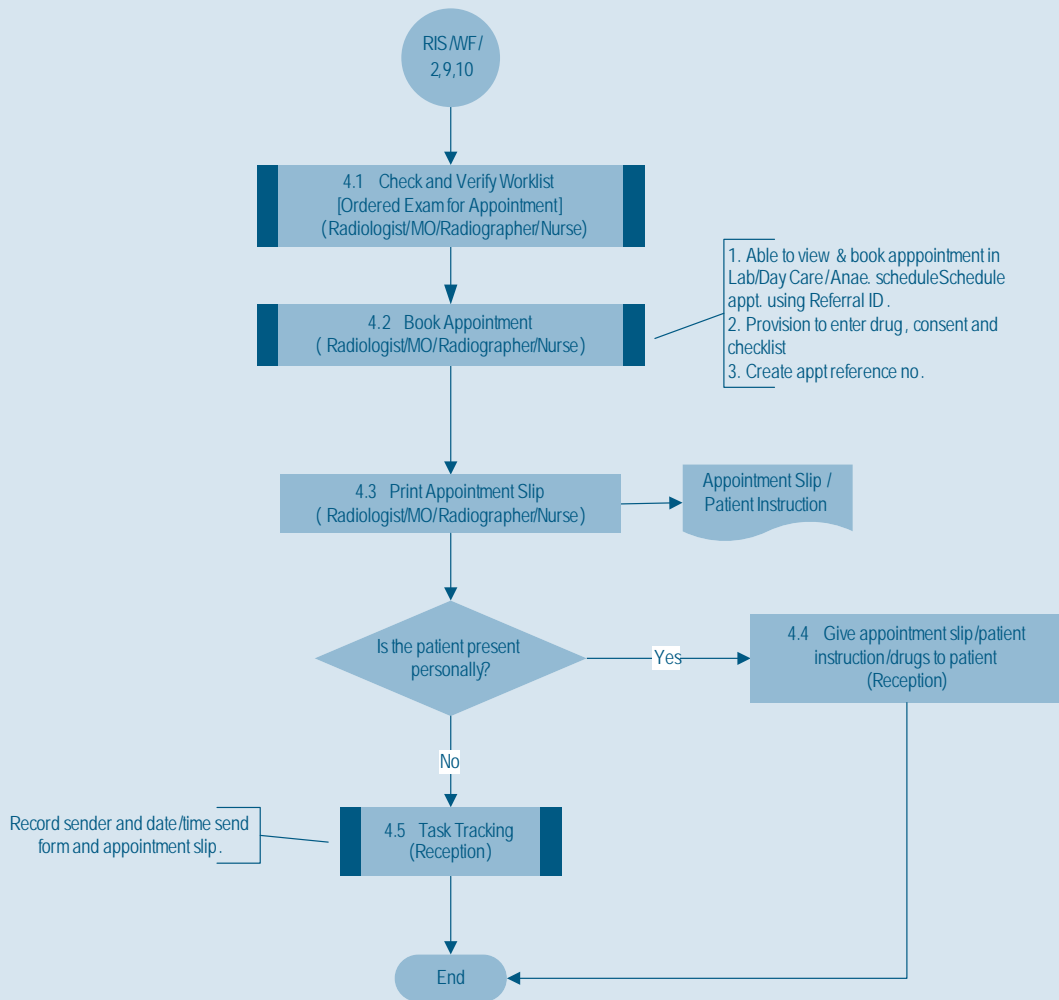
## WORKFLOW FOR SCHEDULING RADIOLOGICAL EXAMINATION (INTERNAL PATIENT) RIS/WF/3



## WORK PROCEDURE FOR SCHEDULING RADIOLOGICAL EXAMINATION (FOR INTERNAL PATIENTS) RIS/WP/3

1. This work procedure is applicable for scheduling radiological examination appointment for patients within the hospital and enterprise. This work procedure is not applicable for patients referred from outside the enterprise.
2. Upon receiving the order for making appointment, the imaging personnel will schedule the appointment in RIS, which will be transmitted to CIS.
3. For non interventional cases, the radiologist/MO/radiographer/reception shall view tasklist and schedule appointment. If the cases require lab/daycare/anaes scheduling, the imaging personnel shall coordinate the scheduling according to the earliest available dates from the relevant disciplines. However if the given date is not acceptable to the clinician, the clinician shall make the necessary arrangements with the relevant disciplines.
4. The nurse / clinician will retrieve the appointment date in CIS and print out the appointment slip and specific instructions for preparing patient prior to examination. The necessary medication is to be attached to the order. The nurse / clinician will inform the patient / relatives.
5. For Interventional cases, the radiologist/ MO/nurse shall do pre procedure screening for review of cases. If the patient is agreeable for the procedure, the radiologist or MO shall obtain the consent from the patient and then schedule the appointment. If the patient is not agreeable for the procedure, document the refusal in the refusal form. The patient shall sign the consent or refusal form.

## WORKFLOW FOR SCHEDULING RADIOLOGICAL EXAMINATION (EXTERNAL PATIENT) RIS/WF/4

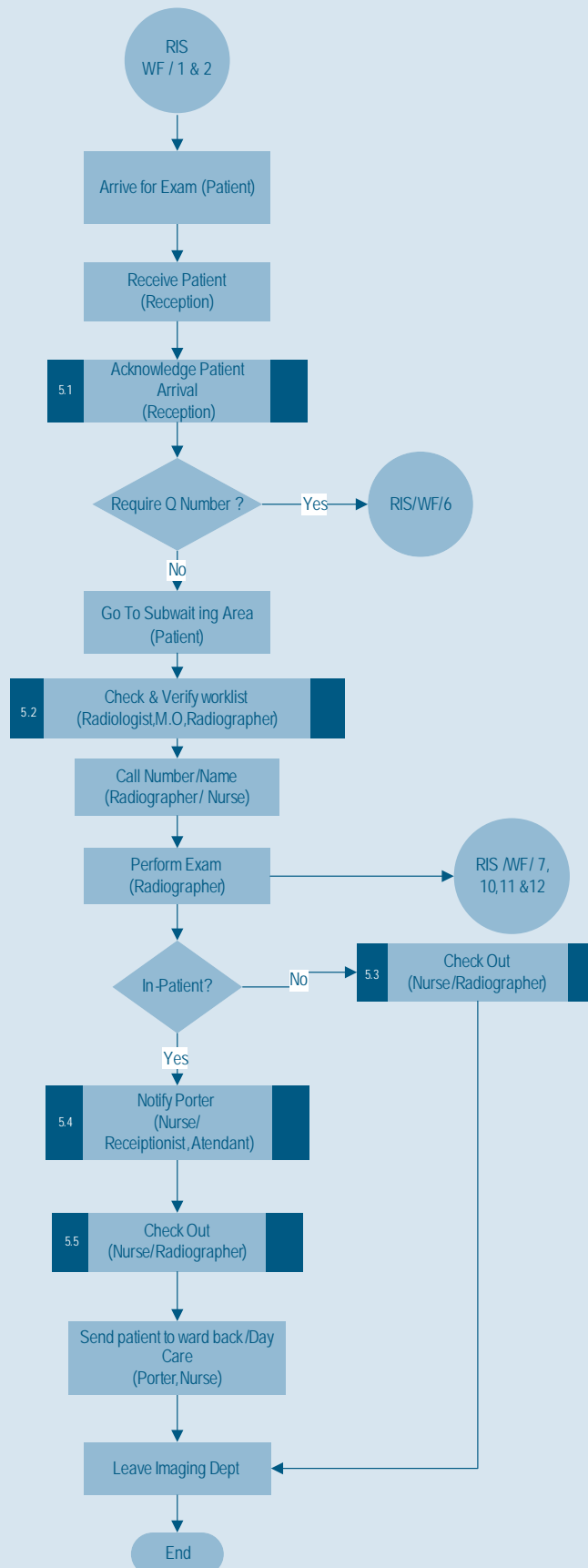


## WORK PROCEDURE FOR SCHEDULING RADIOLOGICAL EXAMINATION ( FOR EXTERNAL PATIENT )

### RIS/WP/4

1. This work procedure is applicable for scheduling and making appointment for radiological examination for patients referred from outside the enterprise.
2. Upon receiving the request for an appointment, the imaging personnel at the reception counter will schedule appointment in RIS. Appointment slip and instructions to the patient will be printed.
3. The patients may or may not be present personally in the imaging department at the time of scheduling appointment. If the patient/relative is present, they are counselled and pre – examination medication from the floor stock is given and documented.
4. For those cases where the patients bring the forms personally, the imaging personnel at the reception counter will give appointment slip to the patient and explain specific instructions of preparation as indicated. The medication preparation shall be attached to the order.
5. For those instances where the request form alone is sent, the imaging personnel at the counter will send the form back to the requesting clinician indicating the appointment date and specific preparation required.
6. Upon receiving the forms with the appointment date, the requesting clinician will inform the patient about the date and specific instruction and provide necessary preparation as indicated.

