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CHAPTER 276: VETERANS HEALTH ADMINISTRATION: RADIOLOGY SERVICE

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1 PURPOSE AND SCOPE

- A. This document outlines space planning criteria for VA Handbook 7610 Chapter 277: Radiology Service. It applies to all medical facilities at the Department of Veterans Affairs (VA).
- B. Radiology Service includes diagnostic imaging modalities (i.e. General Radiology, Fluoroscopy, Computed Tomography (CT), Interventional Radiology (IR), Ultrasound, and Mammography) for inpatients and outpatients and is an ancillary department for the entire medical facility.
- C. Satellite Radiology Suite includes selected high-volume outpatient diagnostic imaging modalities (i.e. General Radiology, Chest) physically separated from but related to Radiology Service.

2 DEFINITIONS

- A. Angiographic Room: A radiographic/fluoroscopic system with rapid filming techniques and with special capabilities for performing angiographic procedures. The system may be single-plane or bi-plane.
- B. Chest Room - Dedicated: A specific or specialized radiographic room used for routine chest X-rays and those radiographic procedures which can or should be performed in an upright position.
- C. Computed Radiology (CR): CR uses special plate technology, scanning and computer processing to produce a digital image of a patient's organ or body part. This digital image can be printed to a dry processor, if needed.
- D. Computed Tomography (CT): The technique employing ionizing radiation to produce axial (cross section) body section images. Data obtained by X-ray transmission through the patient are computer analyzed to produce these images. The series of sectional, planar images may be manipulated to produce different planar views of the area of interest and eliminate overlying structures such as bone. Manipulations of data allows for the selective view of either dense tissues such as bones or diffuse tissues such as the heart, brain, or lung. CT is used for both head and body imaging and is applicable to diagnosis, biopsy, and therapy planning.
- E. Concept of Operations: A user-developed guide to the functional operation of the VA healthcare facility. It defines the function of the facility and the scope of medical services to be provided in the new or remodeled space.
- F. Diagnostic Radiology: The medical specialty that utilizes imaging examinations with or without ionizing radiation to affect diagnosis. Techniques include radiography, tomography, fluoroscopy, ultrasonography, mammography, interventional radiography (IR) and computed tomography (CT).
- G. Diagnostic Room: Designated room containing diagnostic equipment performing patient procedures such as Radiographic, Radiographic/Fluoroscopic (R/F), Mammography, Ultrasound, Interventional Radiology (IR), and Computed Tomography

- (CT). They may also be referred to as Scanning Room, Procedure Room, or Gantry. For MRI Scanning Rooms, refer to VA Handbook 7610: Chapter 275.
- H. Digital Radiography: The capture or conversion of radiographic images in a digital format.
 - I. Fluoroscopy: The technique used to produce real time motion in either an instantaneous or stored fashion. A non-ionic contrast material is injected or consumed by the patient to enhance visualization of various organs. A constant stream of radiation passes through the patient and strikes a fluorescent screen creating shadows of the opaque internal organs. Induced motion provides a continuous or nearly continuous evaluation of the visual effects of that motion. Images produced by this modality include upper and lower gastrointestinal series, cystography, pyelography and esophageal mobility studies.
 - J. Functional Area: The grouping of rooms and spaces based on their function within a clinical service. Typical Functional Areas are Reception Areas, Patient Areas, Support Areas, Staff and Administrative Areas, and Residency Program.
 - K. General Purpose Radiology Room: A room in which direct radiography is performed.
 - L. General Radiology: Images of the skull, chest, abdomen, spine, and extremities produced by the basic radiographic process.
 - M. Head Room: A room specifically designed for the examinations involving the skull to include sinuses, mastoids, jaws, etc. (This room is not anticipated in the future. It is included here to identify a room size if an existing piece of equipment is relocated.)
 - N. Input Data Statement(s): A set of questions designed to elicit information about the healthcare project in order to create a Program for Design (PFD) based on the criteria parameters set forth in this document. Input Data Statements could be Mission related, based in the project's Concept of Operations; and Workload or Staffing related, based on projections and data provided by the VHA or the VISN about the estimated model of operation. This information is processed through mathematical and logical operations in SEPS II.
 - O. Interventional Radiology (IR): The clinical subspecialty that uses fluoroscopy, CT and ultrasound to guide percutaneous (through the skin) procedures such as performing biopsies, draining fluids, inserting catheters, or dilating or stenting narrowed ducts or vessels. IR Procedures are complex, requiring a team of doctors and technicians. As such they are often performed in the Surgical Suite, and scheduled in advance as they require special preparation. An IR / Special Procedure Room can be categorized as 1) Angiographic Room, (2) Vascular / Neuro-radiology Room.
 - P. Magnetic Resonance Imaging (MRI): The technique utilizing magnetic and radio frequency fields to produce computer calculated images of human anatomy (body tissue) and monitor body chemistry. While immersed in a magnetic field, the portion of the body to be scanned is exposed to energy in the radio frequency range. The effects of this exposure on atomic nuclei position are read by the computerized system and converted into images. MRI reflects tissue density and body chemistry. (Refer to VA Handbook 7610: Chapter 275)

