DR. VITHALRAO VIKHE PATIL FOUNDATION'S MEDICAL COLLEGE - [VIMS], AHMED NAGAR

DEPARTMENT OF RADIO-DIAGNOSIS
Standard Operating Procedure

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1. INTRODUCTION

Department of Radio-diagnosis provides comprehensive imaging solutions in the area of conventional radiology, cross sectional imaging and emergency radiology services.

Department of Radio diagnosis provides facility for conventional radiology service, ultrasonography, Doppler, CT scan, MRI, Digital mammography, DSA and interventional radiological studies.

2. SCOPE

Department of Radio-diagnosis provides round the clock radiology services in conventional radiology, ultrasound imaging, Doppler, whole body multislice CT scan, MRI for outpatients, emergency patients and inpatients.

Radio-diagnosis department is located in the basement and ground floor close to out patient's and emergency department. All the equipment are located at functionally independent rooms and operated by qualified and trained technicians and doctors. Mobile X-ray and Ultrasound units are available to take care of radiology requirements of patients in ICU and wards as and when required.

Purpose and Scope:

1. The Department of Radio-diagnosis of the hospital provides comprehensive services in the following Radiological imaging modalities (a brief description of the same are also stated below):

i. General Radiography : X-rays are a form of radiation, like light or radio waves that can be focused into a beam. Once it is carefully aimed at the part of the body being examined, an x-ray machine produces a small burst of radiation that passes through the body, recording an image on photographic film or a special image recording plate

ii. Mobile Radiography : Mobile unit used for bed side radiography of bed ridden patients and sometimes used to X-ray during operative procedures in Operating Room.

iii. Ultrasound : Ultrasound or sonography, uses high frequency sound waves to demonstrate structures and pathologies inside the body. As the sound waves pass through the body, echoes are produced, and bounce back to the transducer. These echoes can help doctors determine the location of a structure or abnormality, as well as information about its make up. Ultrasound is a painless way to examine internal organs.

iv. Magnetic Resonance Imaging (MRI) : MR scans use magnetic resonance that images the body from different angles and then use computer processing to show a cross section of the various tissues and organs pictured. MRI scans have proven to be very helpful in diagnosis of soft tissues especially brain, spinal cord, joints, abdomen, chest and other muscles.

v. Interventions : vascular and non-vascular. (USG /CT guided aspiration, drainage, biopsies)

vi. A computerized tomography scan (CT scan) uses computers and rotating X-ray tube to create cross-sectional images of the body. These images provide more detailed information than normal X-ray images. They can show the soft tissues, blood vessels, and bones in various parts of the body. A CT scan may be used to visualize brain, paranasal sinuses, orbits, neck, thorax, abdomen, pelvis, extremities and joints, arteries and veins.During a CT scan, the patient lies in a gantry while the X-ray tube of the machine rotates and takes a series of X-rays from different angles. These pictures are then sent to a computer, where they're combined to create images of slices, or cross- sections, of the body. They may also be combined to produce a 3D image of a particular area of the body.

vii. Digital mammography (full-field digital mammography - FFDM), is a mammography system in which the x-ray film is replaced by electronics that convert x- rays into mammographic pictures of the breast. These systems are similar to those found in digital cameras and their efficiency enables better pictures with a lower radiation dose. These images of the breast are transferred to a computer for review by the radiologist and for long term storage. The patient's experience during a digital mammogram is similar to having a conventional film mammogram. Computer-aided detection (CAD) systems search digitized mammographic images for abnormal areas of density, mass, or calcification that may indicate the presence of cancer. The CAD system highlights these areas on the images, alerting the radiologist to carefully assess this area. Breast tomosynthesis/digital breast tomosynthesis (DBT), is an advanced form of breast imaging where multiple images of the breast from different angles are captured and reconstructed into a three-dimensional image set. The radiation dose for breast tomosynthesis systems remains within the FDA-approved safe levels for radiation from mammograms. Screening with breast tomosynthesis results in improved breast cancer detection rates and fewer call-backs. Breast tomosynthesis may also result in earlier detection of small breast cancers that may be hidden on a conventional mammogram, greater accuracy in pinpointing the size, shape and location of breast abnormalities, fewer unnecessary biopsies or additional tests, greater likelihood of detecting multiple breast tumors, clearer images of abnormalities within dense breast tissue.

2. **Scope** : Provision of comprehensive services in following areas

1. Routine X-Ray
2. Special X-Ray procedures- Barium studies, IVU, MCU,RGU, HSG
3. Ultrasonography
4. Doppler studies
5. Computed tomography (CT scan)
6. Magnetic Resonance Imaging
7. Interventions (vascular, non-vascular)
8. Digital mammography

SOP (Standard Operating Procedure)
for X-Ray Unit of the Department of Radio-Diagnosis & Imaging.

1. Patient will be received at X-Ray Reception.
2. The Reception staff will make an entry in the Register & allocate X-ray no.
3. As the patient's turn comes he/ she will be asked to go to the room by Reception staff along with the requisition slip which will be handed over to the radiographer.
4. The radiographs will be taken.
5. After completion of the examination, the patient is asked to see the referring doctor as the x-rays are sent via PACS if the patient requires a print they need to pay the charges and then the printed films will be handed over to them at the reception.
6. In case of procedures (conventional) - done on appointment basis, according to the appointments. They are performed and printed reports are handed over either on the same day or the next day.

REPORTS PRINTED & SIGNED BY DOCTORS

It will be the responsibility of the concerned doctor to hand over the original signed printed report to reception for dispatch & also handover the copy to Report Printing staff for filing.

Standard Operating Procedure For Intervention Procedures In The Department of Radio-diagnosis

After due consultation with faculty members of the department, following protocol is being laid down as Standard Operating Procedure as regards Intervention Procedures (Ultrasound/CT guided procedures- diagnostic and therapeutic)

1. The procedures will be performed under supervision and guidance of Professor Dr. Sushil Kachewar or other faculty member who is experienced and well conversant with the technique.
2. The procedures will not be undertaken by Post Graduate Residents in a situation where the trained faculty member is not available.
3. All the requests for the above-mentioned procedures will be routed through Professor Dr. Kachewar or other faculty members in his absence.
4. The procedures are to be undertaken by appointment and during working hours only. The procedures will be performed between 9:00am to 3:00pm only so as the sample to reach Pathology department before closure of their working hours.
5. On duty JR-II/III of Department of Radio-diagnosis -
    I. He/she will assist/perform the procedures after obtaining due consent and permission of the faculty under his/her supervision.
    II. He/she will write procedural notes on a separate sheet of paper in duplicate and retain its copy in the department for record.
    III. He/she will be responsible for the post-procedural follow-up and keep faculty member informed from time to time.
    IV. It will be his/her duty to keep emergency tray with all the necessary drugs ready.
6. A nursing assistant must be present during the procedure to assist the doctors. It is also imperative on the part of nursing staff on duty to keep emergency tray ready and see for expiry of drugs, on daily basis, which need to be discarded if expired.
7. All the record pertaining to the case is to be submitted to departmental office for safe record keeping.
8. *The referring physicians/surgeons are requested to send their doctor who is competent to manage any complication which may arise during the procedure in the interest of patient care.*
9. It will be the duty of JR-I/II of department of Radio-diagnosis to ensure that the sample obtained after the procedure, which is earmarked for pathological examination, reaches the referring physician/surgeon immediately after the procedure for onward transmission.

3. ORGANOGRAM

Organization Structure of the Department :

Head of Department of Radio-diagnosis

Faculties- Professor,

Associate professor,

Assistant professor

Senior Residents

Junior Residents (JR3, JR2, JR1)

MRI > CT technician > Radiology Technician or Radiographers/Staff Nurse/ Dark Room Assistants/ Attender

4. JOB DESCRIPTION OF THE DEPARTMENT

STAFFING IN RADIOLOGY DEPARTMENT

Designation	Required Qualification
Radiologist	Faculty-MD/DNB/DMRD Postgraduate resident
Senior radiographer/RS0-1	Diploma in Radiological Technology (DRT) One year X-ray technician certificate course
Radiographer	DRT
Radiology Assistant	Nursing Assistant Training
Secretary	Receptionist
Staff Nurse	BSc/GNM
Attender	SSC

JOB DESCRIPTION OF PROFESSOR, ASSOCIATE PROFESSOR AND ASSISTANT PROFERSSOR:

1. Responsible for planning and implementation of teaching programs.
2. Teaching subjects in the curriculum.
3. Supervision of clinical teaching program
4. Assisting in the administration.
5. Supervision of student's health, welfare and security.
6. Assisting in making time table for PG students, senior residents.
7. Conducting examinations, tests (sessional and terminals).
8. Preparation of reports on student's progress.
9. Assisting in maintenance of school records.
10. Participation in student guidance activities.
11. Guiding-Students extracurricular programs.
12. Any other duty assigned.

HOD :

1. They will be responsible for the smooth and efficient functioning of their respective department.
2. They will be responsible for all the medical staff working in their respective department.
3. They will be responsible for the deployment and utilization of services of medical and clerical staff working under them. They will keep the Medical Superintendent informed/ take his approval in important matters in this regard.
4. They will be responsible for maintaining the functional status of all equipment under their department and will promptly ensure that these equipment function smoothly/ repaired and without lengthy downtime. They will keep liaison with the company maintaining the machine, officer in-charge of M & R, officer in-charge of purchase in this regard.
5. They will be responsible for the proper segregation and collection of hospital waste in their respective department as per the guidelines issued by CPCB and other authorities from time to time. A proper record is to be kept by them in this regard.
6. They will be responsible for section of casual leave of staff working under them and will a keep a record of leave. They will make alternative arrangement in case an official proceeds on leave or their application is forwarded by them.
7. They will assign duties to the various Heads of Units working under them from time to time.
8. They will ensure that all serious patients / M.Ps / VIP admitted in their department are well attended and will keep Medical Superintendent informed about any event which may affect the attention of press, higher administration authorities or Parliament.
9. They will ensure that all records relating to patients especially the MLC case are in order complete and is kept in safe custody.
10. They will be responsible for the general upkeep, sanitation, cleanliness and availability of essential supplies in their respective departments.
11. They will be the designated authority on behalf of M.S. for issuing condemnation certificate to declare unserviceable, old & non functionary equipment / furniture etc. where all other sources of condemnation certification is not possible or available.
12. Organizing teaching /training of P.G. Student /other staff, of the department.
13. Any other duty assigned by M. S.