## WORKFLOW FOR PATIENT MOVEMENT IN IMAGING DEPARTMENT RIS/WF/5

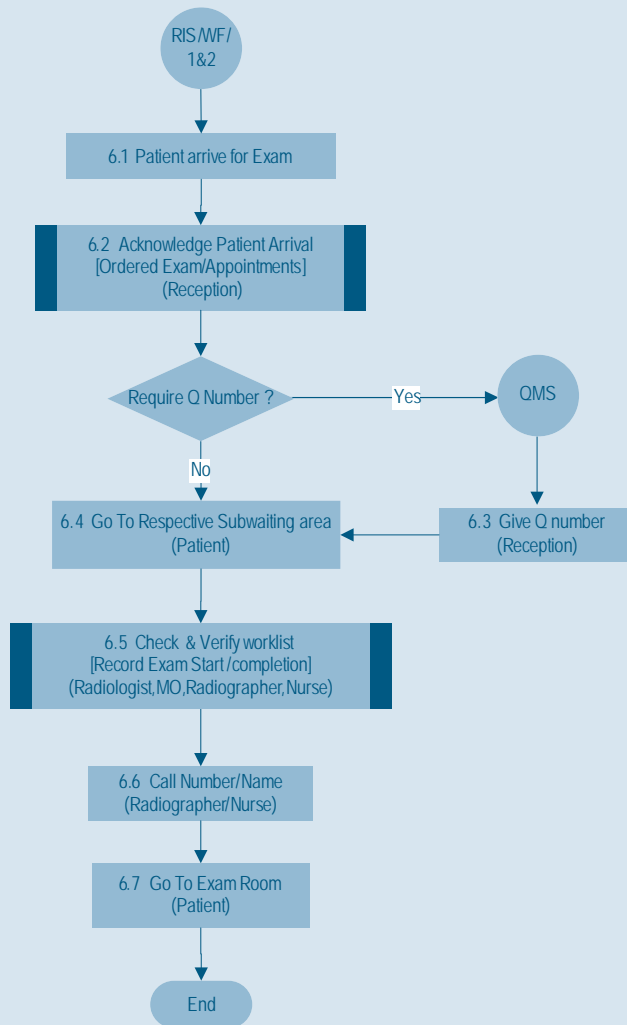


## WORK PROCEDURE FOR PATIENT MOVEMENT IN IMAGING DEPARTMENT RIS/WP/5

1. This work procedure is applicable for patient movement in imaging department. This applies to all patients sent for radiological examination from within the hospital/ enterprise or from outside the enterprise.
2. Upon receiving the patient, the imaging personnel at reception counter will accept the patient for examination as per procedures and guidelines. Refer to RIS/WF/1 for patients within the hospital/ enterprise and RIS/WF/2 for patients from outside the enterprise.
3. Upon accepting the patient, the imaging personnel will acknowledge patient arrival in RIS and check whether a queue number is required or not.
4. For those patients requiring queue number, refer to RIS/WF/6 ( Queue Number)
5. For those patients who do not require queue number they will be requested to wait in the sub-waiting area close to the examination room.
6. The imaging personnel in charge of the examination will check work list in the RIS and confirm the patient has arrived. The imaging personnel will then call the patients to the examination room.
7. The radiological examination will then be performed as per work procedure in RIS/WF/ 7(General Radiography), RIS/WF/10(Special), / RIS/WF/ 11(Mammo), / RIS/WF 12(Angio Interven).
8. Upon completion of examination for outpatients, the patient leave the room and imaging department.
9. For inpatients, the patients will be requested to wait in sub-waiting area until ward staff /porter arrives from the ward.
10. The imaging personnel at the reception counter will inform the porter/ward staff to fetch the patient.
11. The patient will leave the imaging department accompanied by the porter/ ward staff.



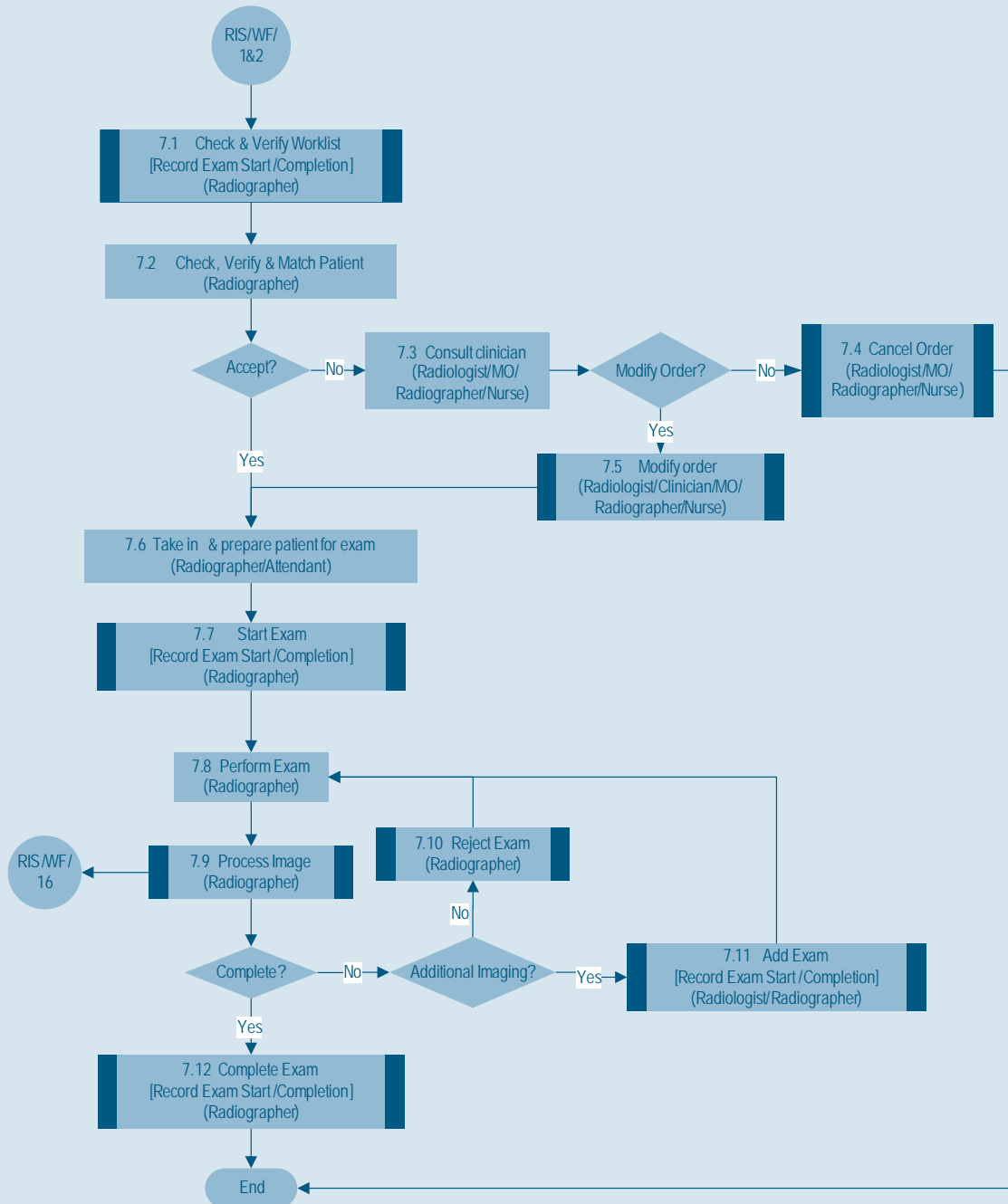
WORKFLOW FOR PATIENT QUEUING FOR RADIOLOGICAL EXAMINATION IN IMAGING DEPARTMENT  
RIS/WF/6



## WORK PROCEDURE FOR PATIENT QUEUING FOR RADIOLOGICAL EXAMINATION IN IMAGING DEPARTMENT RIS/WP/6

1. This work procedure is applicable for patients queuing in Imaging Department. This applies both for internal and external patients.
2. Upon patient arrival at the imaging department, the imaging personnel at the reception counter will acknowledge patient's arrival and give queue number for non critical cases. A duplicate number will be generated, one for the patient and one attached to the appointment card. Separate series of number will be given for different categories of patient (ED, Ambulatory, Non Ambulatory, Senior Citizens/Paediatrics).
3. Critical cases will not be given queue number and will be sent directly to the examination room.
4. Upon arrival at the sub-waiting area, the patient will wait for his number to be called.
5. The imaging personnel in examination room will view and call the 'next' number. The 'next' number refers to the patient queue number in sequence.
6. When a number is called, the patient whose number is called will go in for the examination. For non ambulatory cases, the imaging personnel will attend to the patient in the sub waiting area and bring the patient in for the examination.

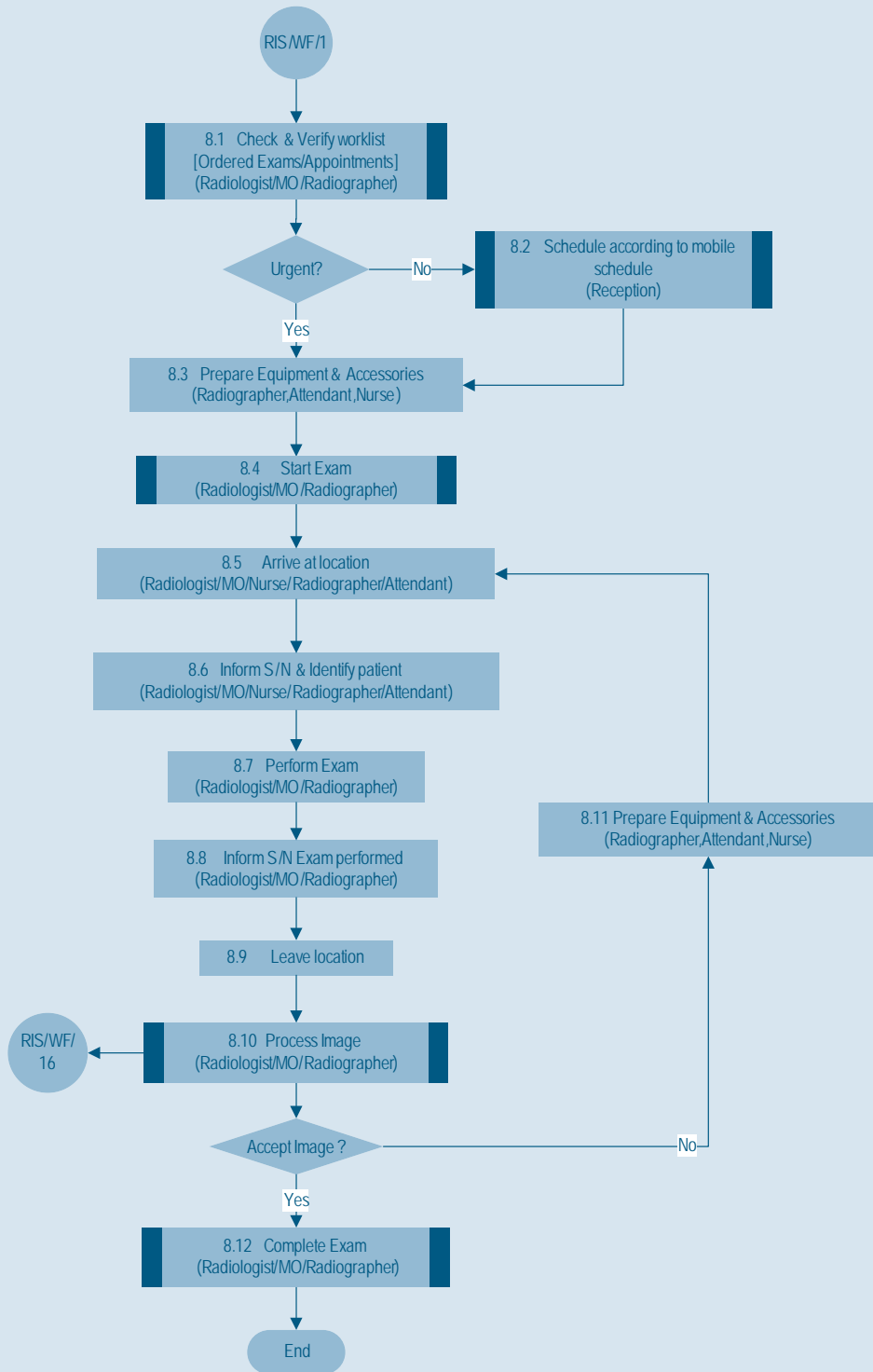
## WORKFLOW FOR PERFORMING GENERAL RADIOGRAPHY EXAMINATIONS RIS/WF/7



## WORK PROCEDURE FOR PERFORMING GENERAL RADIOGRAPHY EXAMINATIONS IN IMAGING DEPARTMENT RIS/WP/7

1. This work procedure is applicable for performing general radiological examination for internal and external patients.
2. The patients may be critical or non-critical. Non critical patients will have a queue number whereas critical cases will not.
3. Therefore at the sub-waiting area, there will be a mixture of patients with and without queue number.
4. The radiographer in the examination room will view work list to check on the number of patients waiting.
5. Priority will be given to critical cases that will be called by name.
6. As for non critical cases with queue number, the patient will be called in sequence according to the queue number given at reception counter. Refer RIS/WF/6 (Queing Patients).
7. When the patient arrives at the examination room, the radiographer will check and verify the order details.
8. If the order details does not match the patient in the room (i.e. not the correct patient), the patient will be requested to wait for their turn.
9. If the order details match, the radiographer will perform the examination as per work procedure.
10. Upon completion of examination, the patient will leave the examination room. Refer RIS/WF/14 (Image Reporting), RIS/WF/16 (PACS), RIS/WF/17 (Hard & Soft Copy).