- Q. Mammography: A modality utilizing ionic radiation along with single emulsion film and extended processing for breast examinations.
- R. Net-to-department gross factor (NTDG): This number, when multiplied by the programmed net square foot (NSF) area, determines the departmental gross square feet (DGSF) The **NTDG** factor adopted for **Radiology** is **1.60**.
- S. Picture Archiving and Communication System (PACS): The digital capture, transfer and storage of diagnostic images. A PACS system consists of workstations for interpretation, image/data producing modalities, a web server for distribution, printers for file records, image servers for information transfer and holding, and an archive of off-line information. A computer network is needed to support each of these devices.
- T. Procedure / Suite Stop: A procedure/suite stop is one encounter of a patient with a healthcare provider. Per these criteria, the procedure/suite stop is the-workload unit of measure for space planning. One individual patient can have multiple procedure/suite stops in a single visit or in one day.
- U. Program for Design (PFD): A space program based on criteria set forth in this document and specific information about Concept of Operations, Workload projections and Staffing levels authorized.
- V. Radiography: A still patient image record utilizing ionizing radiation. Historically the image-recording medium has been film. The industry has moved to a digital image format since the mid 90's. The image is recorded in digital format. This digital image can also be stored on film. The VA is presently converting to digital imaging with film being utilized as a back-up system. However, some film based services do remain within the VA system.
- W. Radiographic / Fluoroscopic Room: A room containing a radiographic/fluoroscopic system that produces either still photographic records or real-time images of internal body structures. Most fluoroscopy procedures are performed early in the day because of fasting requirements. After most fluoroscopy procedures have been completed, this room can be used as a general purpose room.
- X. Room Efficiency Factor: A factor that provides flexibility in the utilization of a room to account for patient delays, scheduling conflicts, and equipment maintenance. A room with an 80% room efficiency provides a buffer to assume that this room would be available 20% of the time beyond the planned operational practices of the room. This factor may be adjusted based on the actual and/or anticipated operations and processes of the room/department.
- Y. Stereotactic Mammography: Imaging of the breast from two slightly angled directions in order to identify a path to help guide a needle for breast biopsy. The procedure may be performed upright or with the patient lying face down. Several stereotactic pairs of X-ray images are made. Small samples of tissue are then removed from the breast using a hollow core needle or vacuum-assisted biopsy device that is precisely guided to the correct location using X-ray imaging and computer coordinates.
- Z. SEPS (VA SEPS): Acronym for Space and Equipment Planning System, a digital tool developed by the Department of Defense (DoD) and the Department of Veterans

Affairs to generate a Program for Design (PFD) and an Equipment List for a VA healthcare project based on specific information entered in response to Input Data Statements. VA-SEPS incorporates the propositions set forth in this chapter as well as all chapters in VA's Handbook 7610. VA-SEPS has been designed to aid healthcare planners in creating a space plan based on a standardized set of criteria parameters.

- AA. Tomography Room: Used for body section imaging (laminography) and is applicable to the skull, inner ear, chest, a variety of orthopedic applications. (This room is not anticipated in the future. It is included here to identify a room size if an existing piece of equipment is relocated.)
- BB. Tomography System: The technique used to provide a still or static patient image record employing mechanical motion and ionizing radiation to enhance the visual clarity of a particular anatomic part by controlled blurring of superimposed structures. (This modality is experiencing reduced use within the VA; however some services still use it at this time.)
- CC. Ultrasound: High frequency sound waves are utilized to determine the size and shape of internal organs based on the differential rates of reflection. In addition, images can be observed in real time to reveal motion, and can include coloration of arterial and venous blood flow. Cyst aspiration and fluid removal are also procedures done with the ultrasound modality.
- DD. Vascular / Neuro-radiology Room: A diographic / fluoroscopic system with a rapid film changer and with capabilities for performing a range of neuro, visceral, and peripheral procedures. The system may be single-plane or bi-plane.
- EE. Workload: Workload is the anticipated number of procedures or suite stops that are processed through a department/service area. The total workload applied to departmental operational assumptions will determine overall room requirements by modality.

3 OPERATING RATIONALE AND BASIS OF CRITERIA

- A. Workload Projections or planned services / modalities for a specific VA medical center, hospital or satellite outpatient clinic project are provided by the VA Central Office (VACO) / VISN CARES Capacity Projection Model. The workload projections are generated by methodology based upon the expected veteran population in the respective market/service area. Healthcare planners working on VA medical center, hospital or satellite outpatient clinic projects will utilize and apply the workload criteria set forth herein for identified services and modalities to determine room requirements for each facility.
- B. Space planning criteria have been developed on the basis of an understanding of the activities involved in the functional areas of the Radiology Service and their relationship with other services of a medical facility. These criteria are predicated on established and/or anticipated best practice standards, as adapted to provide environments supporting the highest quality health care for Veterans

- C. These criteria are subject to modification relative to development in the equipment, medical practice, vendor requirements, and subsequent planning and design. The selection of the size and type of Radiology equipment is determined by VACO Radiology Service and upon Veterans Health Administration (VHA) anticipated medical needs.
- D. Radiology Services, as used in these criteria, includes all diagnostic imaging modalities such as radiology, fluoroscopy, computed tomography (CT), interventional radiology, ultrasound, mammography, and bone densitometry.
- E. Room capacity per year should be based on:

$$\frac{\text{Operating days per year} \times \text{Hours of operation per day}}{\text{Minutes per procedure} / 60 \text{ minutes}} = \text{Number of annual procedures}$$

- 1. The general planning model for VA facilities assumes 250 Operating Days per Year and 8 Hours of Operation per Day. Room capacity will fluctuate as hours of operation are modified, i.e., additional capacity may be generated by extending the daily hours of operation within the same physical setting.
- 2. Basic Room Efficiency Factor is 80%.
 - a. Modalities with routine, scheduled procedures and backup equipment (more than one piece of the same type of equipment in the department) should plan for an efficiency factor of 85%.

Example: Assume a procedure room that averages 30 minute per procedure/suite stop:

$$\frac{250 \text{ operating days per year} \times 8 \text{ hours of operation per day}}{30 \text{ minutes per procedure} / 60 \text{ minutes}} = 4,000 \text{ annual procedures}$$

A maximum capacity of 4,000 procedures/suite stops per year, assuming 100% utilization. However, 100% utilization is not realistic to achieve, thus, it is not realistic as a design standard. Apply Room Efficiency Factor:

4,000 x 80% = 3,200 annual procedures. TABLE 1: WORKLOAD PARAMETER CALCULATION

PROCEDURE	AVERAGE LENGTH OF PROCEDURE (minutes)	ANNUAL PROCEDURES PER ROOM (rounded)	MINIMUM WORKLOAD TO GENERATE ONE ROOM
General Purpose Radiology Room	22	4,370	1,310
Chest Room - Dedicated	20	4,800	1,440
Radiographic / Fluoroscopic (R/F)	45	2,140	640

Room			
Mammography Room	20	4,800	1,440
Stereotactic Mammography Room	40	2,400	720
Ultrasound Room	50	1,920	580
Interventional Procedure Room	100	960	290
CT Scanning Room	25	3,840	1,150

The number of annual procedures per room will be used as a criteria parameter to calculate the number of procedure rooms in the Space Criteria section of this document. The minimum workload to generate one room is 30% of the calculated annual procedures per room unless otherwise indicated.