Job Duties and Tasks for: "Faculty Radiologist"

1. Supervise and teach residents or medical students.
2. Schedule examinations and assign radiologic personnel.
3. Participate in continuing education activities to maintain and develop expertise.
4. Implement protocols in areas such as drugs, resuscitation, emergencies, power failures, and infection control.
5. Provide advice on types or quantities of radiology equipment needed to maintain facilities.
6. Participate in research projects involving radiology.
7. Treat malignant internal or external growths by exposure to radiation from radiographs (x-rays), high energy sources, or natural or synthetic radioisotopes.
8. Participate in quality improvement activities including discussions of areas where risk of error is high.
9. Develop treatment plans for radiology patients.
10. Establish or enforce standards for protection of patients or personnel.
11. Administer radiopaque substances by injection, orally, or as enemas to render internal structures and organs visible on x-ray films or fluoroscopic screens.
12. Administer or maintain conscious sedation during and after procedures.
13. Review or transmit images and information using picture archiving or communications systems.
14. Interpret images using computer-aided detection or diagnosis systems.
15. Recognize or treat complications during and after procedures, including blood pressure problems, pain, over sedation, or bleeding.
16. Prepare comprehensive interpretive reports of findings.
17. Obtain patients' histories from electronic records, patient interviews, dictated reports, or by communicating with referring clinicians. .
18. Conduct physical examinations to inform decisions about appropriate procedures.
19. Confer with medical professionals regarding image-based diagnoses.
20. Instruct radiologic staff in desired techniques, positions, or projections.
21. Evaluate medical information to determine patients' risk factors, such as allergies to contrast agents, or to make decisions regarding the appropriateness of procedures.
22. Document the performance, interpretation, or outcomes of all procedures performed.
23. Develop or monitor procedures to ensure adequate quality control of images.
24. Coordinate radiological services with other medical activities.
25. Provide counseling to radiologic patients to explain the processes, risks, benefits, or alternative treatments.
26. Communicate examination results or diagnostic information to referring physicians, patients, or families.
27. Perform interventional procedures such as image-guided biopsy, percutaneous trans-luminal angioplasty, trans-hepatic biliary drainage, and nephrostomy

catheter placement.

28. Perform or interpret the outcomes of diagnostic imaging procedures including magnetic resonance imaging (MRI), computed tomography (CT), mammography, or ultrasound.

Staff Nurse :

- Supervise, guide and train the working of staff nurses and nursing assistants.
- Patient care and administration of drugs in various radiological procedures and investigations.
- Responsibilities of maintenance of stock of materials and drugs.
- Patient care in various radiological procedures and investigations.
- Transportation of patients where required.

RSO-1

- RSO shall assist the organization in meeting the relevant regulatory requirements applicable to his/her X-ray installation. He/she shall implement all radiation surveillance measures, conduct periodic radiation protection surveys, maintain proper records of period of quality assurance tests and personnel doses, instruct all workers on relevant safety measures, educate and train new entrants and take local measures including issuance of clear administrative instructions in writing to deal with radiation emergencies. RSO shall ensure that all radiation measuring and monitoring instruments in his/her custody are properly calibrated and maintained in good condition. Suitable records of such surveys including layout drawings, dose

  Mappings, and deficiencies noticed and remedial actions taken shall be maintained for future follow up.

<u>Senior Radiographer</u>

1) To assist the doctor in special diagnostic radiographic investigation.
2) To supervise the work of radiographer and guide him whenever required.
3) Proper storing of X-ray films of all medico-legal cases and to produce it in court when demanded.
4) Maintenance of record of x-ray reports of patients referred.
5) To maintain discipline in the department.

Radiographer

- Carryout radiography related work in conventional, cross sectional and interventional radiological procedures.
- Preparing and dispatching monthly reports of radiology department including statistics, safety and quality issues to the Chief Executive Officer.
- To impart training to junior colleagues in Radiography, radiation safety and patient care.
- Responsible for implementation and maintenance of quality control program.
- Maintenance of registers / records.
- Care of equipment and materials.

Jr. Radiographer

1. To take diagnostic radiographs of patients as required by doctors.
2. Proper storing of unexposed x-ray films.
3. Keeping account of x-ray films supplied, used and balance in hand.
4. To wear the film badge to assess exposure to x-ray radiation.
5. To perform duty in emergency department and orthopedic department in rotation.
6. To carry out the portable x-ray of seriously ill patients.
7. To keep record of all x-ray taken in the register.
8. To maintain the cleanliness of the x-ray room.
9. To keep record of paid/ unpaid radiological investigations done for patients

X-Ray/ Dark Room attendant :

- To assist radiographers in carrying out portable X-Ray by mobilizing X-Ray machine from Department.
- To keep machines and rooms dust free.
- To keep records and receive X-Ray films.
- To develop the film by dipping in chemicals in dark room.

Department clerk/Statistical Assistant

1. Disposal of all letters received in the department.
2. Maintenance of files for different subjects dealt with in the department.
3. Scrutiny of Statistical returns compiled by the Admission and Discharge Analysis/Desk and the Medical Statistics Desk.
4. Forwarding of statistical returns to the D.G.H.S. and other agencies.
5. Control of furniture, linen and stationary items through proper inventory, preparation of monthly indents for these items.
6. Supervision of the department work in the absence of Medical Record Officer.
7. Participation in the training programs of the department.

Receptionist :

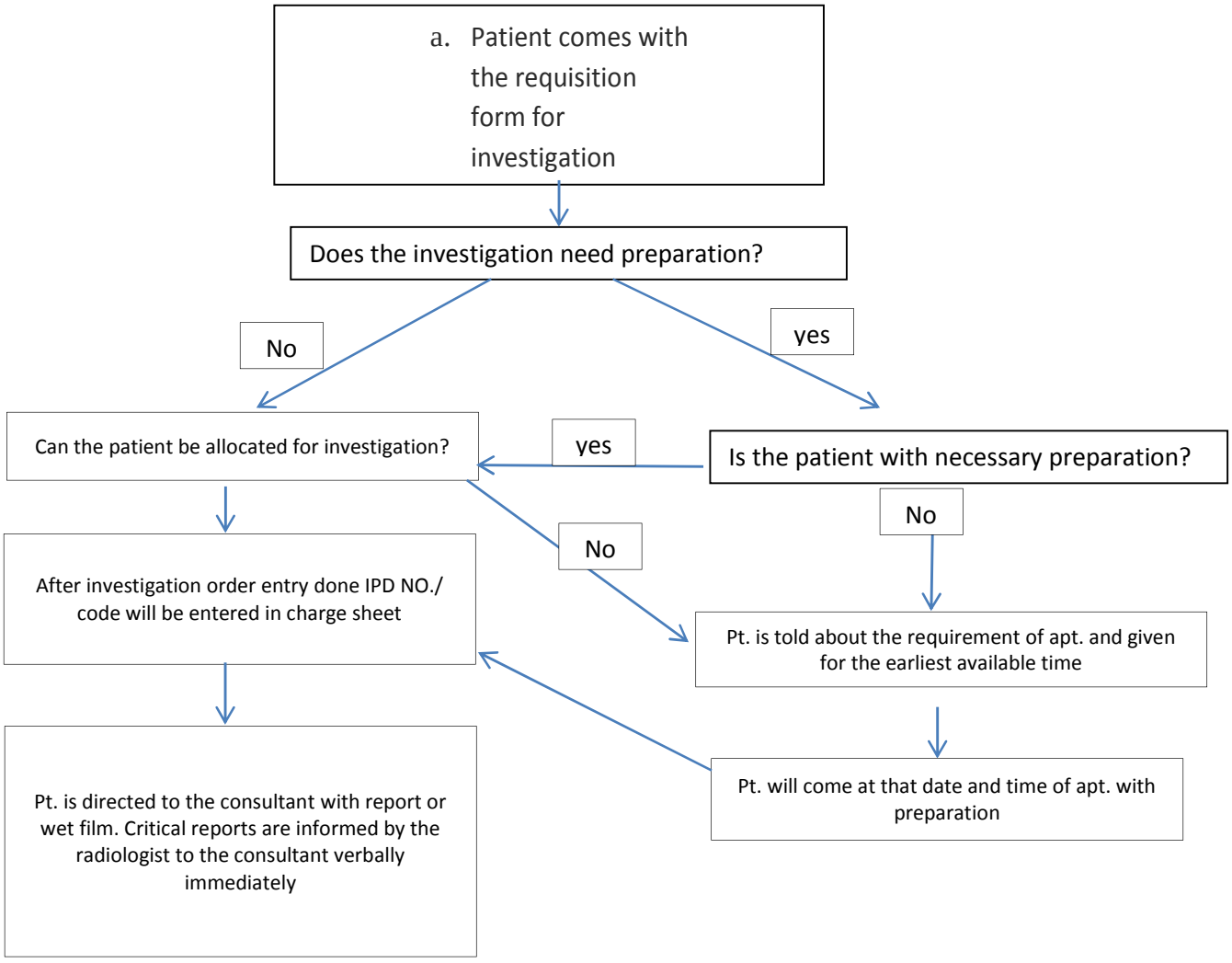
- Generate Radiology Reports.