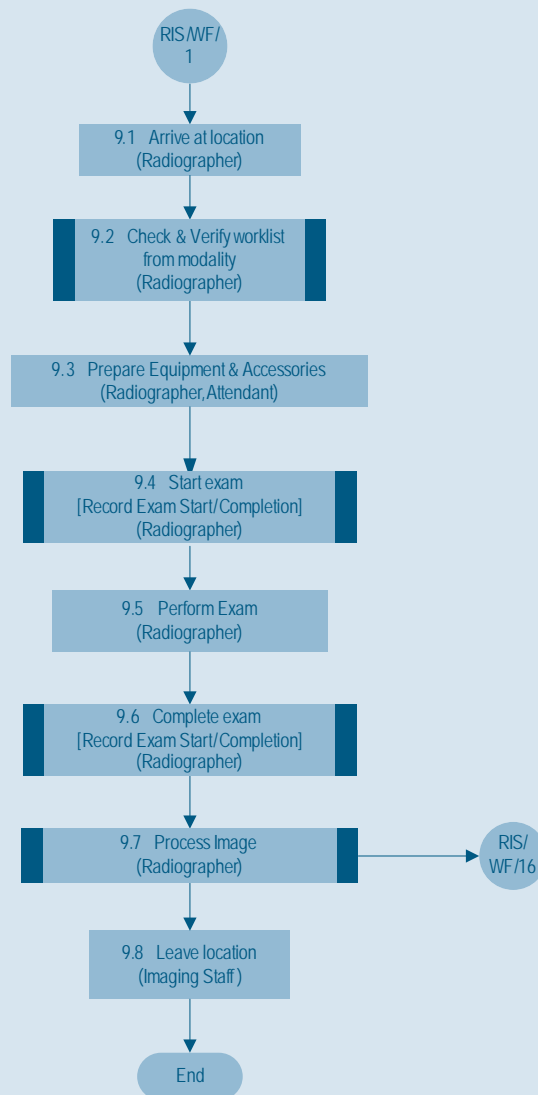
**WORKFLOW FOR MOBILE IMAGING SERVICES (GENERAL, US, C-ARM)**  
**RIS/WF/8**



## WORK PROCEDURE FOR MOBILE IMAGING SERVICES (GENERAL, US, C-ARM) RIS/WP/8

1. This work procedure is applicable for both mobile general radiography and ultrasound.
2. The imaging personnel in the examination room will view work list to check on the number of mobile request and status.
3. For urgent cases, the clinicians have to call the imaging personnel. For routine mobile, cases will be done according to mobile schedule.
4. The imaging personnel will prepare equipment & accessories to be brought to the requesting location
5. On arrival at the location, the team shall inform the ward staff to identify the patient. The team will then proceed with the examination
6. The ward staff will also be informed when the examination has been performed and the team will leave the location.
7. The radiographer will process the image in the imaging department. Images will be viewed and if not acceptable, the examination will be repeated.
8. For ultrasound images, images will be selected for archiving.
9. Upon completion of examination, ultrasound examination will be reported. Mobile General Examination will be reported on request only. Images will be archived. Refer RIS/WF/14 (Image Reporting), RIS/WF/16 (PACS).

## WORKFLOW FOR SATELLITE STATIC FLUOROSCOPY EXAMINATION RIS/WF/9

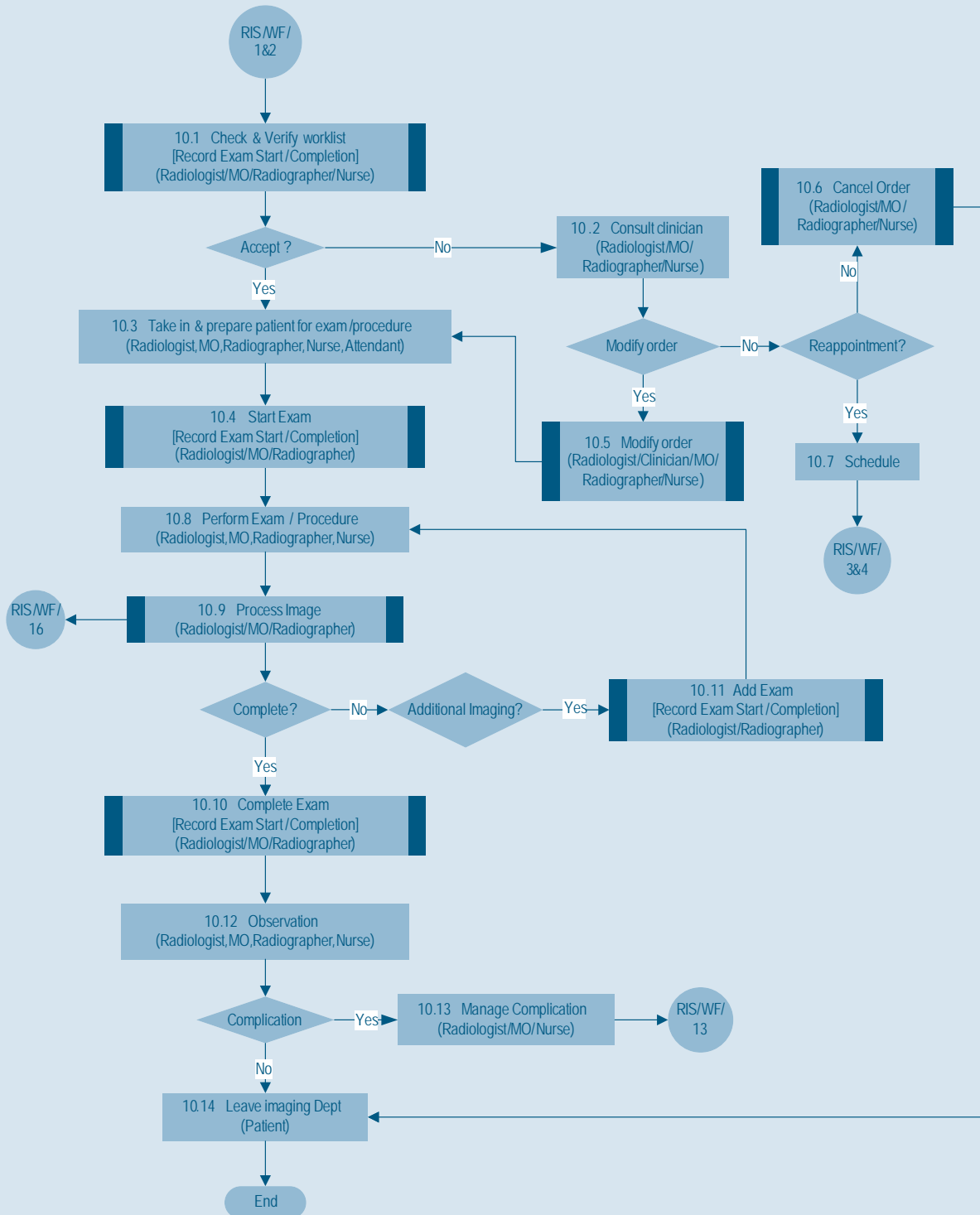


**WORK PROCEDURE FOR SATELLITE STATIC FLUOROSCOPY RADIOLOGICAL EXAMINATION**  
**RIS/WP/9**

1. This work procedure is applicable for radiological fluoroscopy examination in the Invasive Cardiac Lab, Daycare and C-Arm
2. The radiographer will view work list to check on the number of request and location.
3. On arrival at the location, the radiographer will change to the proper attire according to local policy.
4. The radiographer shall notify the staff on arrival. The radiographer will prepare the equipment and proceed with the examination.
5. Upon completion of examination, the images are processed and reporting is done on request only. Refer RIS/WF/14 (Image Reporting), RIS/WF/16 ( PACS).



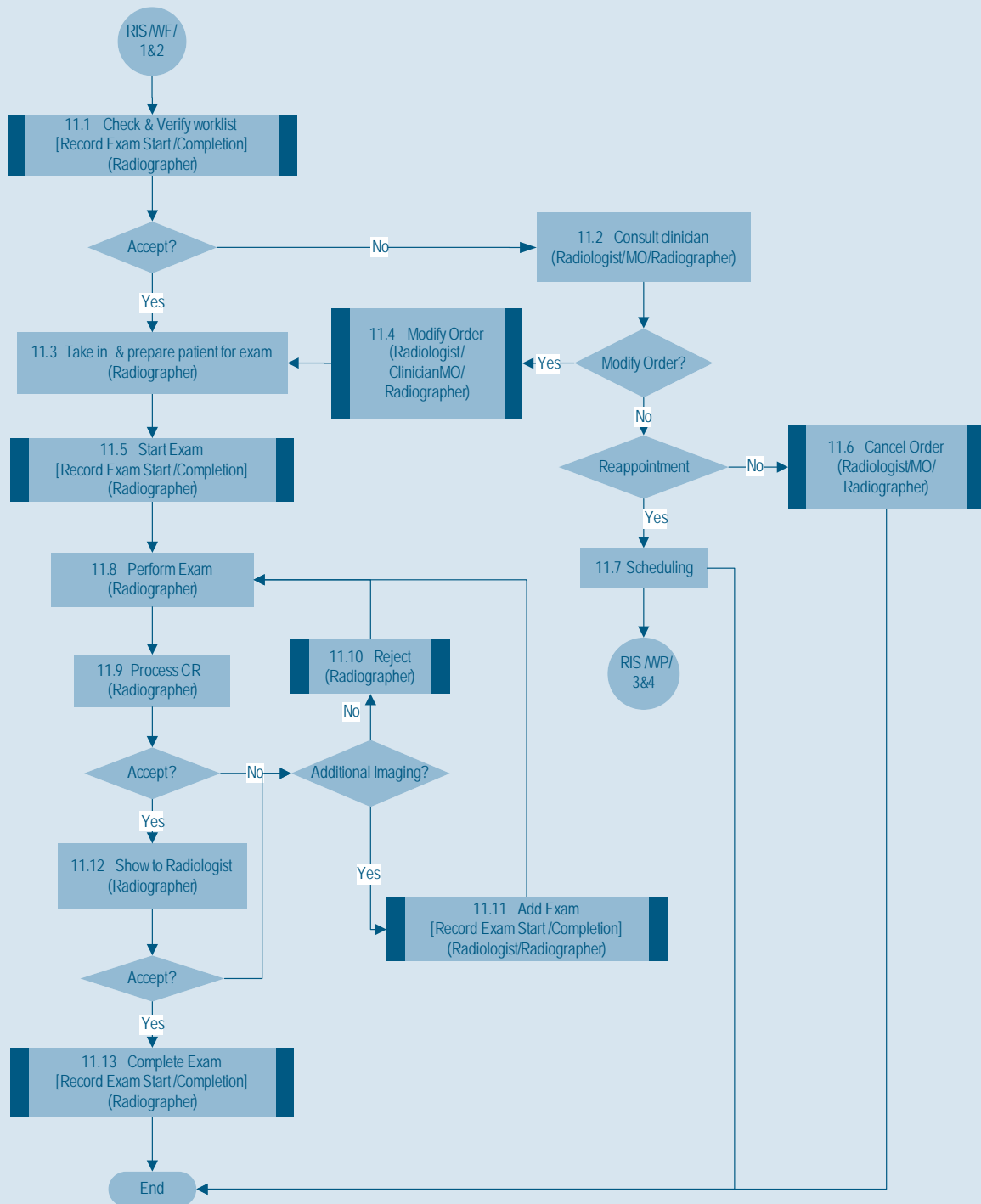
## WORKFLOW FOR PERFORMING SPECIAL PROCEDURES (USG, CT, MRI, FLUO, IVU) RIS/WF/10