- F. Authorization for Interventional Radiology, CT, Ultrasound, and Mammography Rooms will be project specific as approved by VA Central Office Radiology Service based on the following:
1. In order to operate a dedicated Interventional Radiology Room(s) for angiographic and vascular / neuro-radiology procedures should have an annual workload of at least 500 procedures.
 2. An Ultrasound unit should have an annual workload of at least 1,500 exams.
 3. A dedicated Mammography unit should have an annual workload of at least 300 exams.

4 PROGRAM DATA REQUIRED (INPUT DATA QUESTIONS)

A. Mission Input Data Statements

1. How many rooms will have CR / cassette capability? (M)
2. Is provision of conventional film-based services authorized? (M)
3. Is Tele-Radiology authorized? (M)
4. Will the Interventional Radiology Procedure Room include the Control Room? (M)
5. Is a 3D Workstation authorized? (M)
6. Is a Mobile Radiology Unit authorized? (M)
7. Is a Residency Program authorized? (M)
8. Is a Teaching Department authorized? (M)
9. Will Tomography services/room be provided? (M)
10. Is PACS authorized? (M)

B. Workload Input Data Statements

Use either Relative or Absolute Values depending on available data.

1. Relative Values
 - a. How many annual Radiology stops / procedures (all types) are projected (W)?

- (1) What percentage of total annual stops / procedures is projected for General Radiology? (W)
- (2) What percentage of total annual stops / procedures is projected for Chest Procedures? (W)
- (3) What percentage of total annual stops / procedures is projected for Head Room Procedures? (W)
- (4) What percentage of total annual stops / procedures is projected for Radiography / Fluoroscopy (R/F) Procedures? (W)
- (5) What percentage of total annual stops / procedures is projected for Mammography Procedures? (W)
- (6) What percentage of total annual stops / procedures is projected for Stereotactic Mammography Procedures? (W)
- (7) What percentage of total annual stops / procedures is projected for Ultrasound Procedures? (W)
- (8) What percentage of total annual stops / procedures is projected for Interventional Radiology Procedures? (W)
- (9) What percentage of total annual stops / procedures is projected for Computed Tomography Procedures? (W)

2. Absolute Values

- a. How many annual General Radiology stops / procedures are projected? (W)
- b. How many annual Chest stops / procedures are projected? (W)
- c. How many annual Head (room) stops / procedures are projected? (W)
- d. How many annual Radiography / Fluoroscopy stops / procedures are projected? (W)
- e. How many annual Mammography stops / procedures are projected? (W)
- f. How many annual Stereotactic Mammography stops / procedures are projected? (W)
- g. How many annual Ultrasound stops / procedures are projected? (W)
- h. How many annual Interventional Radiology stops / procedures are projected? (W)
- i. How many annual CT stops / procedures are projected? (W)

C. Staffing Input Data Statements

1. How many administrative FTE positions are authorized? (S)
2. How many chief technician positions are authorized? (S)
3. How many FTE administrative assistant positions are authorized? (S)
4. How many FTE non physician professional positions are authorized? (S)
5. How many FTE scheduler positions are authorized? (S)
6. How many FTE transcriptionist positions are authorized? (S)
7. How many radiologist positions are authorized? (S)
8. How many resident positions are authorized? (S)

9. How many students will be assigned to Radiology Services? (S)
10. Is a Quality Assurance provider position authorized? (S)
11. Is a Physicist position authorized? (S)
12. Is a Radiology Assistant Chief position authorized? (S)

5 SPACE CRITERIA

A. Reception Area

1. **Main Waiting (WRC01)**..... **150 NSF (13.9 NSM)**
Minimum NSF. Provide an additional 45 NSF per each additional diagnostic room greater than three.

Waiting space shall be out of traffic, under visual control by staff, and arranged to accommodate wheelchairs.
2. **Reception (RECP1)** **120 NSF (11.2 NSM)**
Minimum NSF. Provide an additional 10 NSF for every diagnostic room greater than three. Maximum of 160 NSF
3. **Patient Interview Room (PAIA1)** **120 NSF (11.2 NSM)**
Provide one per Radiology Service. Provide one additional if Interventional Radiology is in the Concept of Operations.
4. **Patient Education Kiosk/Alcove (CLSC1)** **30 NSF (2.8 NSM)**
Provide one per Radiology service.
5. **Public Toilet (TLTU1)** **50 NSF (4.7 NSM)**
Provide one for male and one for female.

B. Patient Areas

1. Radiology

The main Radiology Suite includes all diagnostic rooms (both General Purpose and Special Procedures) and direct support facilities for both inpatients and outpatients except those facilities which may be located in a "Satellite Radiology Suite (Ambulatory Care)".

- a. **Radiology Sub-Waiting (WRC01)** **45NSF (4.2 NSM)**
Minimum NSF. Provide an additional 15 NSF per each diagnostic room over one room.

Sub-waiting supports General Purpose, Radiographic/Fluoroscopic, and Chest Rooms.
- b. **General Purpose Radiology Room (XDR01)** **300 NSF (27.9 NSM)**
Divide the projected number of annual procedures by 4,370; provide one room for each whole increment of 4,370, and/or remainder of 1,310 or greater. Minimum annual workload to provide a room is 1,310 (see Table 1).

Includes control area.

- c. **General Purpose Radiology Toilet (TLTU1)** **50 NSF (4.7 NSM)**
Provide one minimum. Provide an additional one per every three General Purpose Radiology Rooms.

- d. **Radiology Dressing Room/Cubicle (DR001)** **35 NSF (3.3 NSM)**
Provide one per each General Purpose Radiology Room and two per each dedicated Chest Room.

- e. **Chest Room (XDCS1)**..... **250 NSF (23.2 NSM)**
Divide the projected number of annual procedures by 4,800; provide one room for each whole increment of 4,800, and/or remainder of 1,440 or greater. Minimum annual workload to provide a room is 1,440 annual procedures (see Table 1).

Includes Control Area.

- f. **Head Room (XDR01)** **250 NSF (23.2 NSM)**
Provide one if in Concept of Operations.

Includes control area. This room is not anticipated in future projects. It is included here to identify a room size if an existing piece of equipment is relocated.