Attender :

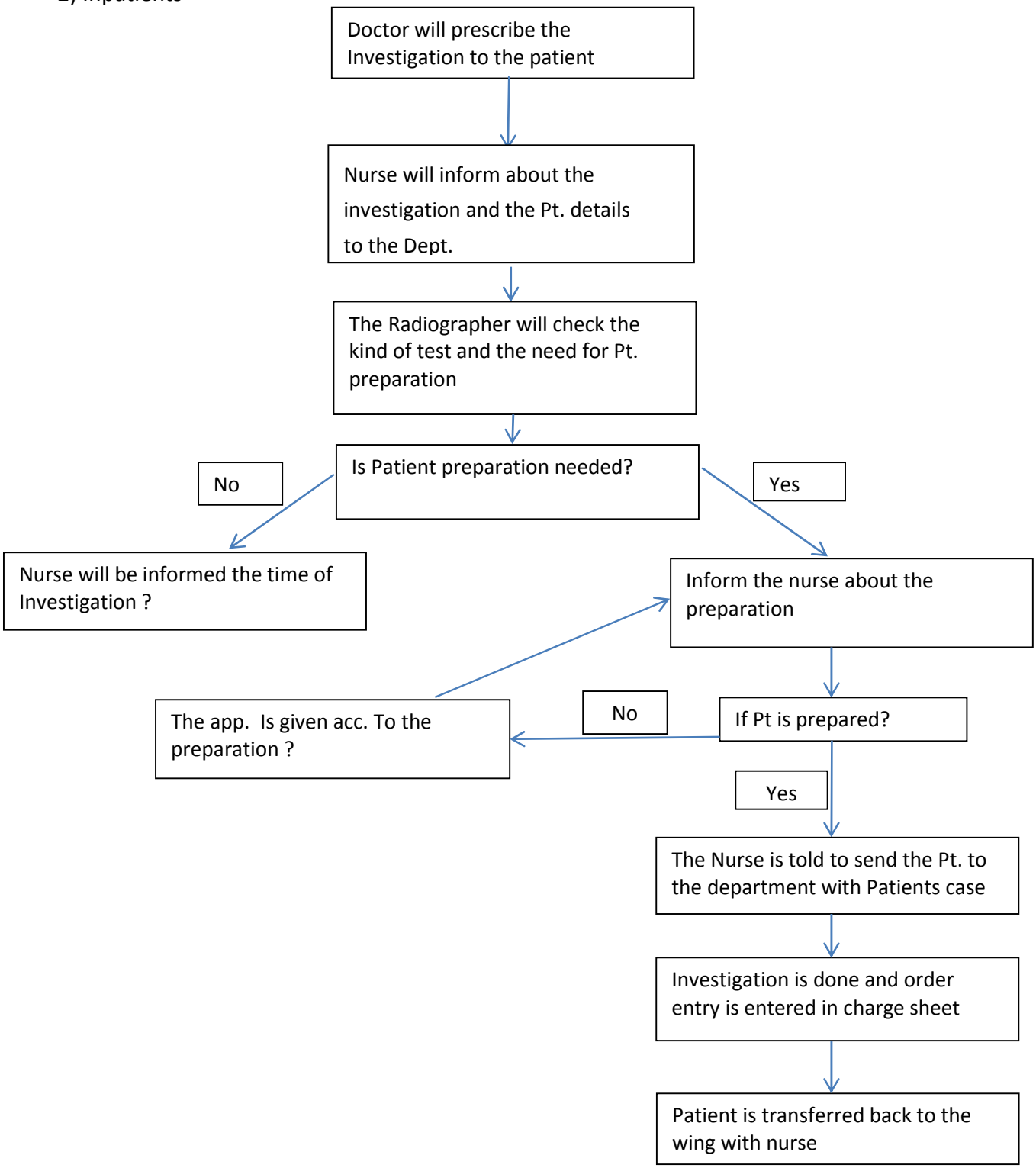
- Transportation of patients where required

5. DEPARTMENTAL PROCEDURES

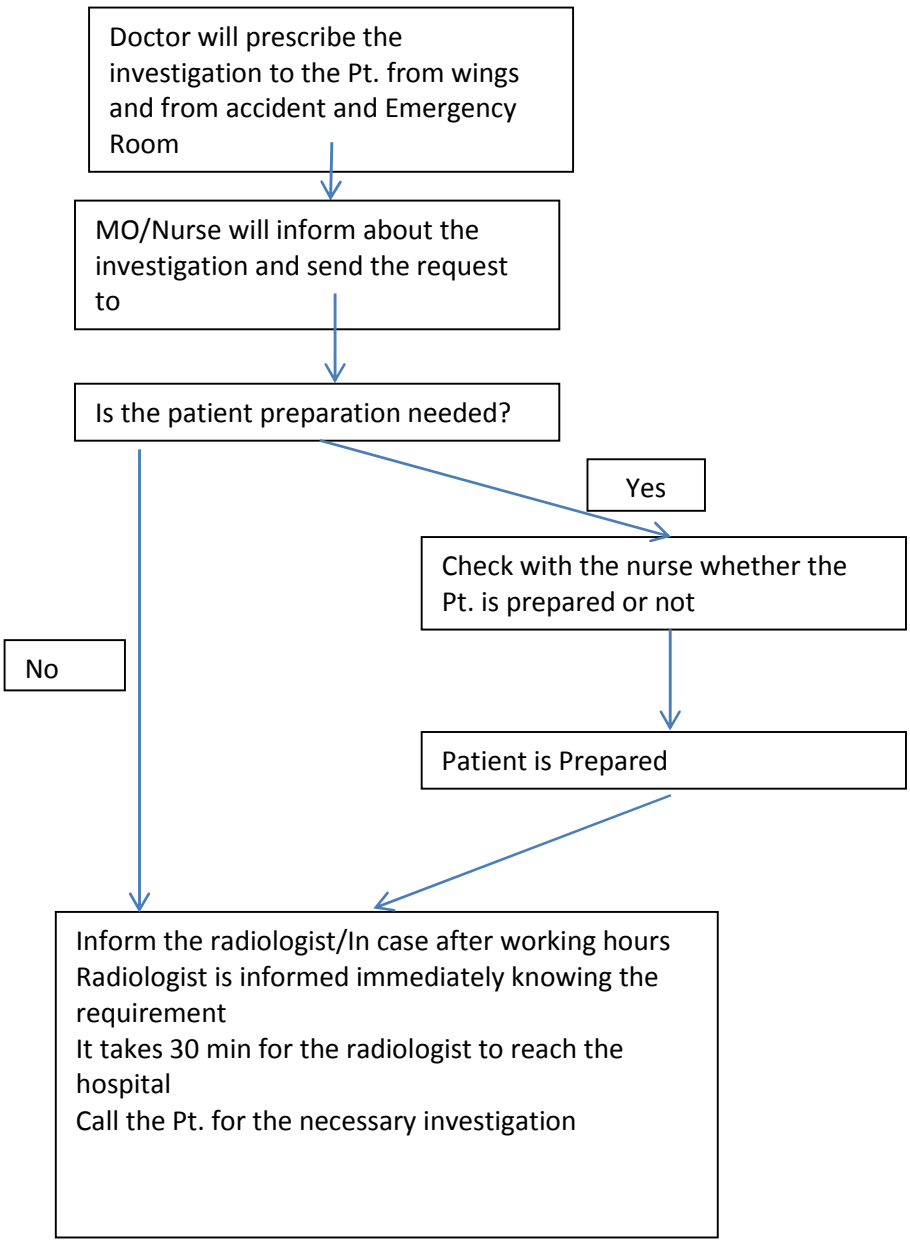
1. Out Patient with Consultation:



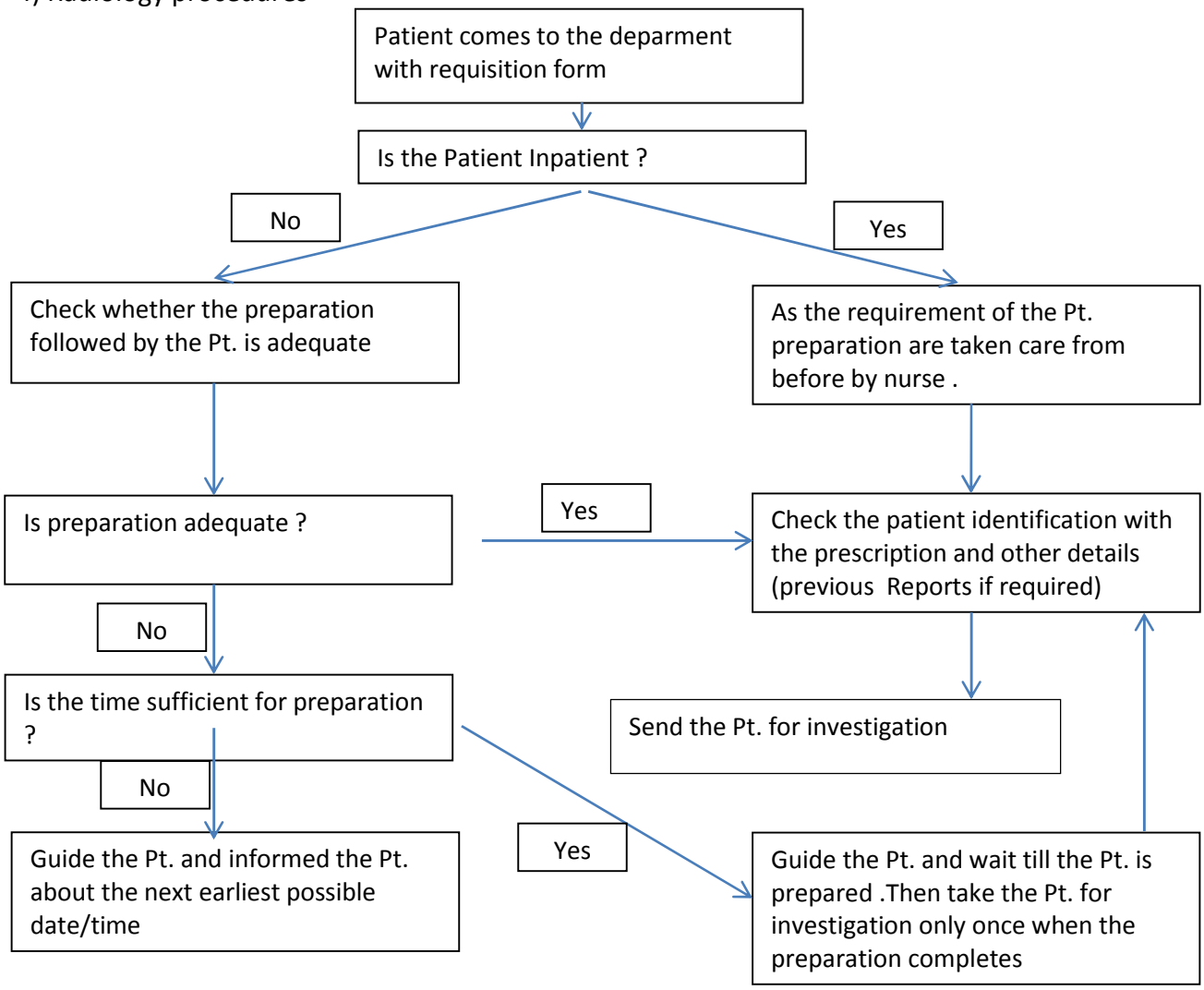
2) Inpatients



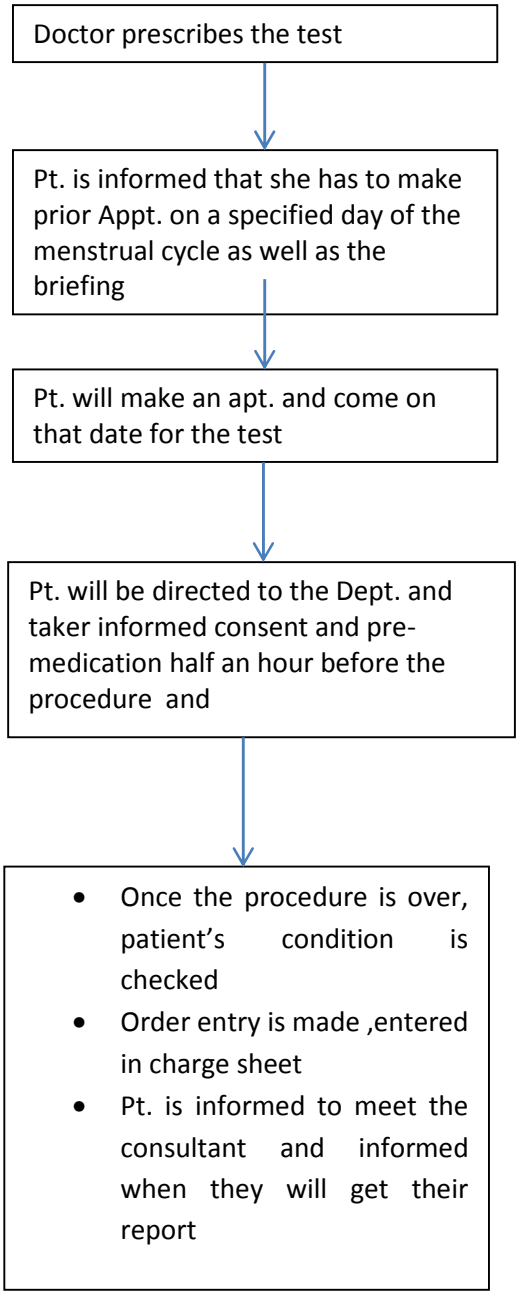
3) In-patients/Emergency patients (For all Radiology Procedures) After Duty Hours



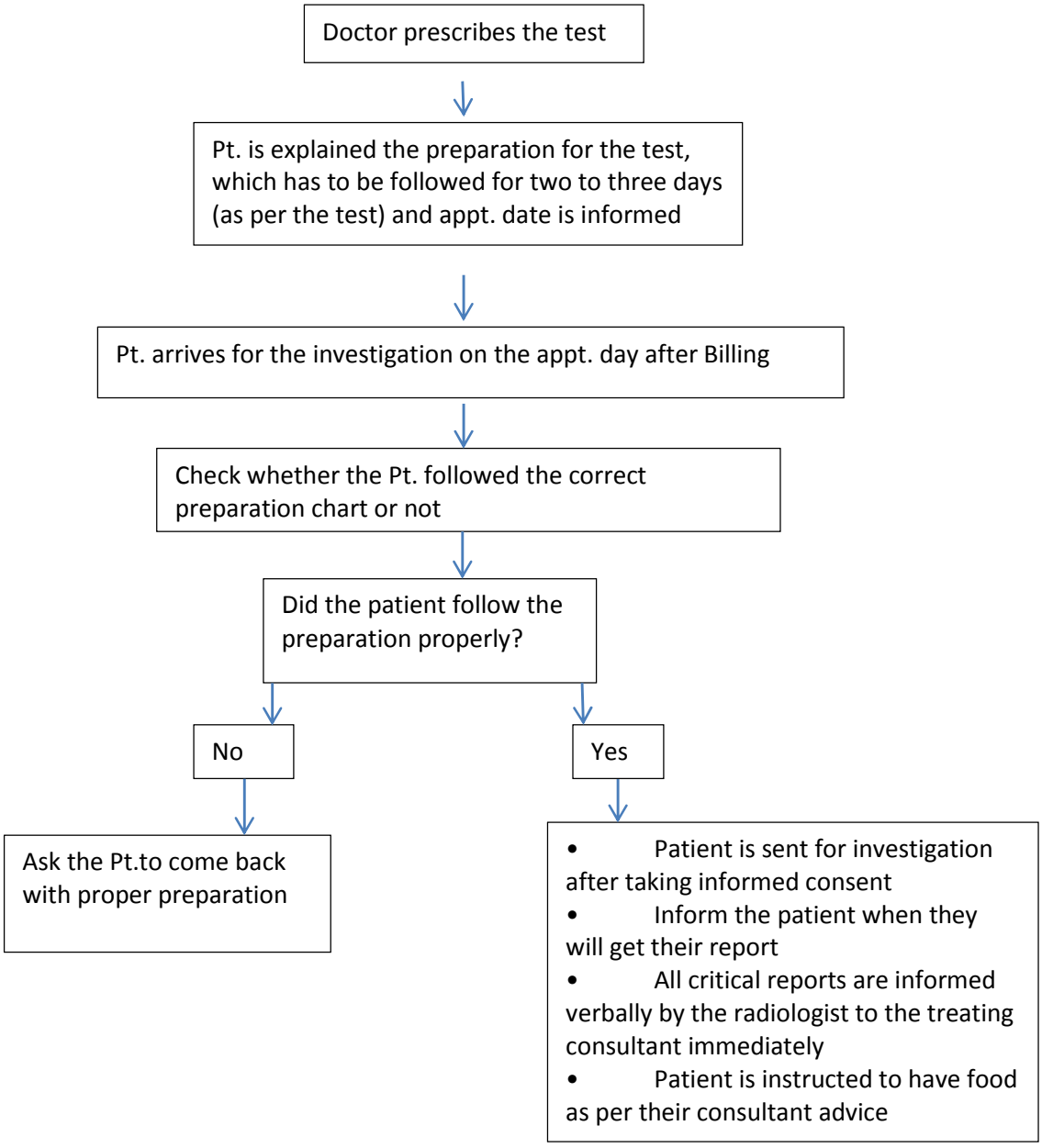
4) Radiology procedures



5) Hysterosalpingogram (HSG)