**WORK PROCEDURE FOR PERFORMING SPECIAL PROCEDURES (ULTRASOUND, CT, MRI, FLUOROSCOPY & IVU)**  
**RIS/WP/10**

1. This work procedure is applicable for performing special procedures (Ultrasound, CT, MRI, Fluoroscopy, & IVU) for internal and external patients.
2. On receiving patients, the imaging personnel shall check and verify patient with the worklist and patient preparation. If the case is accepted, the patient is taken in and prepared for the examination.
3. If the case is not accepted, the imaging personnel shall discuss with clinician by phone to decide whether the examination is still required. If it is still required, the case is rescheduled. Refer to RIS/WF/3 (Scheduling For Internal Patients), RIS/WF/4 (Scheduling For External Patients). If the examination is not required, the order is cancelled.
4. The examination shall be performed according to the imaging protocols.
5. The image shall be processed and viewed by radiologist to decide whether additional imaging is required. If required, imaging personnel shall place the new order in RIS and update in CIS. If not required, examination can be completed. Refer RIS/WF/14 (Image Reporting), RIS/WF/16 (PACS) and RIS/WF/17 (Hard & Soft Copy).
6. The patient is observed for any complication. If yes refer to RIS/WF/13 (Complication). If no, patient can leave department.

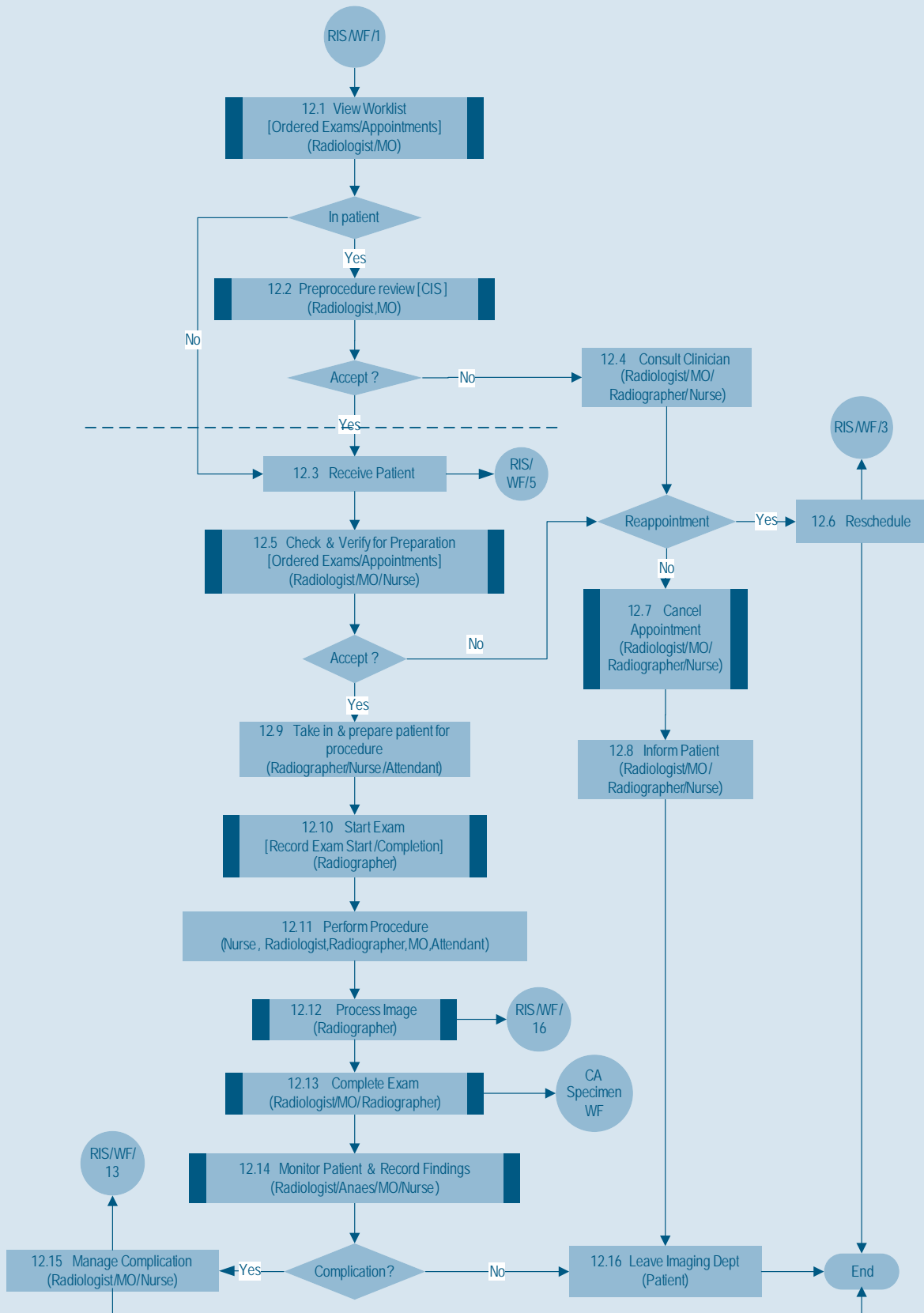
## WORKFLOW FOR PERFORMING MAMMOGRAPHY EXAMINATION RIS/WF/11



## WORK PROCEDURE FOR PERFORMING MAMMOGRAPHY EXAMINATION. RIS/WP/11

1. This work procedure is applicable for performing mammography examination for internal and external patients.
2. On receiving patients, the imaging personnel shall check and verify patient with the worklist. If the case is accepted, the patient is taken in and prepared for the examination.
3. If the case is not accepted, the imaging personnel shall discuss with the clinician by phone to decide on alternative examination. If the order can be modified it will be modified. If not, the case is cancelled or rescheduled. Refer to RIS/WF/3 (Scheduling For Internal Patients), RIS/WF/4(Scheduling For External Patients).
4. The examination shall be performed according to the imaging protocols.
5. The image shall be processed and checked for image acceptance. If accepted, the image will be shown to the radiologist who will then decide whether additional imaging is required. If required, the radiologist will place a new order through RIS and update in CIS. If the image is not of diagnostic quality, the image is rejected and a repeat is required. The reason for rejection shall be captured.
6. If the image is accepted, the examination can be completed. Refer RIS/WF/14 (Image Reporting), RIS/WF/16 (PACS), RIS/WF/18 (Digitize Image) and patient leaves department.