- g. **Tomography Room (XDR01)** **320 NSF (29.7 NSM)**
Provide on if in Concept of Operations.

Includes control area. This room is not anticipated in future projects. It is included here to identify a room size if an existing piece of equipment is relocated.

- h. **Radiographic / Fluoroscopic (R/F) Room (XDRF1)** **320 NSF (29.8 NSM)**
Divide the projected number of annual procedures by 2,140; provide one room for each whole increment of 2,140 and/or remainder of 640 or greater. Minimum annual workload to provide a room is 640 (see Table 1).

Includes control area.

- i. **R/F Dressing Room/Cubicle (DR001)**..... **35 NSF (3.3 NSM)**
Provide one per R/F Room.

- j. **R/F Patient Toilet (TLTU1)** **50 NSF (4.7 NSM)**
Provide one per R/F Room

- k. **Mammography / Stereotactic Mammography Sub Waiting (WRC01)**..... **45 NSF (4.2 NSM)**
Minimum NSF. Provide an additional 15 NSF per each diagnostic room greater than one.

- l. **Mammography Room (XDM01)** **160 NSF (14.9 NSM)**

Divide the projected number of annual procedures by 4,800; provide one room for each whole increment of 4,800 and remainder of 1,440 or greater. Minimum annual workload to provide the first room is 300. (see Table 1).

A mammography radiographic procedure is an examination of the breast. Unilateral or bilateral examinations are performed. This room also will be used for teaching breast self-examination procedures. The equipment makes it possible to examine a patient not only in a standing or sitting position but also when lying down.

- m. **Stereotactic Mammography Room (XDM02) 200 NSF (18.6 NSM)**
Divide the projected number of annual procedures by 2,400; provide one room for each whole increment of 2,400, and/or increment of 720 or greater. Minimum annual workload to provide a room is 720 (see Table 1).
- n. **Mammography Dressing Room / Cubicle (DR001) 35 NSF (3.3 NSM)**
Provide one per Mammography Room and/or Stereotactic Mammography Room.
- o. **Mammography Patient Toilet (TLTU1) 50 NSF (4.7 NSM)**
Provide one per four Mammography and Stereotactic Mammography Rooms.
- p. **Mammography Processing Room (XDMP1) 110 NSF (10.2 NSM)**
Provide minimum one when mammography is provided. Provide one room per each increment of four Mammography and Stereotactic Mammography Rooms.
- q. **Mammography Quality Assurance Work Area (OFDR1) 120 NSF (11.2 NSM)**
Provide one per Mammography Processing Room.
- r. **Mammography Biopsy Examination Room (EXRG3) 120 NSF (11.2 NSM)**
Provide one only when Stereotactic Mammography Room is authorized.
- s. **Ultrasound Sub-waiting (WRC01) 45 NSF (4.2 NSM)**
Minimum NSF. Provide an additional 15 NSF per each diagnostic room greater than one.
- t. **Ultrasound Room (XDUS1) 180 NSF (16.8 NSM)**
Divide the projected number of annual procedures by 1,920; provide one room for each whole increment, and remainder of 580 or greater. Minimum annual workload to provide the first room is 1,500.

This room provides facilities for one ultrasound system, which contains the computer and the mobile scanner unit and a multi-format camera. Space for movement of a stretcher or a bed has been considered within the room's internal circulation patterns. The room location should be within the main diagnostic radiology department's boundaries so supporting facilities and personnel can be used during examinations, (e.g., waiting room and dressing cubicles). Patients may need an adjacent toilet for voiding both during and after many of the examinations. Ultrasound rooms require a sink, laundry hamper, a place to

store clean linen, and various supplies for biopsy, catheterization and fluid localization. Ultrasound does not involve radiation therefore; there is no need for shielding.

- u. **Ultrasound Dressing Room/Cubicle (DR001)..... 35 NSF (3.3 NSM)**
Provide one per Ultrasound Room.
- v. **Ultrasound Patient Toilet (TLTU1)..... 50 NSF (4.7 NSM)**
Provide one per Ultrasound Room
- w. **Patient Stretcher Holding Bay (WRL01) 80 NSF (7.4 NSM)**
Provide one per two diagnostic rooms.

This bay provides space for holding and/or observation of patients either pre- or post-procedure.

- x. **Equipment Storage (SRE01)..... 100 NSF (9.3 NSM)**
Provide one per Radiology Patient Area.

2. Interventional Radiology (IR)

Verify IR is in Radiology concept of operations.

IR Procedures are complex, percutaneous, radiographies and fluoroscopies. Two types of rooms are Angiographic Room, and Vascular / Neuro-radiology Room. These procedures require sterile conditions, special preparation, and are scheduled in advance. As such they are often performed in the Surgical Suite, in an Operating Room.

- a. **Sub-waiting (WRC01).....45NSF (4.2NSM)**
Minimum NSF. Provide an additional 15 NSF per each diagnostic room greater than one.
- b. **Procedure Room (separate control room) (XABP1) 500NSF (46.5 NSM)**

Procedure Room (including control room)(XABP1)..... 600 NSF (55.8 NSM)

Divide the projected number of annual procedures by 960; provide one room for each whole increment of 960, and remainder of 290 or greater. Minimum annual workload to provide the first room is 500. (see Table 1).

Procedure room if control area is separate.

- c. **Control Room (XACR1) 120 NSF (11.2 NSM)**
Provide only if control room is separate from the Procedure Room.

Two adjacent procedure rooms may share one control room.

- d. **System Component Room (XACV1) 120 NSF (11.2 NSM)**
Provide one minimum; Provide one per two Procedure Rooms. Provide an additional one if greater than two rooms.

This room houses the computer system image processor components for the digital fluoroscopic imaging procedures. The room must be well illuminated for maintenance procedures and, because this is a separate room, it must be air conditioned and humidity controlled.

- e. **Patient Stretcher Holding Bay (WRL01) 80 NSF (7.5 NSM)**
Provide two per Procedure Room.

This bay provides space for holding, preparation, and/or observation of patients either pre- or post-procedure

- f. **Patient Toilet (TLTU1)..... 50 NSF (4.7 NSM)**
Provide one per every two Procedure Rooms.

- g. **Medication Prep (MEDP1)..... 60 NSF (5.6 NSM)**
Provide one per Interventional Radiology Patient Area.