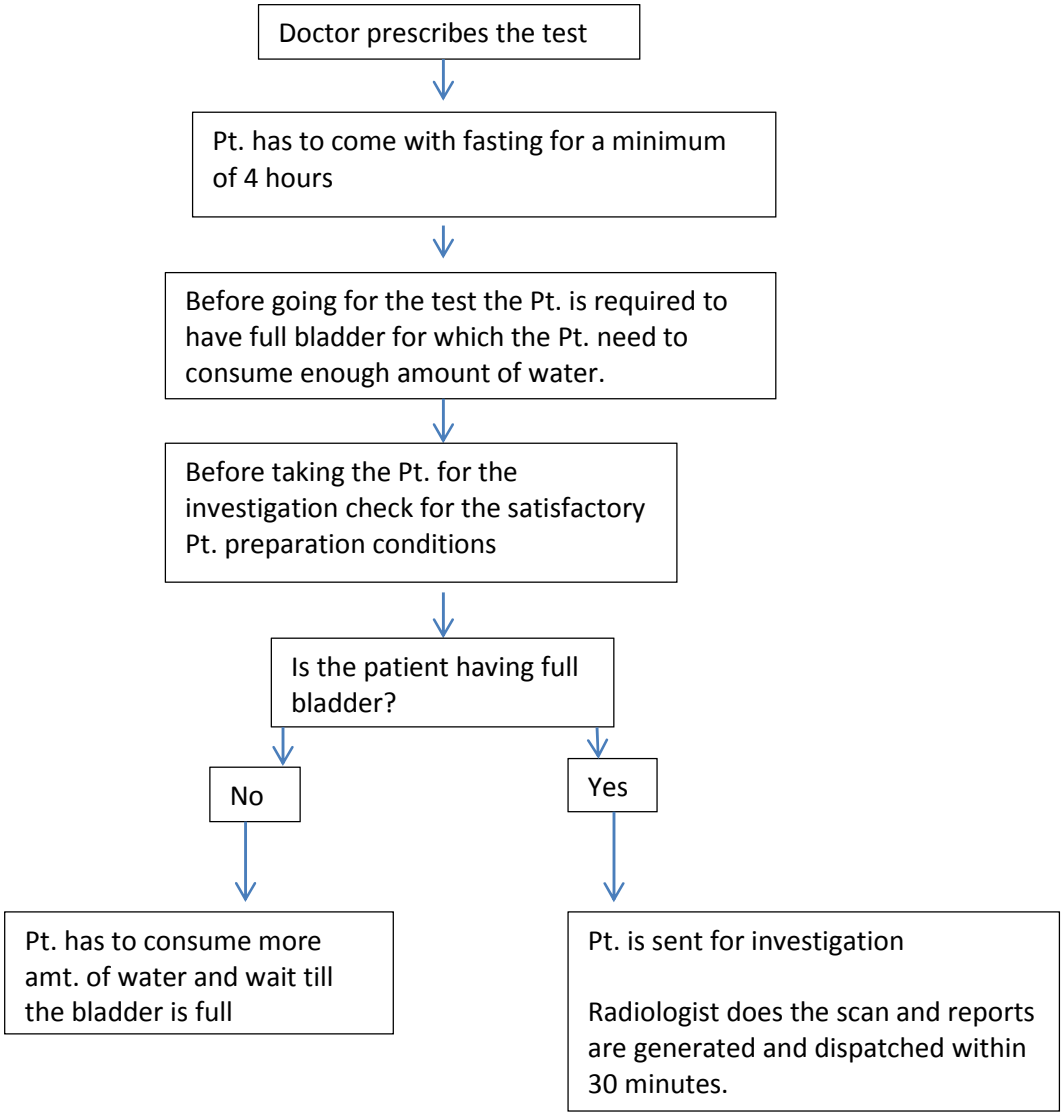


6. G.I. Tract Study:

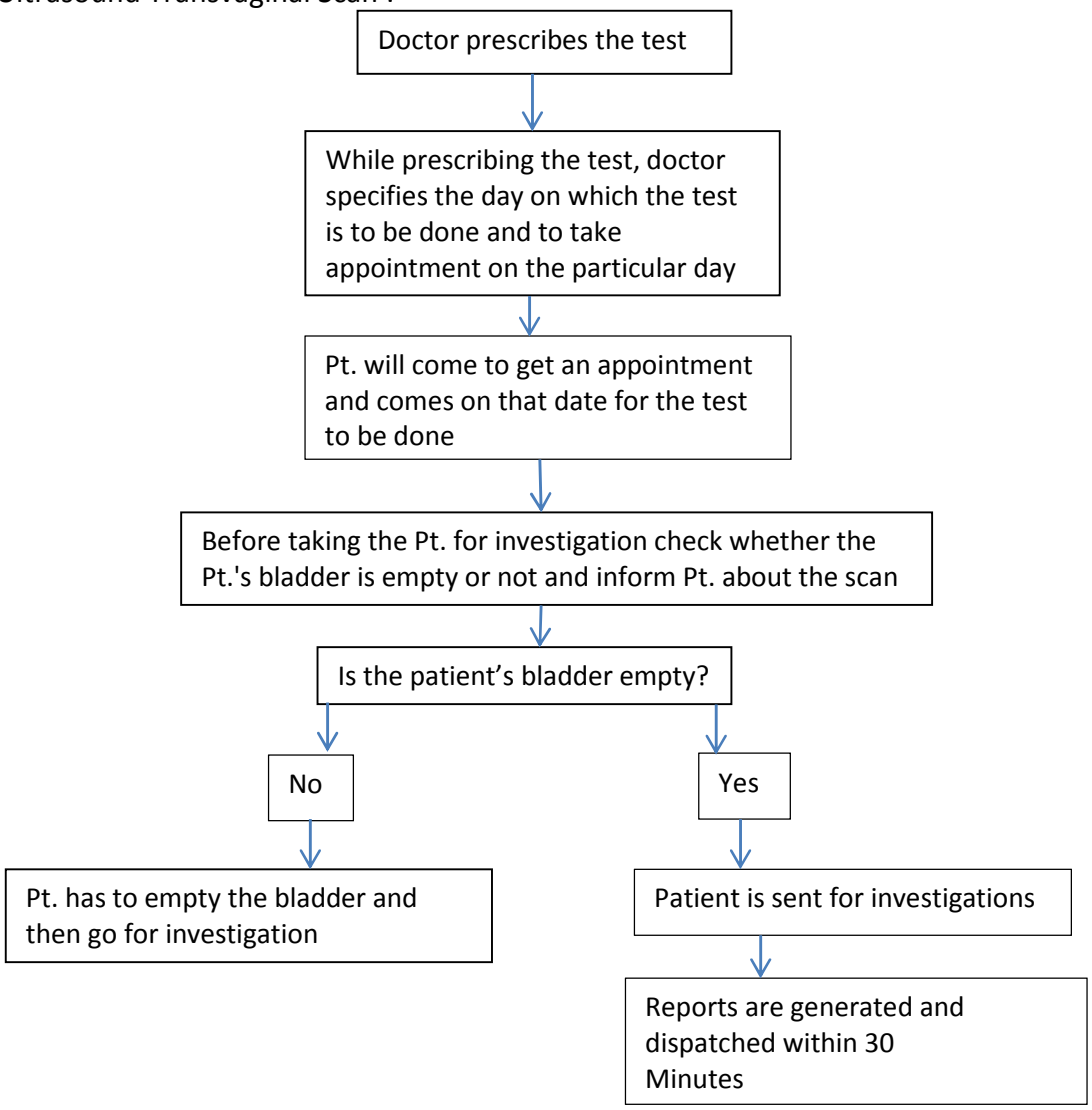


U.S SCAN PROCEDURES

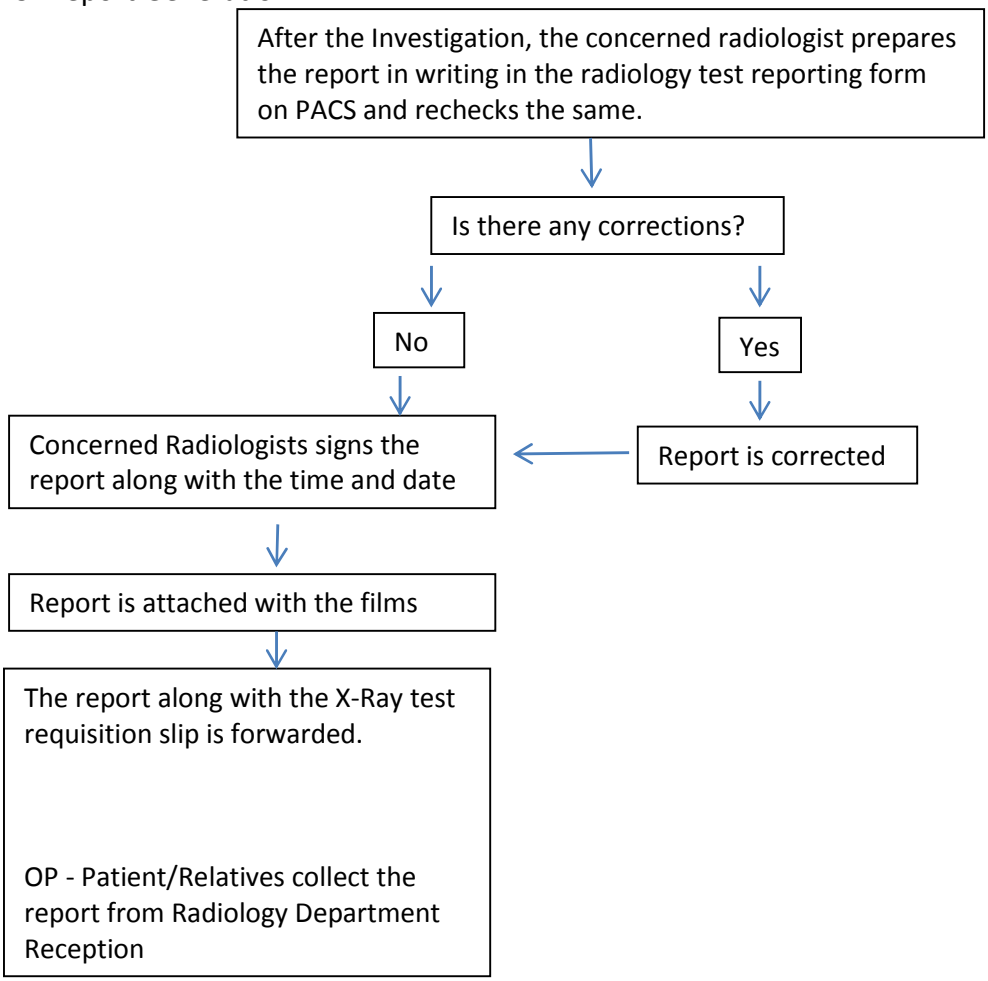
7. Ultrasonogram (Abdomen):



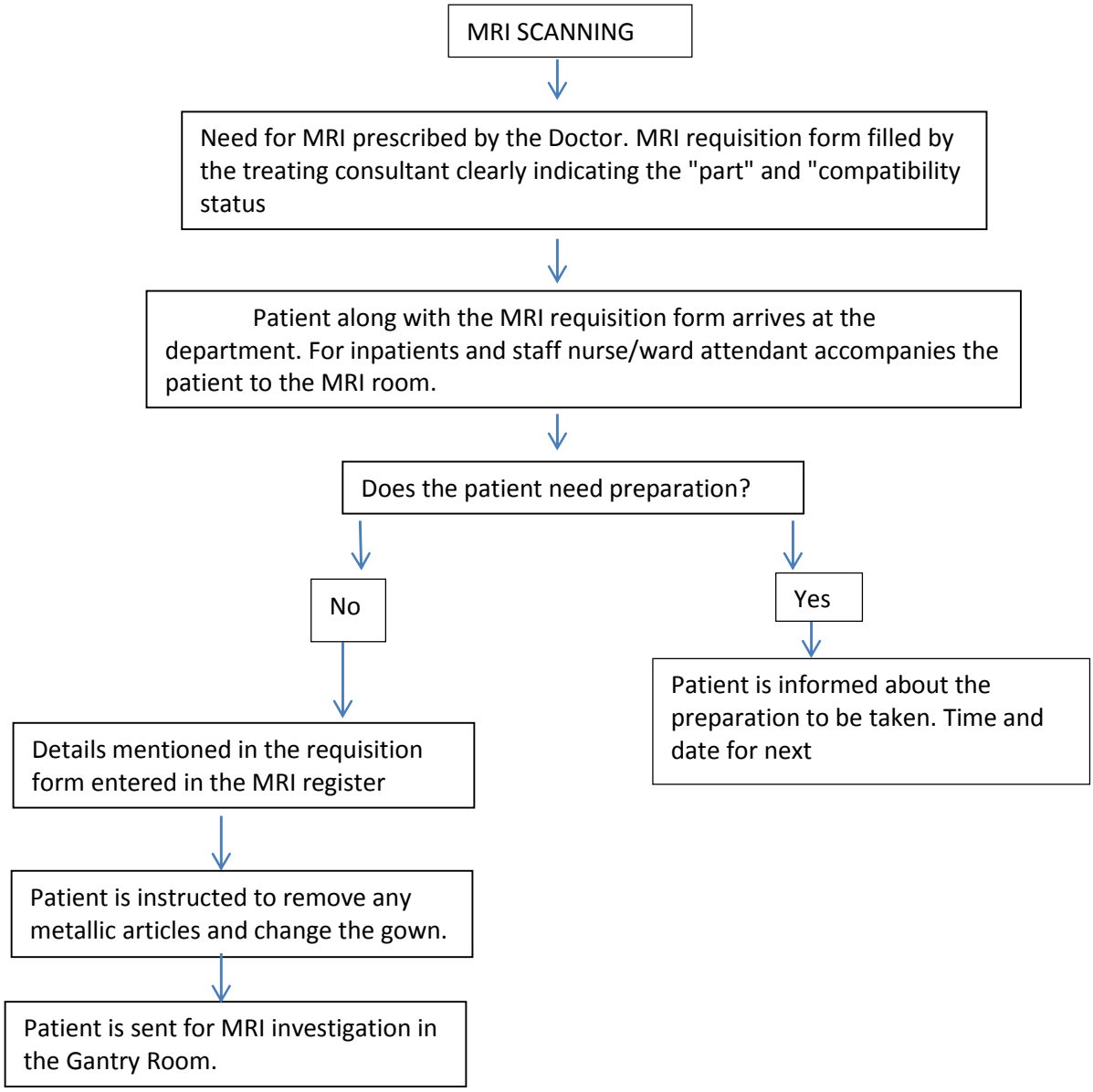
8. Ultrasound Transvaginal Scan :



9. Report Generation:



10. MRI: Magnetic Resonance Imaging:



6. POLICIES OF THE DEPARTMENT:

1. The Radiology Department operates within all applicable legislation, regulations and Registration requirements.
2. All laws, regulations, directives, guidelines and registration requirements of Atomic Energy Regulatory Board (AERB) & Health & Family Welfare Office, Maharashtra will be met and followed.
3. The hospitals Radiology Department have a valid and current Radiology AERB Registration & Valid Approvals issued by the District Health & Family Welfare Office, Maharashtra, which will be posted in public view.
4. All staffs will be provided with Thermo luminescent Dosimeter to measure
5. (Radiation received during working hours) Occupational exposure
6. *All* required records will be maintained by the Radiology Department.