## WORKFLOW FOR PERFORMING ANGIOGRAPHY AND INTERVENTIONAL PROCEDURE. RIS/WF/12

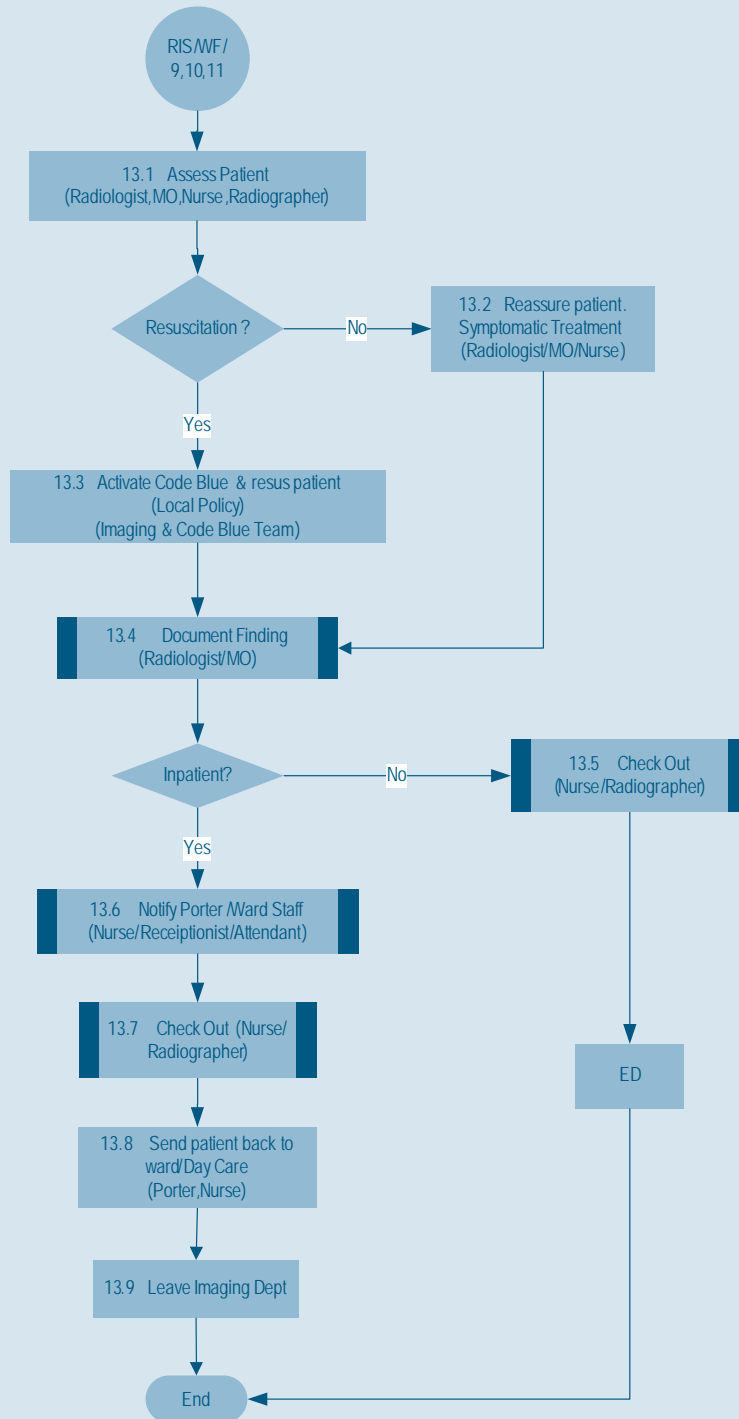


## WORK PROCEDURE FOR PERFORMING ANGIOGRAPHY AND INTERVENTIONAL PROCEDURE.

### RIS/WP/12

1. This work procedure is applicable for performing Angiography and Interventional procedures.
2. The imaging personnel shall view the tasklist for angiography and interventional procedures and perform preprocedure round/review.
3. If the case is accepted, the patient is sent to imaging and reception will acknowledge the arrival. The patient is sent to the subwaiting area and the imaging staff will check and verify the preparation. If adequately prepared, the patient is taken into the procedure room to start the examination.
4. If at any stage, the case is not accepted, the imaging personnel shall discuss with clinician by phone to decide whether the examination is still required. If the examination is still required, the case is rescheduled. Refer to RIS/WF/3 (Scheduling For Internal Patients). If the examination is not required, the order is cancelled and the patient will be informed and will leave imaging department.
5. The examination shall be performed according to the Angiography and Interventional imaging protocols. The patient shall be monitored throughout the procedure.
6. Upon completion of examination, the procedure is recorded in CIS, image processed and report generated. Refer RIS/WF/14 (Image Reporting), RIS/WF/16 (PACS).
7. The patient is observed for any complication. If yes refer to RIS/WF/13 (Complication). If no, patient can leave department.

**WORKFLOW FOR EMERGENCIES IN RADIOLOGY DEPARTMENT.**  
**RIS/WF/13**

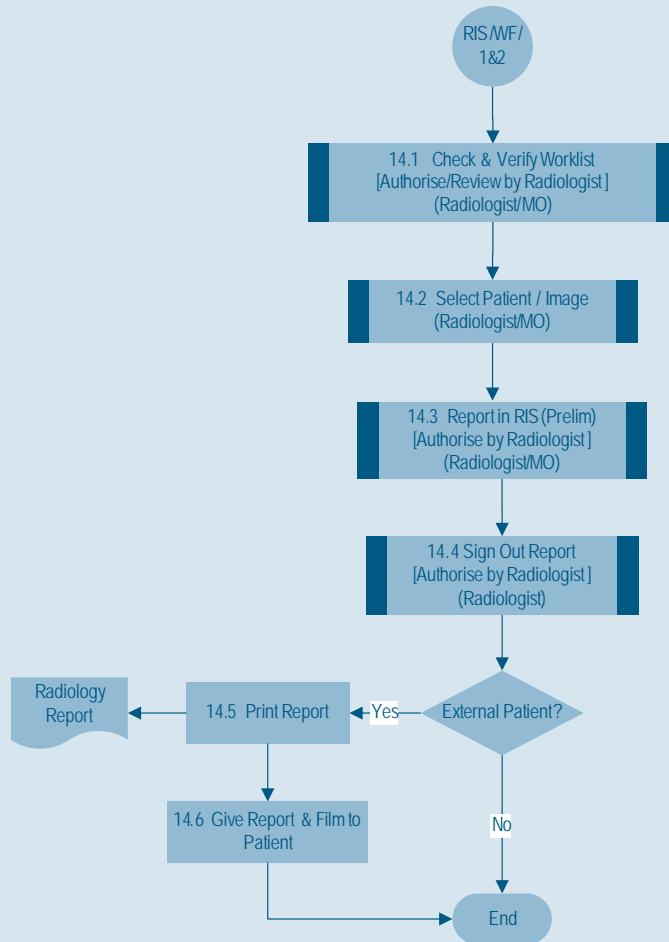


## WORK PROCEDURE FOR EMERGENCIES IN RADIOLOGY DEPARTMENT. RIS/WP/13

1. This work procedure is applicable for any emergencies encountered in Radiology department.
2. The imaging personnel will assess the patient and if necessary resuscitate patient and activate "CODE BLUE". If not, reassure and give symptomatic treatment.
3. If resuscitation is successful and patient is stable, call the ward to fetch patient for inpatient case. For outpatient refer to ED as per PMS Referral Policy.
4. In the event of death, for outpatient the case shall be referred to ED and for inpatient the case will be sent back to the respective ward.
5. Document the findings in CIS



## WORKFLOW FOR IMAGE REPORTING. RIS/WF/14

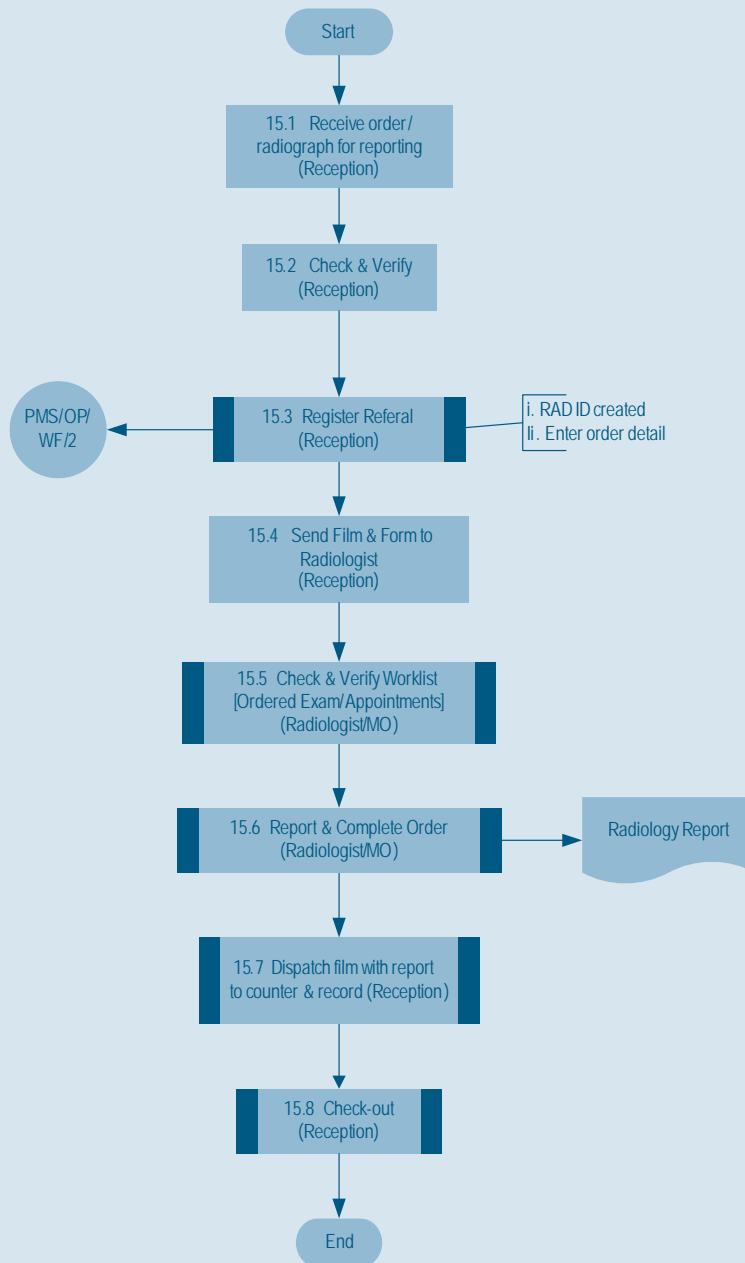


## **WORK PROCEDURE FOR IMAGE REPORTING.**

### **RIS/WP/14**

1. This work procedure is applicable for any image reporting procedures as per local policy.
2. The imaging personnel will view the work list for reporting.
3. The radiologist will select the images or patient's data and report in RIS. The preliminary report shall be made available for the clinician to view in CIS for internal patient. Modification to the report can be done before the final report is made. A change to the final report is saved as addendum.
4. For external patients, a report will be printed and sent to the requesting clinicians together with the film/ soft copy.
5. The images will be stored in PACS. Refer RIS/WF/16 (PACS).

## WORKFLOW FOR IMAGE REPORTING/ REFERRAL CONSULTATION RIS/WF/15

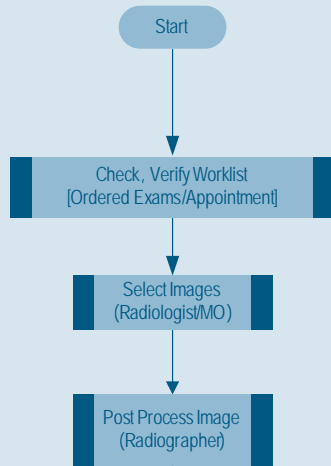


## WORK PROCEDURE FOR EXTERNAL IMAGES REPORTING RIS/WP/15

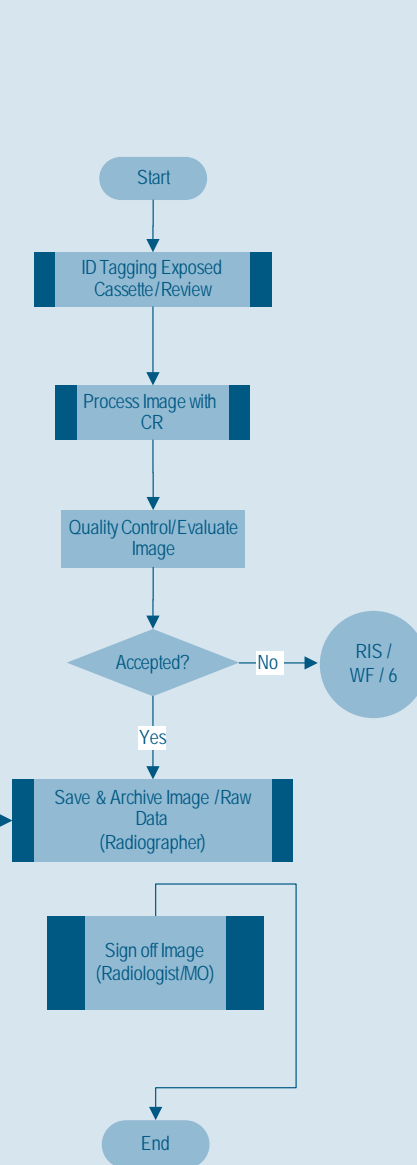
1. This work procedure is applicable for external images reporting as per local policy.
2. Upon receiving request form and images for reporting, the reception will check, verify and match form and images.
3. The order shall be registered using Image Registration Number.
4. The reception staff will send the images together with the form to the radiologist for reporting.
5. The radiologist will view the images and make the report in the RIS, and will print the report.
6. The images with the report will be dispatched to the counter and the imaging personnel will check out the order.
7. Images dispatched with the report should be captured in the system.