- h. **Viewing / Consultation Room (XVC01) 100 NSF (9.3 NSM)**
Provide one minimum. Provide one per two Procedure Rooms. Provide an additional one if greater than two rooms.

- i. **Scrub Alcove (ORSA1)..... 60 NSF (5.6 NSM)**
Provide one minimum. Provide an additional one per two Procedure Rooms greater than one.

Includes two scrub sinks.

- j. **Sterile Supply / Instrument Room (ORCW1) 100 NSF (9.3 NSM)**
Provide one minimum. Provide one per two Procedure Rooms, maximum two rooms.

- k. **Equipment Storage Room (SRS01)..... 120 NSF (11.2 NSM)**
Provide one minimum. Provide one per two Procedure Rooms.

Storage for equipment, catheters, guidewires, etc.

- l. **Film Processing Room (XFP01).....75 NSF (7.0 NSF)**
Provide if conventional film processing is required..

3. Computed Tomography (CT)

The CT suite includes four core elements: Scanning Room, Computer/Power Equipment Room, Control Room, Viewing/Consultation Room.

- a. **Sub-waiting (WRC01).....45 NSF (4.2 NSM)**
Minimum NSF. Provide an additional 15 NSF per each CT Scanning Room greater than one.

- b. **CT Scanning Room (XCTS1) 400 NSF (37.2 NSM)**
Divide the projected number of annual procedures by 3,840; provide one room for each whole increment of 3,840 and remainder of 1,150 or greater. Minimum annual workload to provide a room is 1,150 (see Table 1).

Excludes control area. This room contains a fixed scanning gantry, couch, pedestal and peripheral devices as well as support functions (i.e., crash cart, counter workspace, hand sink, and storage.) Items that may be stored in this room are linens, intravenous and oral contrast agents, disposable syringes, biopsy trays, needles, alcohol preps, tubes, pans, etc.

- c. **Control Room (XCTC1)** **120 NSF (11.2 NSM)**
Provide one per CT Scanning Room.

Note: two adjacent Scanning Rooms may share one Control Room.

This room contains a free standing operator's console which is used to control the scanning operations and image manipulation for different application studies. An observation window provides visual access to the scanning room for viewing the patient during a procedure. The operator should have direct access to the patient in the scanning room from the control room and from the control room to the computer and power equipment room.

- d. **Power and Equipment Room (XMRE1)**..... **120 NSF (11.2 NSM)**
Provide one per CT Scanning Room.

This room houses the electrical power panels and electronic panels, X-ray power supply and components, computer system image processor components, and other peripheral devices. This room must be well illuminated for maintenance procedures and, because this is a separate room, it must be air conditioned and humidity controlled.

- e. **Physician Viewing Room (XCTL1)** **120 NSF (11.2 NSM)**
Provide one per CT Patient Area.

Applicable when Authorized by Radiology Service, the Department of Veterans Affairs (VA) Central Office. This space will not be required with all CT imaging systems. It is only needed in facilities with approved teaching programs or facilities with large workloads. One viewing room will support two CT scanners. This room is utilized as a physicians viewing room and for group consultations, reading, and interpretations of CT images. Included is an independent display console which the physician may apply a number of interactive procedures in order to extract more information.

- f. **Patient Toilet (TLTU1)** **50 NSF (4.7 NSM)**
Provide one per CT Scanning Room.

Locate adjacent to scanning room.

- g. **Patient Stretcher Holding Bay (WRL01)** **80 NSF (7.4 NSM)**
Provide one per two CT Scanning Rooms.

This bay provides space for holding, preparation, and/or observation of patients either pre- or post-procedure

- h. **Medication Prep (MEDP1)**..... **60 NSF (5.6 NSM)**

Provide one per CT Scanning Room.

- i. **Storage Room (SRS01)** **80 NSF (7.4 NSM)**
Provide one per CT Patient Area.

Storage for contrast material, laser film, mobile equipment.

C. Support Areas

- 1. **Staff Work Area (WRCH1)** **60 NSF (5.6 NSM)**
Minimum NSF. Provide an additional 30 NSF per each diagnostic room greater than two.
- 3. **Crash Cart Alcove (RCA01)**..... **20 NSF (1.9 NSM)**
Provide one per Radiology Service.
- 4. **Stretcher/Wheelchair Storage (SRLW1)** **40 NSF (3.8 NSM)**
Provide one per two procedure / scanning rooms.
- 5. **Storage, Alcove, Mobile X-Ray Unit (XRM01)** **40 NSF (3.8 NSM)**
Provide one if in Concept of Operations.

Refer to Chapter 100 – MS&N Patient Care Units for alternate location.

This area is used for temporary storage of a mobile radiographic unit that is line powered, capacitor discharged or battery powered.

- 6. **Mobile C-Arm Storage Alcove (XRM02)**..... **40 NSF (3.8 NSM)**
Provide one if in Concept of Operations.
- 7. **Tele-Radiology Workstation (XVC01)** **120 NSF (11.2 NSM)**
Provide one if in Concept of Operations.

Provide one workstation/digitizer to send out images

- 8. **Tele-Radiology Office(XVC01)** **120 NSF (11.2 NSM)**
Provide one if in Concept of Operations.
- 9. **Storage (SRE01)**..... **100 NSF (9.3 NSM)**
Provide one per Radiology Service.
- 10. **Linen Storage Alcove (LCCL1)** **20 NSF (1.9 NSM)**
Add all GR, RF, MR, US, IR procedure/scanning rooms, divide by two. Provide one per increment. Minimum of one per Radiology Service..
- 11. **Clean Supply Room (SRSE1)** **100 NSF (9.3 NSM)**
Minimum NSF. Provide an additional 40 NSF per procedure/scanning room greater than two.
- 12. **Soiled Utility Room (USCL1)** **120 NSF (11.2 NSM)**
Provide one per Radiology Service.

13. Housekeeping Aids Closet-HAC (JANC1)40 NSF (3.7 NSM)
Provide one per Radiology Service.

The housekeeping aids closet should be placed in the general area of the Radiographic/Fluoroscopic and IR/ Special Procedure Rooms.