Registration certificates:

1. AERB layout Approval
2. Form B–from District Health & Family Welfare Office .

Acts: The Department follows and operates strictly at par with the regulations stated in the following Acts:

- PCPNDT Act 1996
- AERB Safety code No: AERB/SC/MED-2(REV-1)2001
- Atomic Energy Act 1962
- Radiation protection Rules 1971
- Radiation Surveillance Procedures for Medical Applications of Radiation, 1989
- The Bio-Medical Waste (Management and Handling) Rules, 1998

Department of Radiology complies with the following Regulatory requirements for Medical X-Ray installation in India :

- Safety Layout Approval from Atomic Energy Regulatory Board
- Carry out Quality Assurance Performance Test of the x-ray unit yearly
- Employ qualified Staff
- Provide Personnel monitoring badges for all staff members associated with the operation of x-ray machines
- Comply with AERB Safety code No: AERB/SC/MED-2(REV-1)2001
- Periodic heath check-up of technicians and workers working in radiation zone (X-ray, CT, mammography, DSA, Interventions).

Reporting of Imaging Test Results and turn-around time (TAT):

1. All reports of imaging test (CT, MRI, X-ray) – in 24 hours.
2. All reports of USG, Doppler – after the test
3. All critical reports are verbally informed to the concerned consultant immediately by the Radiologist records are maintained for the same.
4. In case of any unavoidable delay, patients are kept informed for the reason for the Delay and by what time the investigations/delivery of reports are likely to be completed.
5. Any patient query regarding the reports will be dealt with immediately and clearly explained, and further consultation arranged.
6. No test results are given to Patient verbally or over telephone.
7. Patient Reports are to be treated as completely confidential.

Reporting of Emergency Cases:

1. In case of an emergency report, the radiologist will give a verbal report to the referring consultant by phone.
2. Final report will be given by the Faculty in 1 hour.

Criteria for Fixing of Appointments:

i. According to "First Come First Serve" basis for routine X-ray investigations.
II. According to the number of patients available on that particular day for the investigation.
III. According to the availability of the radiologist (for the special investigations)
Iv. Depending on the time gap required for the preparation
v. Considering the patients existing health conditions.
vi. Ultrasound scan -Appointment is given in 15 Minutes Interval.

Please note that even in case of given appointments patients from the critical care areas of the hospital like the Emergency Department, OT and other patients requiring emergency imaging investigation etc are given priority for all procedures.

Maintenance of Equipment:

1. Guideline Instructions : General
    a. All staff will clean the Machine in their Posted unit. Staff will conduct daily check on its working condition daily & do regular warm up. Shutdown of machine should be done after working hours.
    b. Night Shift person is responsible for the machine till the handover to the next day Morning shift person.
    c. Never keep any fluids over or near equipments.
    d. Monitor Housekeeping staffs during cleaning mainly with wet mops.
    e. Monthly cleaning record should be maintained for all equipments in Instrument History card.
    f. In case of continuous power fluctuation shut down all the Machines, till proper power supply is observed.
    g. In daily Briefing Working condition & Breakdowns of machine should be handed
    h. over without fail.
    i. Log book for each equipment
2. Infection control:
    a. Ultrasound probes should be cleaned for each patient.
    b. Machines should be cleaned with Antiseptic Solution after handling Road Traffic Accident & Infectious patients.
    c. Mobile Machines shifted to Operating room and Intensive care units, wheels & area in contact with patients should be cleaned with disinfectant solution before and after use of the machine.
    d. Fumigation of USG rooms every month.
3. Breakdown management:
    a. During breakdowns shutdown and restart the unit, check all Input & cables for loose connections. In case this fails, complaint should be logged and Work order should be raised and given to the Biomedical In charge mentioning the Machine Name, time of breakdown.
    b. The Biomedical engineer will inspect the machine & take necessary action as per their protocol.
    c. It is the duty of the Radiographer to inform the Head of the Department of Radiology, Registration Counter ED , ICCU and other patient care areas the breakdown time and follow up on rectification till its working time every 12 Hours the status of the breakdown .
    d. In case of Major Breakdown the Medical Superintendent should be informed.
    e. After rectification service report is received and filed & the same is entered in Instrument History Card.
    f. Incident Report is raised for all Breakdowns more than 24 hours.

The training of Departmental Staff: The training of staff (for both existing and new staff) is of utmost importance to prepare professionals who have high specific knowledge in their area and who could give the best quality of care to their patients. Therefore training in Radiology is a very complex and difficult task mainly due to wide spectrum of radiological applications in the total care process and variety of imaging modalities

Hence the department lays special emphasis on training of the employees to acquaint them with the knowledge and skill pertaining to their job. The approach to training of the staff adopted by the department is as follows:

- One week department Induction for every new employee (Transferred or Fresh Recruit) joining the department.
- One week department Induction to learn department policy & procedures and
- Safety training will be conducted for the new employee in the department.
    - Training in Safety procedures to follow if equipment malfunction occur.
- Training relating to the operation of any new equipment is given prior to the usage of the equipment by company engineers to ensure its proper and safe handling.
- All professional personnel are expected to be competent and proficient in a
- Performance of all procedures by the end of the training program.
- The training program will serve as verification of initial personnel competency and ability to satisfactorily perform patient care and services.
- Those areas felt to be requiring additional focus by the trainee will be identified as Personal goals, for which improved performance will be emphasized.
- All staffs should attend and do regular training.

Departmental Orientation programme for the new employees (Fresh recruit or transferred emphasizes on the following :

1. Overview to various equipment operated by the department in detail
2. Radiation safety & quality Assurance Practices
3. Basic unit maintenance and trouble shooting
4. Documentation and record keeping.
5. PCPNDT act & Maintenance of records is explained
6. Uses of TLD badge & how to use Hand out given.
7. Tum Around time for different types of cases (Normal , Urgent etc.).
8. Safety procedure and Policy of the department.
9. Various forms and Reporting formats use::d by the department

Departmental Inventory Management:

The responsibility for proper management of the departmental inventory rests with the radiographers.

1. A stock book for the various items including the medicines used by the department is maintained.
2. Physical verification of the stock is done every alternate days by the radiographers.
3. Replenishment of stock is done using the appropriate indent request book.
4. All medicines subject to expiry are returned to the pharmacy store and indent request for feedback is placed

7. LIST OF EQUIPMENTS UNDER DEPARTMENT OF RADIOLOGY

Sr. No.	EQUIPMENT DESCRIPTION	MAKE	MODEL
1	X-RAY Machine 800 MA HF With Image intensifier	Vision	Vision Medicaid
2	X-RAY Machine 800 MA With Image intensifier	Vision	Vision Medicaid
3	X-RAY Machine 500 MA With Image intensifier	WIPRO GE HEATH CARE PVT LTD	DX 525
4	X-RAY Machine 600 MA WITH FLUOROSCOPY (HIGH FREQUENCY)	ALLENGERS	Mars-50
5	X-RAY Machine 300 MA	PHILIPS	Diagnox 300
6	X-RAY Machine 300 MA	PHILIPS	GME 300 MA
7	X-RAY Machine Mobile,100 MA	ALLENGERS	100MA
8	X-RAY Machine Mobile, 100 MA	ALLENGERS	100MA
9	X-RAY Machine Mobile, 100 MA	ALLENGERS	100MA
10	X-RAY Machine 100 MA ,Mobile	PHILIPS	Diagnox 100
11	X-RAY Machine 100 MA ,Mobile	MEDITRONICSMFG.CO. PVT.LTD	Diagnox-100
12	X-RAY Machine 60 MA ,Mobile	PHILIPSELECTRONICS	Diagnox-60
13	Digital Radiology conversion kit (14 X 17)	KONICA MINOLTA	AeroDR P11-1417HQ
14	Mammography, Venous Series	ALLENGERS	MAM 403 Venous Series
15	C.T.Scan -128 SLICE	WIPRO GE HEATH CARE PVT LTD	SIGMA
16	M.R.I .- 1.5 tesla	WIPRO GE HEATH CARE PVT LTD	OPTIMA 360-16 CHANNEL
17	Interventional Radiology (DSA)	WIPRO GE HEATH CARE PVT LTD	OPTIMA IGS 320
18	C.R. System with dry view Camera	KONICA MINOLTA	REGIUS 110HQ
19	C.R. System with dry view Camera	KONICA MINOLTA	REGIUS 110

20	PACS (Picture Archieving & Communication System)	MEDIFF	
21	Colour Doppler with four transducers	PHILIPS	Envisor
22	Colour Doppler with four transducers	MINDRAY	MINDRAY
23	Colour Doppler Machine	ACUSON	ASPAN
24	Colour Doppler Machine	WIPRO GE	LOGIQ F6
25	Colour Doppler Machine	WIPRO GE	LOGIQ F6R2
26	Colour Doppler Machine with four transducers	WIPRO GE	LOGIQ F6R2
27	Colour Doppler Machine (Portable)	WIPRO GEVIVID E (portable) 2DECHO	VIVID E
28	USG with two transducers	WIPRO GE HEATH CARE PVT LTD	Logic 200
29	USG with two transducers	WIPRO GE HEATH CARE PVT LTD	Logic C2
30	USG with two transducers (Portable)	MINDRAY	DP-2200
31	USG with two transducers (Portable)	MINDRAY	DP-2200
32	USG with two transducers (Portable)	SHIMADZU	SDU-350 XL

X-ray Machine

1. 800 mA - 2
2. 600 m A -2
3. 300 m A -2
4. 100 m A -5
5. 60 mA -1

Digital Radiology conversion kit (14 x 17)

USG

Color Doppler -5
Grey scale -2

CT scan 128 Slice -1
MRI 1.5 Tesla -1
Mammography -1
DSA -

8. SAFETY PROGRAM

Radiation safety program is implemented in accordance with the safety code for medical diagnostic x-ray equipment and installations of AERB/SC/MED-2. General safety measures against threat from fire, electricity are as per the safety program of the hospital. Safety from radiation to the radiation worker and patients is assured by adherence to following guidelines: -

- All equipment emitting radiation are housed in examination rooms designed in accordance with the guidelines of AERB.
- Mobile protection barriers/ lead glasses are in place at appropriate location.
- Personal protection devices such as lead goggles, lead apron, thyroid shield and gonad shield are available in the department. They are periodically checked for integrity.
- All radiation workers are trained in radiation safety measures aimed at reducing radiation exposure to themselves and patient.
- TLD badges are provided to all Radiation workers, which are periodically sent for evaluation and records maintained.
- Imaging signage depicting radiation hazard are displayed at all relevant stations.