PACS WORKFLOW (RADIOLOGY)  
RIS/WF/16

WORKFLOW FOR MODALITIES  
(CT, MRI, MAMMOGRAM, FLURO)  
(without cassette)



WORKFLOW FOR COMPUTER RADIOLOGY  
(using cassette)

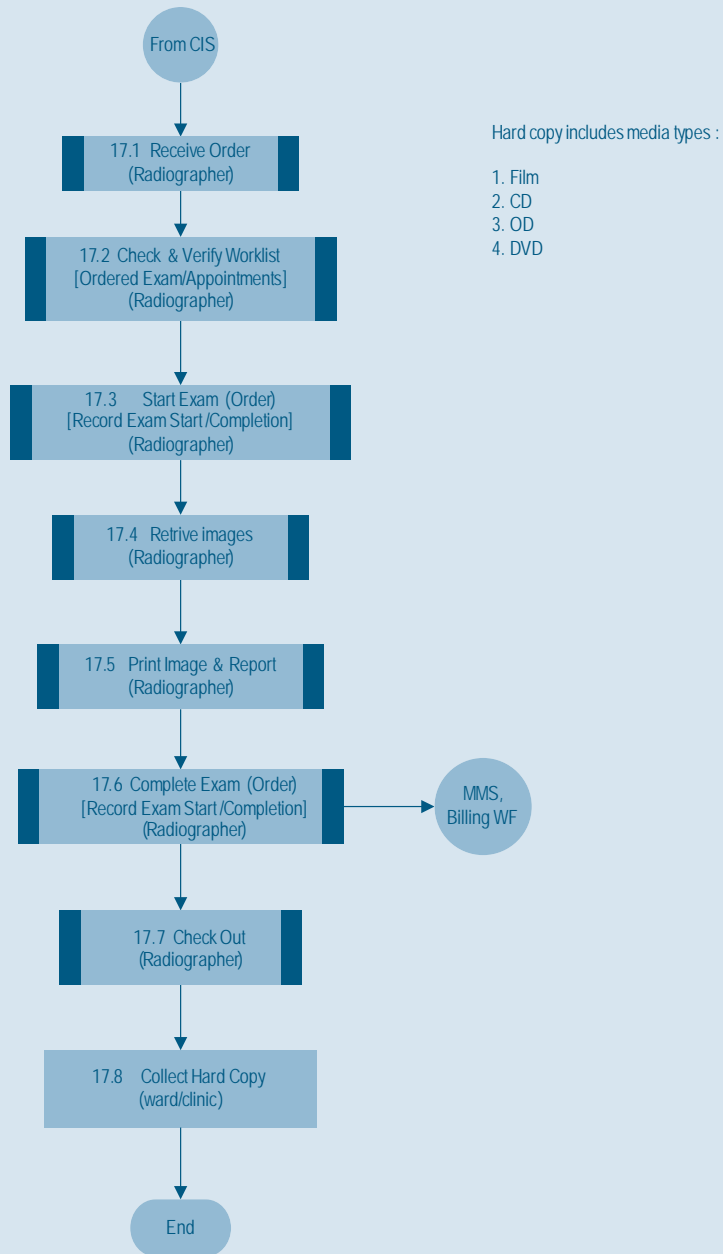


## WORK PROCEDURE FOR PACS (RADIOLOGY)

### RIS/WP/16

1. This work procedure is applicable for the processing and archiving of images.
2. Upon completion of performing examination, the radiographer has to process image according to the modalities.
3. If imaging plate is used, image is scanned through a cassette reader; the image shall be processed and checked for image acceptance.
4. If image is acceptable, image will be saved and sent to archive by radiographer. If image is not acceptable, the radiographer has to repeat the examination.
5. If imaging plate is not used, the images are viewed at the workstation. The images are selected by the radiologist. Post-processing of images will be done by the radiographer. The images and raw data shall be saved and sent to archive.
6. The radiologist/ MO will retrieve images from archive for reporting.
7. Upon completion of report, the radiologist shall sign off image. Refer RIS/WF/14 (Image Reporting)

## WORKFLOW FOR HARD AND SOFT COPY RIS/WF/17

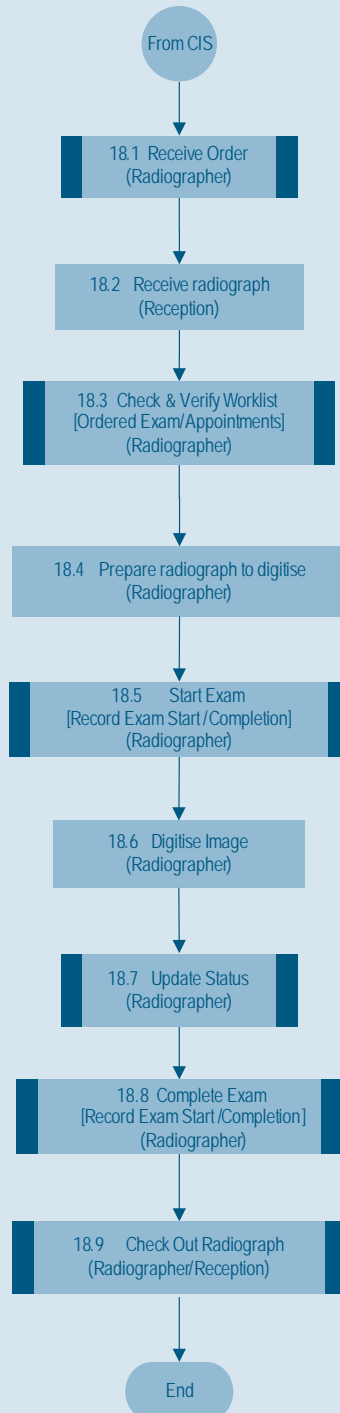


## WORK PROCEDURE FOR HARD AND SOFT COPY RIS/WP/17

1. This work procedure is applicable in reproducing images in the form of hard copy (radiograph) and soft copy media.
2. Upon receiving the order, the imaging personnel will check, verify and acknowledge the order.
3. The radiographer will start the examination by retrieving images from the archive and match the images to the order.
4. For hard copy, the images will be reproduced as radiograph and for soft copy; the images will be burned to CD ROM.
5. Upon completion of the order, the imaging staff will check out the order.
6. Hard copy radiograph or soft copy media dispatched should be captured through the system.



## WORKFLOW FOR DIGITIZING IMAGE RIS/WF/18



## WORK PROCEDURE FOR DIGITIZING IMAGE. RIS/WP/18

1. This work procedure is applicable for digitizing images requested by the clinician for internal patient through the CIS.
2. On receiving the order for digitizing images, the reception will receive the radiograph and inform the radiographer concerned.
3. Upon receiving the radiographs, the radiographer will view the worklist for digitizing images to check, match and verify the radiograph.
4. If acceptable, the radiographer will send the radiograph to digitizer work area and start performing digitizing. Updating the status of the digitized images will also be done accordingly.
5. If not, the radiograph will be returned back to the respective clinic/ward.
6. Upon completion of the digitizing, the imaging staff will check out the radiograph back to the respective clinic/ward through the reception counter.
7. Dispatching of the radiograph should be captured through the system.

**5.1. Physician Order Entry (CIS) & Receiving Order:-**

- 5.1.1. Online scheduling system to be made available. Imaging department shall be able to control the system.
- 5.1.2. Schedule orders on requested date and time.
- 5.1.3. Make request on line at point of care.
- 5.1.4. Names of ordering doctor shall appear in Physician Order Entry (POE) and shall be co-signed by specialist.
- 5.1.5. Mechanism of informing and alerting the requesting doctor of the appointment date.
- 5.1.6. Track patients undergoing imaging examination.
- 5.1.7. Single entry, multiple users.
- 5.1.8. Provide list of orderables in CIS.
- 5.1.9. Indicate, view and print special instruction required for preparation of patient, attached to the orderables.
- 5.1.10. Modify, replace, and cancel orders before order completion.
- 5.1.11. Support order tracking at the following levels – Ordered, Completed / Reported / Verified.
- 5.1.12. Retrieve, view and print 'report'.
- 5.1.13. Names of reporting doctor to appear in the report and to be co-signed by the radiologist.
- 5.1.14. System enabled check list to be provided for obtaining consent.
- 5.1.15. For special examination such as MRI, CT scan, mammogram and angiogram, validation should be system enabled.

**5.2. Receive Imaging Request:-**

- 5.2.1. Alert system to indicate specific request e.g. Mobile/ Urgent
- 5.2.2. View:-
  - 5.2.2.1. Patient demographics.
  - 5.2.2.2. Work list for all radiological examination at any workstation.
  - 5.2.2.3. Order details.
  - 5.2.2.4. Priority listing.
  - 5.2.2.5. Filter work list according to date, modalities.
  - 5.2.2.6. Generate management report and workload statistic of the department.
  - 5.2.2.7. Generate label.

**5.3. Receive Patient:-**

- 5.3.1. Read bar-code, ID-card, GMPC.
- 5.3.2. Record patient arrival / departure time.
- 5.3.3. Alert that the patient is scheduled for more than one exam / procedure for the day.
- 5.3.4. To queue patient by time of arrival and modalities / rooms.

**5.4. Perform Examination:-**

- 5.4.1. View order details/ comment / allergies by radiographer/radiologist.
- 5.4.2. Provision of "field" for 'radiologist' assigned to the procedures.
- 5.4.3. Modify, replace, cancel, reschedule orders (at Ordered status)
- 5.4.4. Update examination status:-
  - 5.4.4.1. start, complete, cancel, replace.
- 5.4.5. Able to record 'repeat / reject' examinations with reasons for 'repeat / reject' and number of films used / images taken.
- 5.4.6. Route completed special examination / procedure to specific radiologist work list for reporting.
- 5.4.7. Ability to re-route to another radiologist work list, cases already assigned to a specific radiologist.
- 5.4.8. Provision of a text area for radiologists' / radiographer.
- 5.4.9. Ability to support pre-coded format for contrast examination.
- 5.4.10. Ability to enter complications for current procedure and extract information on complications from previous procedure.
- 5.4.11. Filter Exam according to:-
  - 5.4.11.1. Date (+/- 24 hrs), Department, Modalities etc.
- 5.4.12. Able to:-
  - 5.4.12.1. 'RESET' started exam.
  - 5.4.12.2. REMOVE' completed exam with authorisation.
  - 5.4.12.3. Record Name of personnel performing the examination according to log in ID.
  - 5.4.12.4. Add other personnel involved in the procedure if required other than the login personnel.
  - 5.4.12.5. Record exposure factor.