14. Picture Archiving and Communications System (PACS):

a. PACS: Digital Quality Control Area (XVC01)..... 180 NSF (16.8 NSM)
Provide one per Radiology Service if in Concept of Operations.

b. PACS: Digital Archival Storage Room (XFDs1) 140 NSF (13.1 NSM)
Minimum NSF. Provide an additional 10 NSF per procedure/scanning room greater than fourteen and if in Concept of Operations.

Contains switch/server/backup storage.

c. PACS: 3D Workstation (XCTC1)..... 120 NSF (11.2 NSM)
Provide one if in Concept of Operations.

**d. PACS: Computed Radiology (CR)
Reader Area (XCTI1)..... 40 NSF (3.8 NSM)**
Provide one per procedure/scanning room with CR capability and if in Concept of Operations.

15. Conventional Film:

a. Darkroom – Film Processing (SFP01) 100 NSF (9.3 NSM)
Provide one per Radiology Department and if in Concept of Operations.

Not required if also providing a daylight processor.

b. Daylight Processing (XFP03) 100 NSF (9.3 NSM)
Provide one per Radiology Department and if in Concept of Operations.

Not required if also providing a darkroom.

c. Film Sorting Area (XFSA1) 80 NSF (7.5 NSM)
Provide one area per film processing area and if in Concept of Operations

d. Film Files Storage-Fixed Shelving (XFFA1) 250 NSF (23.3 NSM)
Provide one if in Concept of Operations.

Required for film storage and third party films or archived films waiting to be digitized.

e. Film Storage-Fixed Shelving (XFFA1) 60 NSF (5.6 NSM)
Provide one if in Concept of Operations.

f. Chemical Storage (SRS01) 40 NSF (3.8 NSM)
Provide one if in Concept of Operations.

- 16. **Viewing and Consultation Room/
Non-teaching (XVC01)**..... 120 NSF (11.2 NSM)
Provide one if in Concept of Operations.
- 17. **Viewing and Consultation Room/
Teaching (XVC01)**..... 240 NSF (22.3 NSM)
Provide one if in Concept of Operations.

The Viewing and Consultation Room is the focal point of daily activity where staff and residents will review all cases to be seen that day, meeting throughout the day to discuss patient care progress and to confer with attending physicians. Activities also include training, film viewing, and reading. This is usually a high traffic area and should not be located in the main circulation pattern.

D. Staff and Administrative Areas

- 1. **Office, Chief Radiologist (OFDR1)**..... 150 NSF (13.9 NSM)
Provide one per Radiology Service.
- 2. **Office, Assistant Chief Radiology (OFDR1)** 120 NSF (11.2 NSM)
Provide one per Assistant Chief FTE position authorized.
- 3. **Office, Secretary and Waiting Area (SEC01)** 120 NSF (11.2 NSM)
Provide one per Radiology Service.
- 4. **Office, Staff Radiologist (OFDR1)** 120 NSF (11.2 NSM)
Provide one per Radiologist FTE position authorized.

One or more offices may be located in the Satellite Radiology Suite, as appropriate.

- 5. **Office, Administrative Assistant (OFA01)** 120 NSF (11.2 NSM)
Provide one per every two Administrative Assistant FTE positions authorized.
- 6. **Office, Professional, Non Physician (OFA01)** 120 NSF (11.2 NSM)
Provide one per Professional, Non Physician FTE position authorized.
- 7. **Office, Chief Technician (OFA01)** 120 NSF (11.2 NSM)
Provide one per Chief Technician FTE position authorized.
- 8. **Office, PACS Administrator (OFA01)**..... 120 NSF (11.2 NSM)
Provide one per PACS Administrator FTE position authorized.
- 9. **Office, Physicist (OFA01)**..... 120 NSF (11.2 NSM)
Provide one per Physicist FTE position authorized.
- 10. **Cubicle, Data Processing Administrative (OFA03)**..... 80 NSF (7.5 NSM)
Provide one per each Radiology, CT, and IR Patient Area.
- 11. **Office, Quality Assurance (OFDR1)**..... 140 NSF (13.1 NSM)
Provide one per each Radiology, CT, and IR Patient Area.

Includes meeting space.

12. **Office, Scheduler (OFA03)** **80 NSF (7.5 NSM)**
Provide one per Scheduler FTE position authorized.

13. **Cubicle, Transcriptionist (OFA03)** **80 NSF (7.5 NSM)**
Provide one per Transcriptionist FTE position authorized.

14. **Office, Transcription Supervisor (OFA01)**..... **120 NSF (11.2 NSM)**
Provide one per Radiology Service.

15. **Copy Room (RPR01)**..... **120 NSF (11.2 NSM)**
Provide one per Radiology Service.

Accommodates copier, fax, supplies, and scanning equipment.

16. **Conference / Classroom (CRR01)**..... **300 NSF (27.9 NSM)**
Provide one per Radiology Service.

The spaces below provide programming of Lounge, Lockers, Toilets at department/service/chapter level. Otherwise, sum all departments/services/chapters data for Lockers, Lounges and Toilets, and program space in Chapter 410-EMS Lockers, Lounges, Toilets and Showers. *Either/or – do not duplicate space.*

17. **Staff Lounge (SL001)**..... **160 NSF (11.2 NSM)**
Provide a minimum of 160 NSF; or 15 NSF for each FTE position authorized, whichever is greater.

18. **Staff Lockers (LR001)**..... **6 NSF(.6 NSM)**
Provide one per FTE position authorized for whom office space is not provided.

19. **Staff Toilet (TLTU1)**..... **50 NSF (4.7 NSM)**
Divide the total male FTE positions authorized by 20. Provide one male toilet for each whole increment. Minimum of 6 authorized male FTE positions to provide a separate male toilet. Divide the total female FTE positions authorized by 15. Provide one female toilet for each whole increment. Minimum of 5 authorized female FTE positions to provide a separate female toilet.

E. Residency Program

This programming includes at department/service/chapter level. Otherwise, sum all departments/services/chapters data for Residency Program, and program space in Chapter 402 – Educational Facilities. *Either/or – do not duplicate space.*

Resident spaces should be grouped in one area close to Viewing and Consultation Room.

1. **Cubicle, Resident / Intern (OFA03)**..... **60 NSF (5.6 NSM)**
Provide one per Resident / Intern position authorized and if in Concept of Operations.