9. QUALITY ASSURANCE

PROGRAM Machine Related

- All radiology equipment are under periodic maintenance service by the supplier.
- X-ray machines and CT scanner are periodically calibrated, evaluated and quality check performed by biomedical department as per AERB guidelines.
  a) Congruence of radiation and optical field
  b) Central beam alignment
  c) Focal spot size as declared by the X -Ray tube manufacturer
  d) output consistency
  e) Leakage rate
  f) Linearity of timer
  g) Accelerating voltage
  h) Timer checking
- Daily machine check and exposure evaluation performed by the Radiographer in charge.
- Qualified Engineers from Biomedical Department carry out Periodic and Breakdown maintenance and liaise with the engineers of the manufacturer.

Image Related

- X-ray: All X-rays including contrast studies are checked for quality by a Senior Radiographer in each station before dispatching and documented in the case Registers *in* the same station (Ref: X-ray registers kept in each station). Examinations requiring opinion of Radiologist are shown to the duty Radiologist. Referring doctors also consult the radiologists with films.
- Ultrasound: All Ultrasound scans and reports are checked by the Radiologist who performs the procedure before dispatching. All reports are marked in the case register kept in the Ultrasound room
- CT scan: All CT examinations are verified for adequacy of image quality and content of information by the CT technologist on duty which is counter checked and verified by the duty radiologist
- MRI- All MRI examinations are verified for adequacy of image quality and content of information by the MRI technologist on duty which is counter checked and verified by the duty radiologist.
- Digital mammography- All mammography examinations are verified for adequacy of image quality and content of information on by the mammography technologist on duty which is counter checked and verified by the duty radiologist

Verification and validation of methods and results :

Verification and validation method of X-Ray is regularly done by the radiographer in-charge with a checklist and the same is documented in the department. CT imaging methods are verified by the duty radiographer and re-verified by the radiologist. Ultrasound scanning methods are verified by the duty radiologist.

- X-Ray results are verified by the duty radiographer and re-verified by the radiologist/ faculty.
- CT images and reports are verified by duty radiologist and the same is re-verified by the second radiologist/ faculty when available.
- USG images and reports are verified by faculty/duty radiologist and the same is re-verified by the second radiologist when available.
- Telephonic/personal interactions with the clinical consultant in charge.
- Telephonic/personal interactions with the pathologist whom needed.
- The Radiologists, Radiographers and quality officer discuss the finding of the verification and validation procedure. In every week two or three cases randomly taken and observe whether the clinical findings are match with radiological findings.

Patient related

- X-ray films: Processed X-ray films are available for dispatch within 30 minutes.
- Ultrasound Scan: Scan reports are ready for dispatch 30minutes after the scan.
- CT scan: They are drafted and reviewed by postgraduate residents after the scan. Final report is done by Faculty/ radiologist within 24 hours after the scan.

Certain examinations do require academic discussions and inter departmental interactions. Such reports are issued the next day.

<u>Waste disposal protocols</u>

Waste disposal in Department of Radiology is in accordance with the general waste disposal policy. General Hospital wastes are collected in designated containers as per the existing protocol.

Specific wastes

Fixer: Handed over to outside agency for recycling through store. Developer: Handed over to stores for safe disposal. From store, it is diluted with water (I:15 i.e. 1 liter solution & 15 liters water) then discard to STP.

Waste Film: Handed over to the outside agency for recycling.

Regulatory Requirement (PCPNDT)

Department of Radiology is totally committed to the principles laid down in PCPNDT Act.

Following procedures have been incorporated to meet the requirements :

- Display of sex determination signboards at prominent locations in the hospital and at ultrasound examination room.
- Display of PCPNDT Registration Certificate at a prominent place in the department
- Form F to be sent along with every prenatal Sonography.
- Maintaining copy of Form F and report at the department.
- Monthly dispatch of PCPNDT data to the District Medical Officer (DMO) in the specified format before 5th of every month.
- Process of department as detailed in the documented procedures and work instructions.

10. LIST OF CRITICAL RESULTS

Central Nervous System- Cerebral Haemorrhage / Haematoma; Hypoxic ischemic encephalopathy (HlE) , Germinal matrix hemorrhage; Herniation Syndrome; intracranial Infection/Empyema; Skull fracture–complex in nature; Unstable fracture of spine; Compression of spinal cord
Neck Region- Airway Compromise (eg. Epiglottitis); Carotid Artery Dissection; Critical carotid stenosis
Chest Region- Tension Pneumothorax; Aortic Dissection; Large or Central Pulmonary Embolism; Ruptured Aneurysm; Mediastinal Emphysema; cardiac tamponade ; massive pleural effusion; peri-aneurysmal hematoma ; impending aneurysmal rupture
Abdomen Region – Unexpected free air in abdomen ; ischemic bowel; Appendicitis; Portal Venus air; Volvulus; Traumatic Visceral Injury ; Retroperitoneal Hemorrhage ; Active [Intra- abdominal Hemorrhage; High grade bowel obstruction
Urogenital- Ectopic pregnancy; Placental abruption; Placenta Previa in near term; Testicular or ovarian torsion; Testicular or ovarian torsion; Fetal demise; severe utero-placental or fetoplacental insufficiency on Doppler with altered cerebro-placental ratio
Vascular- DVT , arterial thrombosis
Others- Retained surgical/foreign body; Significant Line/tube mis-placement

Reporting of critical results-

- The radiologists informs the referring doctors all critical results of X-ray, USG , CT scans, MRI by telephone within 10 minutes.
- Reports of critical results are given by Faculty / Radiologist within 30 minutes-1 hour.

11. GUIDELINES ON PRE-PROCEDURAL PREPARATIONS AND POST-PROCEDURAL CARE

Intra-Venous Urogram (IVU)

Pre-procedural preparation

- Low Residue diet two days prior to the examination.
- Nothing by mouth (NBM) for 8 hr Prior to the examination.
- Laxative at bed time for two days to the procedure.
- Anti-flatulent for two days prior to the procedure.
- Blood Urea and Serum Creatinine to be checked.
- Pre contrast checklist to be filled.
- 18gauge IV Cannula to be inserted on all patients. Informed Consent to be obtained prior to procedure.
- Patient to be sent with a responsible bystander/ Relative.
- Please send all relevant medical and investigation records.

Post-procedural care

- Nothing by mouth for 30minutes.
- Liberal intake of oral fluid to be encouraged.
- Patient to be observed in the daycare unit /Emergency observation room for 4hrs.

Barium Enema

Pre-procedural preparations

- Low residue diet two days prior to the examination.
- No solid food for 12hrs prior to the examination.
- Fluid intake is permitted up to 2hrs prior to the examination.
- Laxative at bedtime for two days prior to the procedure.
- Anti-flatulent for two days prior to the procedure.
- Informed consent is obtained.
- Patient is sent with a responsible bystander/ relative.
- All relevant medical and investigation records are sends along with the patient.

Post-procedure care

- Pre-procedural diet and medications can be resumed on reaching the ward.
- Explain the patient that bowel motion may be white in color for a few days.

Barium Meal :

Pre-procedural preparation

- Nothing by mouth 8 Hrs prior to the procedure.
- Laxative at a bedtime the day prior to the procedure.
- Written consent to be obtained.
- All relevant medical and investigation records are sent along with the patient.

Post procedural care

- Pre-procedural diet and medications can be resumed on reaching the ward.
- Inform patient that bowel motion may be white in color for a few days.

Barium Swallow :

Pre-procedural preparation

- Nothing by mouth 6 hrs prior to the procedure.
- Consent to be obtained.
- Please send all relevant medical and investigation records.

Post-procedural care

- Pre-procedural diet and medications can be resumed on reaching the ward.
- Inform patient that bowel motion may be white in color for a few days.

Small Bowel Enema (Enteroclysis)

Pre-procedural preparation

- Nothing by mouth for 12 Hrs prior to the procedure.
- Laxative at bedtime the day prior to the procedure.
- Informed written consent to be obtained.
- If anti spasmodic drugs taken, they should be stopped 1 day prior to the examination.
- 20 gauge IV cannula to be introduced to all.
- Please send all relevant medical and investigation records.
- Any previous history of nasal pathology to be recorded.

Post -procedural care

- Nothing by mouth for 1 hr after the procedure.
- 2 hrs of observation is required.
- Possibility of transient diarrhea should be explained to the patient.

Computerized Tomography (CT)-Thorax and Abdomen (Post Contrast Scan)

Pre-procedural preparation

- Nothing by mouth for 4 Hrs prior to the procedure.
- Informed consent to be obtained.
- Previous H/0 drug allergy, contrast reaction, asthma, multiple myeloma, diabetes.
- Patient is ensured of well hydrated status.
- 18gauge IV cannula to be introduced on all patients.
- Responsible Bystander/ Relative should accompany the patient to the department.
- Please send all relevant medical and investigation records.
- Blood urea and Creatinine to be checked, eGFR checked.
- GI contrast administration (for the time being) will be performed at the Radiology department.

Post-procedural care

- NBM for 30 minutes.
- Vital signs to be monitored for at least for 3 Hrs.
- Pre-procedural medications and diet can be resumed after 30 Minutes.

Computerized Tomography (CT)-Others (Post Contrast Scan)

Pre - procedural preparation

- NBM for 2 Hrs prior to the procedure.
- Precontrast checklist to be filled. Previous H/O drug allergy, contrast reaction, asthma, multiple myeloma, diabetes. Patient is ensured of well hydrated status.
- Informed consent to be obtained.
- 18 gauge IV line to be introduced on all.
- Responsible Bystander/ Relative should accompany the patient to the department.
- Please send all relevant medical and investigation records.
- Blood urea and Creatinine to bechecked.