## 5.5. Image Processing (PACS):-

- 5.5.1. Data - Single entry, multiple user.
- 5.5.2. Ability to post-process / update image.
- 5.5.3. Ability to insert exposure factors on images.
- 5.5.4. Images routed automatically to patient location.
- 5.5.5. Ability to print images from modality and from workstation.
- 5.5.6. Send images manually to other location when required.
- 5.5.7. Off-line data entry when necessary and subsequently auto-update.
- 5.5.8. Digitise film.

## 5.6. Image Distribution:-

- 5.6.1. All workstation in imaging department shall be of high resolution for diagnostic purposes.
- 5.6.2. High resolution diagnostic workstation shall also be provided for in critical

areas such as, Accident & Emergency Department, OT, ICU, CCU, NICU, Ambulatory Care, Specialist Clinics (shared) Wards (shared), CME Department.

5.6.3. Other areas shall be provided with viewing workstation.

5.6.4. Images routed automatically to patient location subject to local policy.

5.6.5. Send images manually to other location when required.

## 5.7. Image Archiving:-

5.7.1. ARCHIVE must be able to:-

5.7.1.1. Distribute images automatically to patient location.

5.7.1.2. Retrieve images on request.

5.7.2. Pre-fetching of previous images automatically upon orders from RIS.

5.7.3. Save and retrieve in-cine mode.

## 5.8. Image Reporting:-

5.8.1. 'RIS' Ability:-

5.8.1.1. To enter reporting application only with password.

5.8.1.2. Name of reporting doctor should be auto-captured from log-in ID into reporting application NOT from drop-list.

5.8.1.3. View patient EMR.

5.8.1.4. When the report is on 'HOLD', it is not transmitted to the requesting doctor. Status shown in work list and radiologist reporting list.

5.8.1.5. Reports will only be transmitted to patient record in patient's EMR automatically at 'SAVE'.

5.8.1.6. Append report without losing the original report once the report is verified.

5.8.1.7. To transmit report both 'HOLD' and 'SAVE' to another radiologist within the department for second opinion, who will then concur or append.

5.8.1.8. To support annotation in the reporting format.

5.8.1.9. Have a report template which can also be modified. To include anatomy.

5.8.2. Voice – recognition dictation system (optional).

5.8.3. Print out report.

5.8.4. To retrieve previous radiological reports in the same reporting application.

5.8.5. To provide different levels of reporting status.

5.8.6. To filter by:-

5.8.6.1. Date.

5.8.6.2. Exam.

5.8.6.3. Modality.

5.8.6.4. Priority.

## 5.9. Request for Radiological Examination From Imaging Department (Department

### **Order Entry):-**

- 5.9.1. Ability to place / reschedule orders on requested date and time in RIS.
- 5.9.2. Ability to track patients schedule for other examinations (future appointments).
- 5.9.3. Ability to track duplicate request within a selected time frame.
- 5.9.4. Single entry, multiple user of data.

### **5.10. Management Report:-**

- 5.10.1. Built in Q.A. output that meet requirements of relevant agencies to generate management report.
- 5.10.2. Statistics format as for IDS.
- 5.10.3. Turnaround time for reports.
- 5.10.4. Waiting time for appointments for special examinations by modality.
- 5.10.5. Turnaround time for examinations.
- 5.10.6. Rate of radiographs rejected, reasons for rejecting.
- 5.10.7. Rates of complication related to radiological examinations.
- 5.10.8. Incident reporting e.g. reaction to contrast media, accidents.
- 5.10.9. Material utilisation report.

### **6.1. IMAGING ORDER REQUEST:-**

- 6.1.1. POE through CIS.
- 6.1.2. Request received in RIS.
- 6.2. IMAGING INSTRUCTION:-**
  - 6.2.1. By radiologist to radiographer through RIS.
  - 6.2.2. For various modalities such as X-ray, CT scan, MRI, endoscopy, ultrasound etc.
- 6.3. IMAGE CAPTURE:-**
  - 6.3.1. Image taken according to instruction.
  - 6.3.2. Image indexed and stored.
  - 6.3.3. Image transmitted to Radiologist.
  - 6.3.4. Option to transmit image to requesting doctor via CIS.
- 6.4. IMAGE READING:-**
  - 6.4.1. High Resolution 2 KB Diagnosis Workstations must be provided for Radiologist. Numbers provided will depend upon the scope and range of modalities available in the hospital.
  - 6.4.2. High Resolution 1 KB Diagnosis Workstations must be provided for Radiology Department and for certain disciplines where high resolution modality images are read by requesting doctors.
  - 6.4.3. Images must be able to be viewed from normal networked PCs.
  - 6.4.4. For high resolution diagnostic workstations there must be features for image manipulation such as zooming, rotation adjusting contrast and definition, etc.
  - 6.4.5. These reading workstations must also have facility for annotation and printing.
- 6.5. IMAGE ARCHIVING POLICY:-**
  - 6.5.1. To archive images in appropriate media depending on Image Archiving Policy.
  - 6.5.2. Image Archiving Policy is based on how soon or how frequently a particular set of images need to be retrieved.
  - 6.5.3. Images that need to be retrieved immediately or frequently shall be stored on real time disk storage and the response time to be about 10 seconds.
  - 6.5.4. Images that need not be retrieved immediately or less frequently shall be stored in nearline CD ROM or Optical Disks and the response time should be less than 60 seconds.
  - 6.5.5. Images that will not be retrieved for a long time shall be archived in offline CD ROM or Optical Disks and the response time can be up to 60 minutes.
  - 6.5.6. To ensure images stored in media of current technology can be retrieved in the future, there must be regular exercise to copy the archived images into a new set of storage media of the same technology or the prevailing technology.

- 7.1. Reporting of film/radiographs from private hospitals shall be done on M.O.U. basis.
- 7.2. Sufficient resources are available to comply fully to the policy requirement.
- 7.3. RIS is integrated with the HIS.



WORK PROCESS	SYSTEM FUNCTION	DATA OUTPUT	DATA INPUT
1. Management report:- i) Routine. ii) Ad-hoc.	<ul style="list-style-type: none"> <li>Generate routine management reports from the application.</li> <li>Hierarchical structured coding.</li> </ul>	IDS:- <ul style="list-style-type: none"> <li>Ref PER.SS.RA.201 Workload statistics.</li> <li>Starting And Ending Date (time frame of report based on date procedure was done).</li> <li>By default, monthly.</li> </ul>	<ul style="list-style-type: none"> <li>Type of Procedure done according to Body System.</li> <li>Date Procedure was done.</li> </ul>
2. Quality Report.	<ul style="list-style-type: none"> <li>Turn around time for radiological report.</li> </ul>	<ul style="list-style-type: none"> <li>TOT = Date of report completion - Date examination completed.</li> </ul> <ol style="list-style-type: none"> <li>By type of examination.</li> <li>By modality.</li> <li>Average TOT = <math>\frac{\text{Sum \{Date of report - Date procedure completed\}}}{\text{Total \# Procedure completed}}</math> = <math>\frac{\text{Sum TOT}}{\text{Total \# procedure complete in the reporting period}}</math>.</li> </ol>	<ul style="list-style-type: none"> <li>Date and time of exam completion.</li> <li>Date and time of exam report:-                             <ol style="list-style-type: none"> <li>By type of examination.</li> <li>By modality.</li> </ol> </li> </ul>
	<ul style="list-style-type: none"> <li>Waiting time for appointments by modalities only.</li> </ul>	<ol style="list-style-type: none"> <li>Date of appointment – Date of order.</li> <li>Average waiting time by modality = <math>\frac{\text{Sum \{Date of appt - Date of order\}}}{\text{Total \# order for the modality}}</math>.</li> </ol> <ul style="list-style-type: none"> <li>Median waiting time by modality.</li> <li>Mode waiting time by modality.</li> </ul>	<ul style="list-style-type: none"> <li>Date order made.</li> <li>Appointment date:-                             <ol style="list-style-type: none"> <li>By modalities.</li> </ol> </li> </ul>

WORK PROCESS	SYSTEM FUNCTION	DATA OUTPUT	DATA INPUT
	<ul style="list-style-type: none"> <li>Rate of Radiographs rejected.</li> </ul>	<ol style="list-style-type: none"> <li>No. of films rejected.</li> <li>No. of films used.</li> <li>Percentage of films rejected.</li> <li>Breakdown of rejection by reasons (number and percentage).</li> </ol>	<ul style="list-style-type: none"> <li>Film size by type.</li> <li>Standard film quantity to be used.</li> <li>Repeat reasons.</li> <li>Number of film used for repeat examination by patient, by examination.</li> <li>Total no. of films used.</li> </ul>
	<ul style="list-style-type: none"> <li>TOT for examination:-               <ol style="list-style-type: none"> <li>By type of examination.</li> <li>By modality.</li> </ol> </li> </ul>	<ul style="list-style-type: none"> <li>TOT for examination:-               <ol style="list-style-type: none"> <li>Date / time examination started - Date / time patient arrival.</li> </ol> <p>Average TOT:-</p> <ol style="list-style-type: none"> <li>Date / Time examination completed – Date/Time pt arrival.</li> </ol> </li> </ul>	<ul style="list-style-type: none"> <li>Date / time patient arrival.</li> <li>Date / time examination started.</li> <li>Date / time examination completed.</li> </ul>
	<ul style="list-style-type: none"> <li>Rate of complication related to radiological examination.</li> </ul> <ol style="list-style-type: none"> <li>Percutaneous needle aspiration.               <ol style="list-style-type: none"> <li>Pneumothorax - 1 – 4 hours after the procedure.</li> <li>Hemorrhage – 24 hours.</li> </ol> </li> </ol>	<ol style="list-style-type: none"> <li>Total no. of Pneumothorax at 1-4 hrs after procedure / Total no. of percutaneous needle aspiration.</li> <li>Total no. of Hemorrhage within 24 hrs after procedure / Total no. of percutaneous needle aspiration.</li> </ol>	<ul style="list-style-type: none"> <li>Date &amp; time procedure (percutaneous needle aspiration) completed.</li> <li>Date &amp; time pneumothorax ( 1-4 hrs after percutaneous needle aspiration) diagnosed.</li> <li>Date &amp; time of hemorrhage (within 24 hrs after percutaneous needle aspiration) detected.</li> </ul>