2. **Cubicle, Student (OFA03)**..... **30 NSF (2.8 NSM)**
Provide one per two student positions authorized and if in Concept of Operations.
3. **Conference / Classroom (CRR01)** **300 NSF (27.9 NSM)**
Provide one if in Concept of Operations.

F. Satellite Radiology Suite

A satellite suite includes all diagnostic rooms and direct support facilities required for the routine radiographic/fluoroscopic examination of outpatients when they cannot be conveniently accomplished in the main Radiology Suite.

1. **Sub-waiting Space (WRC01)** **60 NSF (5.6 NSM)**
Provide one per every two diagnostic rooms
2. **General Purpose Radiology Room (XDR01)** **300 NSF (27.9 NSM)**
Divide the projected number of annual procedures by 4,370; provide one room for each whole increment of 4370 and/or remainder of 1310 or more. Minimum annual workload to provide a room is 1,310 (see Table 1).

Includes control area

3. **Patient Toilet (TLTU1)** **50 NSF (4.7 NSM)**
Provide one per every two diagnostic rooms
4. **Dressing Room / Cubicle (DR001)**..... **35 NSF (3.3 NSM)**
Provide one per each General Purpose Radiology Room. Provide two per each Chest Room.

Chest rooms are high volume rooms and additional dressing rooms are required to keep the throughput high.

5. **Chest Room (XDCS1)** **250 NSF (23.2 NSM)**
Divide the projected number of annual procedures by 4,800; provide one room for each whole increment of 4,800 and/or remainder of 1,440 or more. Minimum annual workload to provide a room is 1,440 (see Table 1).

Includes control area. Space for a radiographic system designed to perform routine up-right chest examinations. The system normally includes a chest unit with a film transporter and film processor system. The system does not normally include a table. This space should have convenient access to patient waiting area; located at the front of the satellite suite because of high anticipated workload.

6. **Digital Quality Control Area (XVC01)**..... **180 NSF (16.8 NSM)**
Provide one per Satellite Radiology Suite.
7. **Picture Archiving and Communications System (PACS):**
 - a. **PACS Archive (XFDS1)**..... **140 NSF (13.1 NSM)**
Minimum NSF. Provide 10 NSF per each additional diagnostic room and if in Concept of Operations.

Contains switch/server/backup storage.

- b. **3D Workstation (XCTC1)**..... 120 NSF (11.2 NSM)
Provide one if in Concept of Operations.

- c. **Computed Radiology Reader Area (XCTL1)**..... 40 NSF (3.8 NSM)
Provide one if in Concept of Operations.

Locate adjacent to each diagnostic room with CR capability to read CR cassettes.

8. Conventional Film:

- a. **Darkroom Film Processing (XFP01)** 100 NSF (9.3 NSM)
Provide one if in Concept of Operations.

- b. **Daylight Processing (XFP03)** 100 NSF (9.3 NSM)
Provide one if in Concept of Operations. Not required if also providing a darkroom.

- c. **Viewing and Sorting (XFSA1)**..... 80 NSF (7.4 NSM)
Provide one if in Concept of Operations.

- d. **Film Files Storage-Fixed Shelving (XFFA1)** 250 NSF (23.2 NSM)
Provide one if in Concept of Operations.

Required for film storage and third party films or archived films waiting digitizing.

- e. **Film Storage- Fixed Shelving (XFFA1)** 60 NSF (5.6 NSM)
Provide one if in Concept of Operations.

- f. **Chemical Storage (SRS01)** 40 NSF (3.7 NSM)
Provide one if in Concept of Operations.

- 9. **Crash Cart Alcove (RCA01)**..... 20 NSF (1.9 NSM)
Provide one per Satellite Radiology Suite.

- 10. **Stretcher/Wheelchair Storage (SRLW1)** 40 NSF (3.8 NSM)
Provide one per every two diagnostic rooms.

- 11. **Storage Room (SRSE1)** 80 NSF (7.5 NSM)
Provide one per every four diagnostic rooms.

- 12. **Common Viewing Room - Non-teaching (XVC01)** 120 NSF (11.2 NSM)
Provide one per every two diagnostic rooms.

- 13. **Common Viewing Room - Teaching (XVC01)** 240 NSF (22.3 NSM)
Minimum NSF or 80 NSF per diagnostic room, whichever is greater.

6 PLANNING AND DESIGN CONSIDERATIONS

- A. Net-to-department gross factor (**NTDG**) for **Radiology** is **1.60**. This number, when multiplied by the programmed net square foot (NSF) area, determines the departmental gross square feet (DGSF).
- B. Radiology imaging services should be strategically located in order to:
1. Maximize efficiency in use by other services (i.e., maximizing the use of high cost equipment).
 2. Plan to accommodate the high probability that the area may require expansion in the future.
 3. Avoid the substantially higher cost of enlarging a Radiology Suite through relocation rather than expansion.
 4. Locate soft spaces such as administrative/conference areas adjacent to the high technology/diagnostic equipment areas that have a higher probability to expand.
- C. Corridors should be designed a minimum of 8 feet in width, to accommodate passage of two stretchers and/or wheelchairs, equipment or beds.
- D. The main Radiology Suite should be readily accessible to both inpatients and outpatients and in proximity to the central patient vertical transportation system serving nursing units. For patient convenience, the suite should be near Ambulatory Care, Nuclear Medicine, and Outpatient and Ambulance entrance areas. It should be functionally organized to separate staff and patient circulation as much as possible.
1. Patient waiting and public areas should be organized in conjunction with patient circulation, which provides separate access to diagnostic rooms and dressing rooms.
 2. Centralized check-in/check-out for all imaging modalities for more efficient utilization of staff.
 3. Locate holding area adjacent to modalities that have a higher volume of inpatients and adjacent to the inpatient access point.
- E. In planning a Radiology Suite, centralized staff administration and support should be considered to the greatest extent possible to maximize staff and space efficiency. Either a central work core or cluster design configuration is preferred:
1. The central work core design with central film processing (if applicable) convenient to each radiology room (Functional Diagram 1, 2) is ideal for suites containing 12 or less diagnostic rooms (both general purpose and special procedures). This design is compact, minimizing the amount of walking for patients, technicians, and the radiologists.
 2. The cluster design is recommended for suites containing more than 12 diagnostic rooms. In this scheme, basic areas consisting of radiography, fluoroscopy,

interventional procedures, and administration are clustered around two or more processing, viewing, and film library facilities.