Post -procedural care

- Nothing by mouth for 30 minutes.
- Vital signs to be monitored for at least for 3 Hrs.
- Pre-procedural medications and diet can be resumed after 30 Mts.

MRI

Pre-procedural preparation

- Nothing by mouth for 4 Hrs prior to the procedure.
- Informed consent to be obtained.
- Previous H/O drug allergy, contrast reaction, asthma, multiple myeloma, diabetes.
- Patient is ensured of well hydrated status.
- 18 gauge IV cannula to be introduced on all patients.
- Responsible Bystander/ Relative should accompany the patient to the department.
- Please send all relevant medical and investigation records.
- Blood urea and Creatinine to be checked, eGFR checked.

Patient will typically receive a gown to wear during MRI examination. Before entering the MR system room, patient and any accompanying friend or relative will be asked questions (i.e., using a screening form) regarding the presence of implants or devices and will be instructed to remove all metallic objects from pockets and hair, as well as metallic jewelry. Additionally, any accompanying individual will need to fill out a screening form to ensure that he or she may safely enter the MR system room. Any questions or concerns will be discussed with the MRI technologist or radiologist prior to the MRI examination.

Before the exam, patient will be asked to fill out a screening form asking about anything that might create a health risk or interfere with imaging. Items that may create a health hazard or other problem during an MRI exam include:

- Certain cardiac pacemakers or implantable cardioverter defibrillators (LCDs)
- Ferromagnetic metallic vascular clips placed to prevent bleeding from intracranial aneurysms
- Some implanted or external medication pumps (such as those used to deliver insulin, pain-relieving drugs, or chemotherapy)Certain cochlear (inner ear) implants
- Certain neuro-stimulation systems
- Catheters that have metallic components
- A bullet, shrapnel or other type of metallic fragment
- A metallic foreign body within or near the eye (such an object generally can be seen on an x-ray; metal workers are most likely to have this problem)

Items that need to be removed by patients and individuals before entering the MR system room include:

- Purse, wallet, money clip, credit cards, cards with magnetic strips
- Electronic devices such as beepers or cell phones
- Hearing aids
- Metal jewelry ,watches
- Pens, paper clips, keys, coins
- Hair barrettes, hairpins
- Shoes, belt buckles, safety pins
- Any article of clothing that has metallic fibers or threads, metallic zippers, buttons, snaps, hooks, or underwire

Objects that may interfere with image quality if close to the area being scanned include:

- Metallic spinal rod
- Plates, pins, screws or metal mesh used to repair a bone or joint
- Joint replacement or prosthesis
- Metallic jewelry including those used for body piercing or body modification
- Some tattoos or tattooed eyeliner (these alter MR images, and there is a chance of skin irritation or swelling; black and blue pigments are the most troublesome)
- Makeup, nail polish or other cosmetic that contains metal
- Dental fillings (while usually unaffected by the magnetic field, these may distort images of the facial area or brain; the same is true for orthodontic braces and retainers)

Post-procedural care

- NBM for 30 minutes.
- Vital signs to be monitored for at least for 3 Hrs.
- Pre-procedural medications can be resumed after 30 Minutes

Hysterosalpingography (HSG)

Pre-procedural preparations

- Procedure to be done between the 6th to 10th day of menstrual cycle.
- NBM 4 Hrs prior to the procedure.
- Inj.TT 0.5 Ml/Min non-immunized individuals.
- IV Cannula to be introduced on all.

Post-procedure instructions

- Radiologist explains that there may for slight bleeding Per Vaginal for 1 to 2 days.

Diagnostic Fluid Aspiration

Pre-procedure preparation

- Informed written consent.
- Coagulation profile to be checked.
- Blood group.
- NBM for 4Hrs. prior to the procedure.
- Responsible Bystander/ Relative should accompany the patient to the department.
- IV cannula to be introduced on

All Post-procedural care

- NBM for 1 hr.
- Vital signs to be monitored for at least 3 hrs.

Micturating cystourethrogram (MCU)

Pre-procedural preparation

- Instruct the patient to micturate prior to the procedure.
- Consent to be obtained

Post-procedural care

- Possibility of transient dysuria may be explained to the patient and to the parents of children.

Image Guided Procedures (EG:-Biopsy, FNAC, PTC, PTBD, Fluid Drainage Procedures, Etc.,)

Pre-procedural preparation

- Informed written consent.
- Coagulation profile to be checked.
- Blood group.
- NBM for 4 Hrs. prior to the procedure.
- Responsible Bystander/ Relative should accompany the patient to the department.
- IV cannula to be introduced on all.
- To arrange one suitable blood donor and sample to be Cross- matched

Post-procedure care

- NBM for 1 hr.
- Vital signs to be monitored at least 3 hrs.

Ultrasonography (USG) -Hepatobiliary System and Pancreas :

Pre-procedural preparations

- A fasting period of 6 hrs is desirable. However light diet / moderate fluid intake may be allowed if patients are unable to tolerate this period of fasting or fasting stat interferes with medication schedule.
- Responsible Bystander / Relative should accompany the patient to the department.
- Please send all relevant medical and investigation records.

Post-procedure care

- Pre-procedural diet and medications can be resumed on reaching the ward.
- Ultrasonography (USG}-Pelvis and Lower Abdomen

Ultrasonography (USG) – Pelvis and lower abdomen :

Pre-procedural preparation

- Patient should attain sufficient urinary bladder volume prior to scanning.
- Responsible Bystander/ Relative should accompany the patient to the department.
- Please send all relevant medical and investigation records.

Pre-procedure care

- Pre-procedural diet and medications can be resumed on reaching the ward.

References

- AERB Manual
- Text books

Records Generated

- Case Registers in CT scan, USG and X-ray stations Various check lists Relevant Laws and Regulation
  - PNDT Act
  - Installation and Renewal Certificates from DRS
  - AERB Manual

COVID STANDARD OPERATING PROCEDURE FOR RADIOLOGICAL PROCEDURES

The SOP aims,

(a) to achieve sufficient capacity for continued operation during a health care emergency of unprecedented proportions,

(b) to support the care of patients COVID-19/ suspected patients, and

(c) to maintain radiologic diagnostic and interventional support for the entirety of the hospital and health system.

In dealing with COVID-19 patients/ suspects in India, imaging should be focused on Portable Radiographs and Bedside portable Ultrasound. Avoid unnecessary patient transport to the department. Frequency of imaging to be based on clinical status of patient, as and when needed. No need for routine daily imaging.

The standing order for the department are to be read in conjunction with the other provisions in Hospital Standing Orders of VIMS.

STANDARD OPERATING PROCEDURE (SOP) FOR PERFORMINGPORTABLE CHEST X-RAY

Main aim is to minimise radiographers stay in patients room, minimise contact with patient as practically possible ensuring patient and staff safety

Appropriate trained and fit tested radiographers to undertake

portable chest x-ray Portable X ray machine used for COVID positive/

suspect patients shall be station in the corresponding isolation ward/ ICU. The machine shall not be used for general use in other patients. Decontamination of the X ray machine shall be done by the cleaning team in the isolation ward/ ICU.

REQUEST:

Request for portable chest X-ray for COVID patient with indication and to inform duty radiographer in x-ray room

Work-flow:

Before arrival at patient's room:

1. Portable X-ray machine that is most appropriate (post 1 hr downtime) will be used.
2. Co-ordination with clinical team to arrange time for chest r-ray, so that nursing staff are ready. Ensure with nursing staff that patient is wearing a surgical mask
3. Radiographers with shifting staff work in pairs.
4. Insert patient details and place X-ray detector in plastic sleeve before proceeding to patient's room.
5. Radiographer and shifting staff first to wear radio protective lead apron. Then to wear full PPE as per institute guidelines.

In patient's room:

1. First recheck if patient is masked and that there is enough space for operating the machine, if not ask for staff nurse help for arrangement
2. If patient co-operative- verbal instructions to patient about exam and ask the patient to sit- up. If patient sedated, ask for additional nursing staff help for placing x-ray detector
3. Place the detector behind the patient, with minimal contact with patient and surroundings. Ensure detector is placed appropriately
4. Sanitize gloved hands and centre the intensifier
5. Sanitize gloved hands and expose. Ensure adequacy of image on monitor

6. Take x-ray detector from behind the patient and place sleeved detector on floor
7. Sanitise gloved hands, remove detector from sleeve and place in portable machine
8. Discard the sleeve and sanitise gloved hands
9. Then remove PPE as per institute guidelines. Transport machine out of anteroom and post process the image

General Instructions in CT room:

- CT scan shall be used only if considered essential in clinical decision making for management.
- Use can be limited to patients with severe respiratory complications, unexplained by combined use of Chest radiography and bedside portable ultrasound.
- All communication between technician- Radiologist, Tech/ Radiologist – Referring doctor, radiology staff – admin should be strictly via telecommunication.
- Ensure minimum contact to staff with patient.
- Ensure minimum time spent by patient in imaging complex.
- Ensure all movable equipment in scan room to be shifted out.
- Cover all non movable equipment covered with transparent plastic sheet prior to patient arrival and removed post procedure.
- Contrast CT scans are to be generally avoided.
- In case contrast administration is needed, accompanying nursing staff to ensure adequate i v access.
- All consents for contrast administration in CT to be taken by clinical team in ICU/Ward/ OPD before shifting to imaging complex.
- Ensure thorough cleaning of surfaces especially contact areas with disinfectants as per institute protocol.
- Only minimal staff to be posted for taking such cases, with staff preferably on shift duties continuously for 7-14 days. Subsequently, next set of staff to replace them .
- Make sure the radiographer and accompanying staff coming with the patient must not enter the CT console room. They should wait in the corridor outside the console while the scan is going on and till it is finished. Once scan is finished, they can re enter the scan room and shift patient back to the bed.
- After shifting the patient back to admission area, thorough cleaning of Scanners with alcohol based sanitizers must be done after wearing PPE. Close the scanning room for required time (according to the sanitizer contact time).

12. ABBREVIATION

1. IP = INPATIENT
2. OP = OUTPATIENT
3. OTC =OVER THE COUNTER
4. US = ULTRASOUND
5. USS = ULTRASOUND SCANNING
6. RDT = RADIO DIAGNOSTIC TECHNOLOGY
7. MRL = MAGNETIC RESONANCE IMAGING
8. OED = ORDER ENTRY DONE
9. OR = OPERATING ROOM
10. TLD = THERMO LUMINESCENT DOSIMETER