WORK PROCESS	SYSTEM FUNCTION	DATA OUTPUT	DATA INPUT
	<ul style="list-style-type: none"> <li>Incident Reporting:-               <ol style="list-style-type: none"> <li>Reaction of contrast media.</li> <li>Accidents.</li> </ol> </li> </ul>	<ol style="list-style-type: none"> <li>Total no. of reaction to contrast media by type.</li> <li>Grand total of reactions.</li> <li>Total no. of accident by type.</li> <li>Grand total of accidents.</li> </ol>	<ul style="list-style-type: none"> <li>Date &amp; time procedure started.</li> <li>Type of reaction.</li> <li>Date &amp; time of accident.</li> <li>Type of accident.</li> </ul>
	<ul style="list-style-type: none"> <li>Material Utilization Report:-               <ol style="list-style-type: none"> <li>Films.</li> <li>Contrast Media.</li> </ol> </li> <li>Create Schedule.</li> </ul>	<ol style="list-style-type: none"> <li>No. of films used.</li> <li>Volume of Contrast Media used in c.c.</li> </ol>	<ul style="list-style-type: none"> <li>Standard data set for consumables used for each procedure:-               <ol style="list-style-type: none"> <li>Quantity film used:-                   <ul style="list-style-type: none"> <li>By size.</li> <li>By type.</li> </ul> </li> <li>Quantity contrast media used by volume and type:-                   <ul style="list-style-type: none"> <li>Others.</li> </ul> </li> </ol> </li> </ul>
3. Appointment / Scheduling.		<ul style="list-style-type: none"> <li>Modality.</li> <li>Day / Date.</li> <li>Location.</li> <li>Type of examination.</li> <li>No. of examination slots per session.</li> <li>No. of reserve / open slots.</li> <li>Name of the Provider.</li> </ul>	<ul style="list-style-type: none"> <li>Modality by type.</li> <li>Day / Date – calendar.</li> <li>Location by room.</li> <li>Type of examination.</li> <li>No. of examination slots per session – morning / afternoon / staggered.</li> <li>No. of reserve / open slots by facility policy.</li> <li>Name of the Provider – radiographer / radiologist.</li> </ul>

WORK PROCESS	SYSTEM FUNCTION	DATA OUTPUT	DATA INPUT
	<ul style="list-style-type: none"> <li>Schedule Appointment.</li> </ul>	<ul style="list-style-type: none"> <li>Name and designation of requesting care provider.</li> <li>Name and ID of patient.</li> <li>Type of exam (modality).</li> <li>Part of body to be examined.</li> <li>Date and time of fixed appointment.</li> </ul>	<ul style="list-style-type: none"> <li>Name and ID of patient.</li> <li>Name and designation of requesting care provider.</li> <li>Type of exam (modality).</li> <li>Part of body to be examined.</li> <li>Date and time of fixed appointment.</li> </ul>
	<ul style="list-style-type: none"> <li>Print Appointment slip.</li> </ul>	<ul style="list-style-type: none"> <li>Name and designation of requesting care provider.</li> <li>Name and ID of patient.</li> <li>Type of exam (modality).</li> <li>Part of body to be examined.</li> <li>Date and time of fixed appointment.</li> <li>Special instructions.</li> </ul>	<ul style="list-style-type: none"> <li>Name and designation of requesting care provider.</li> <li>Name and ID of patient.</li> <li>Type of exam (modality).</li> <li>Part of body to be examined.</li> <li>Date and time of fixed appointment.</li> <li>Special instructions – to derive from standard data set.</li> </ul>
	<ul style="list-style-type: none"> <li>Reschedule Appt.</li> </ul>	<ul style="list-style-type: none"> <li>Name and designation of requesting care provider.</li> <li>Name and ID of patient.</li> <li>Type of exam (modality).</li> <li>Part of body to be examined.</li> <li>Date and time of fixed appointment.</li> <li>Reasons for rescheduling.</li> </ul>	<ul style="list-style-type: none"> <li>Name and designation of requesting care provider.</li> <li>Name and ID of patient.</li> <li>Type of exam (modality).</li> <li>Part of body to be examined.</li> <li>Date and time of fixed appointment.</li> <li>Reasons for rescheduling.</li> </ul>
	<ul style="list-style-type: none"> <li>View task list.</li> </ul>	View Task list by:- <ul style="list-style-type: none"> <li>Modality.</li> <li>Date and time.</li> </ul>	<ul style="list-style-type: none"> <li>Name of clinician.</li> <li>Patient name.</li> </ul>

WORK PROCESS	SYSTEM FUNCTION	DATA OUTPUT	DATA INPUT
		<ul style="list-style-type: none"> <li>Location.</li> </ul> <p>Task list data elements:-</p> <ul style="list-style-type: none"> <li>Name of clinician.</li> <li>Patient name.</li> <li>MRN.</li> <li>Order Number.</li> <li>Patient type.</li> <li>Procedures.</li> <li>Priority status.</li> <li>Request Time.</li> <li>Status time.</li> <li>Order Status.</li> <li>Nursing Unit.</li> <li>Order Comment (mouse over).</li> <li>Allergy (mouse over).</li> </ul>	<ul style="list-style-type: none"> <li>MRN.</li> <li>Order Number.</li> <li>Modality.</li> <li>Date and time.</li> <li>Location.</li> <li>Allergy.</li> <li>Patient type.</li> <li>Procedures.</li> <li>Priority status.</li> <li>Request Time.</li> <li>Status time.</li> <li>Order Status.</li> <li>Nursing Unit.</li> <li>Order Comment.</li> </ul>
4. Performing examination.	<ul style="list-style-type: none"> <li>Select patient from task list and display patient and patient's examination profile.</li> </ul>	<p>Task data elements:-</p> <ul style="list-style-type: none"> <li>Patient demographic.</li> <li>Order number.</li> <li>Performing personnel (default to log on).</li> <li>Hospital name.</li> <li>Examination location.</li> </ul> <p>List of imaging orders for that patient in that facility (present and past):-</p>	* Activation from task list.

WORK PROCESS	SYSTEM FUNCTION	DATA OUTPUT	DATA INPUT
		<ul style="list-style-type: none"> <li>• Procedure name.</li> <li>• Comment.</li> <li>• Reasons for exam.</li> <li>• Order No.</li> <li>• Start date and time.</li> <li>• Complete date and time.</li> <li>• Status.</li> </ul> <p>Option to sort according to each data element in list.</p>	
	<ul style="list-style-type: none"> <li>• Call patient.</li> </ul>	<ul style="list-style-type: none"> <li>• Manual.</li> </ul>	
	<ul style="list-style-type: none"> <li>• Start Exam.</li> </ul>	<ul style="list-style-type: none"> <li>• Starting date and time.</li> <li>• Set status to 'started'.</li> </ul>	<ul style="list-style-type: none"> <li>* Activation of control button.</li> </ul>
	<ul style="list-style-type: none"> <li>• Halt Exam.</li> </ul>	<ul style="list-style-type: none"> <li>• Set status to 'halt'.</li> <li>• Time of halt.</li> </ul>	<ul style="list-style-type: none"> <li>* Activation of control button.</li> <li>• Reasons for halt.</li> </ul>
	<ul style="list-style-type: none"> <li>• Restart Exam.</li> </ul>	<ul style="list-style-type: none"> <li>• Set status to 'restart'.</li> <li>• Time of restart.</li> </ul>	<ul style="list-style-type: none"> <li>* Activation of control button.</li> </ul>
	<ul style="list-style-type: none"> <li>• Abandon Exam.</li> </ul>	<ul style="list-style-type: none"> <li>• Set status to 'abandon'.</li> <li>• Time of abandon.</li> <li>• Reasons for abandon.</li> <li>• System update in RIS and CIS.</li> </ul>	<ul style="list-style-type: none"> <li>* Activation of control button.</li> <li>• Reasons for abandon.</li> </ul>

WORK PROCESS	SYSTEM FUNCTION	DATA OUTPUT	DATA INPUT
	<ul style="list-style-type: none"> <li>Complete Exam.</li> </ul>	<ul style="list-style-type: none"> <li>Completion date and time.</li> <li>Reasons for rejection.</li> <li>No. of films rejected.</li> <li>Consumables.</li> <li>Comment.</li> </ul> <p>System update in RIS and CIS.</p>	<ul style="list-style-type: none"> <li>Activation of control button.</li> <li>Completion date and time.</li> <li>Reasons for rejection.</li> <li>No. of films rejected.</li> <li>Consumables.</li> <li>Comment.</li> </ul>
	<ul style="list-style-type: none"> <li>Invalid Exam (exam wrongly completed).</li> </ul>	<ul style="list-style-type: none"> <li>Invalidate exam and cancel charge.</li> <li>Reasons for 'invalid'.</li> <li>Name of person (authorized only).</li> <li>Date and Time.</li> </ul>	<ul style="list-style-type: none"> <li>Activation of control button.</li> <li>Reasons for 'invalid'.</li> <li>Name of person (authorized only).</li> <li>Date and time.</li> </ul>
5. Reporting Imaging Examination.	<ul style="list-style-type: none"> <li>Retrieve image and patient's exam order.</li> </ul>	<p>Task data elements:-</p> <ul style="list-style-type: none"> <li>Patient demographic.</li> <li>Order number.</li> <li>Performing personnel.</li> <li>Procedure name.</li> <li>Reasons for exam.</li> </ul>	<ul style="list-style-type: none"> <li>Activation of control button.</li> </ul>
	<ul style="list-style-type: none"> <li>Interpret / annotate finding.</li> </ul>	<ul style="list-style-type: none"> <li>Standard report template and free text reporting box.</li> <li>Date and time of report.</li> <li>System update.</li> </ul>	<ul style="list-style-type: none"> <li>Standard report template and free text reporting box.</li> <li>Date and time of report.</li> </ul>
	<ul style="list-style-type: none"> <li>Hold report.</li> </ul>	<ul style="list-style-type: none"> <li>Status update (withhold report from CIS).</li> </ul>	<ul style="list-style-type: none"> <li>Activation of control button.</li> </ul>

WORK PROCESS	SYSTEM FUNCTION	DATA OUTPUT	DATA INPUT
	<ul style="list-style-type: none"> <li>• Save report.</li> </ul>	<ul style="list-style-type: none"> <li>• Status update (release report to CIS).</li> </ul>	<ul style="list-style-type: none"> <li>* Activation of control button.</li> </ul>
	<ul style="list-style-type: none"> <li>• View report.</li> </ul>	<ul style="list-style-type: none"> <li>• Report of exam.</li> </ul>	<ul style="list-style-type: none"> <li>* Activation of control button.</li> </ul>
	<ul style="list-style-type: none"> <li>• Modify report.</li> </ul>	<ul style="list-style-type: none"> <li>• Free text addendum report box.</li> <li>• Differentiate by color.</li> </ul>	<ul style="list-style-type: none"> <li>* Activation of control button</li> <li>Free text addendum report box.</li> </ul>



## MEMBERS OF EXPERT GROUP

- |                                       |   |  |
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**Members**

- |                              |   |   |
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| 3. Dr. Mohd Arif Mohd Hashim | - | Chief Pathologist, Hospital Kuala Lumpur.         |
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**Speakers**

- |   |   |  |
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| 2. Datin Dr. S. Selvaraju               | - | Consultant, IDS MOH.                                     |
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