3. Diagnostic rooms, processing functions, staff workstations, and staff support space should be organized contiguous to a centralized hub element for convenient staff circulation.
 4. Common viewing, multi-viewing, and film library should be arranged to operate as one functional unit within the Radiology Suite.
- F. The following considerations should be applied when planning the radiology rooms:
1. Rooms used for quick-turnaround, high-volume routine examinations (chest, abdomen, extremities, etc.) should be located closest to the reception and patient waiting areas or building access point to decrease patient travel time / distance and increase staff responsiveness.
 2. Procedure rooms for longer more time-consuming procedures (Ultrasound, MRI, etc.) or low volume may be somewhat removed. Procedure rooms for special procedures (interventional, etc.), which require a long-duration examination, may be further from the reception area.
 3. All rooms are sized to provide space to facilitate transfer of patient from stretcher to table/equipment.
 4. Radiology/Fluoroscopy/(Tomography) can be grouped together as they utilize similar support areas. The space and configuration of the Radiographic and Radiographic/Fluoroscopic (R/F) rooms are the same. This allows for future conversion of Radiographic Rooms to R/F rooms and also allows for installation of new technologies which may develop in the future.
 5. CT areas should be co-located adjacent to PET/CT areas in Nuclear Medicine in order to facilitate the use of both CT techs and Nuclear Medicine techs.
 6. CT, MRI, Interventional Radiology and a designated number of radiology rooms need to have an emergency power supply to complete in-process procedures and permit safe egress of patients.
 7. Ultrasound and Mammography are often collocated to share patient privacy concerns, patient intake and support spaces.
 8. Ultrasound and Mammography rooms should have designated dressing rooms, gowned waiting area and patient toilet rooms immediately adjacent to rooms to facilitate patient privacy.
 9. All diagnostic rooms shall be provided with a ceiling support system in accordance with applicable Department of Veterans Affairs (VA) Standard CAD Details. Clear finished ceiling height will be in accordance with the Department of Veterans Affairs (VA) Design and Construction Procedures PG-18-3.
 10. Warning lights above diagnostic room entrances are required to meet safety regulations.

11. The shield control room for each radiology room accommodates the controls and appropriate accessories and must provide required radiation protection for the technician. The wall space of each control booth which faces the radiology room must accommodate an X-ray control window (viewing window) with a minimum dimension of 18" x 24" (324 mm x 610 mm). Voice communication between the patient and technician should be provided. The control room must be positioned so that the technician can observe both patient and the controls simultaneously. Control area must also permit observations of the patient through the viewing window when the table is in 90 degree vertical position as well as when the table is horizontal. Whenever possible, the control room should be designed without a door to the radiology room and it must conform to NCRP standards.
- G. PACS reading stations may be located centrally or remotely. It should be noted that for general viewing by physicians outside the Radiology Service, a typical flat screen monitor will suffice for reading of images. A high-end monitor system should be provided in areas where physician viewing / diagnosis occur, either within the Radiology Service or remotely.
1. Film processing areas (if applicable based upon PACS utilization) will provide accommodations for both the darkroom and the daylight functions. Space allocation between the two functions will be determined on an individual project basis. Processing areas should be situated in the geographic center of the suite, isolated from the general traffic pattern.
 2. Ideally, film storage facilities (if applicable based upon PACS utilization) for patient records for the latest two-year period should be located in the main Radiology Suite. The remaining three years of film requirements may be accommodated in another location with due consideration for convenience of retrieval.
 3. With the continued move to complete PACS system, locate film file spaces to facilitate alternative use in the future.
- H. Mobile X-Ray unit storage alcove is utilized as an equipment storage area for X-Ray unit when not in use. One such area should be provided on each nursing unit floor.
- I. The Housekeeping Aids Closet should be placed in the general area of the Radiographic / Fluoroscopic and Interventional Procedures Rooms.
- J. Staff facilities such as lockers, lounges, and staff toilets should be located within the Service and be convenient to employee assigned work areas.
- K. Consult imaging equipment vendors for recommended and minimum room sizes and equipment layouts prior to finalizing planning layouts.
- L. Refer to Department of Veterans Affairs (VA) Office of Facilities Management Handbooks, Standards, Standard Details, and Design Guides for technical criteria including:
1. Increased HVAC requirements for heat generating imaging, archiving and viewing equipment.

2. Medical Gasses, vacuum, and other service utilities requirements.
 3. Requirements for cabinets, counters and casework designs.
 4. Additional planning and design considerations for Interventional Radiology / Special Procedures.
- M. Radiology shielding must comply with the requirements of the Department of Veterans Affairs (VA) Handbooks PG-18-3, and applicable Standard CAD Details.

7 FUNCTIONAL RELATIONSHIP

Relationship of Radiology Service to services listed below:

TABLE 2: FUNCTIONAL RELATIONSHIP MATRIX

SERVICES	RELATIONSHIP	REASON
Ambulatory Care	2	G,H
Ambulatory Entrance	2	H
Nuclear Medicine Service	3	H
Cardiovascular Laboratory	3	H
Engineering Service – Biomed. Repair Shop	3	H
Pulmonary Medicine (PM)	3	H
Patient Care Units - CCU	3	H
Patient Care Units – MICU, SICU	3	H
Patient Care Units – MS&N	3	H
Patient Care Units - Respiratory	3	H
Surgical Service	3	H
Audiology & Speech Pathology	X	L
Canteen – Dining Facilities	X	D,E,L
Laboratory – E.M. Suite	X	L
Medical Research and Development – Animal Facility	X	L

TABLE 3: FUNCTIONAL RELATIONSHIP MATRIX SATELLITE RADIOLOGY SUITE

SERVICE	RELATIONSHIP	REASON
Ambulatory Care	1	A,G
Ambulatory Entrance	2	H
ENT Clinic	2	G,H
EYE Clinic	2	G,H
Outpatient Satellite Pharmacy	2	G,H

Legend:

Relationship

1. Adjacent
2. Close / Same Floor
3. Close / Different Floor Acceptable
4. Limited Traffic

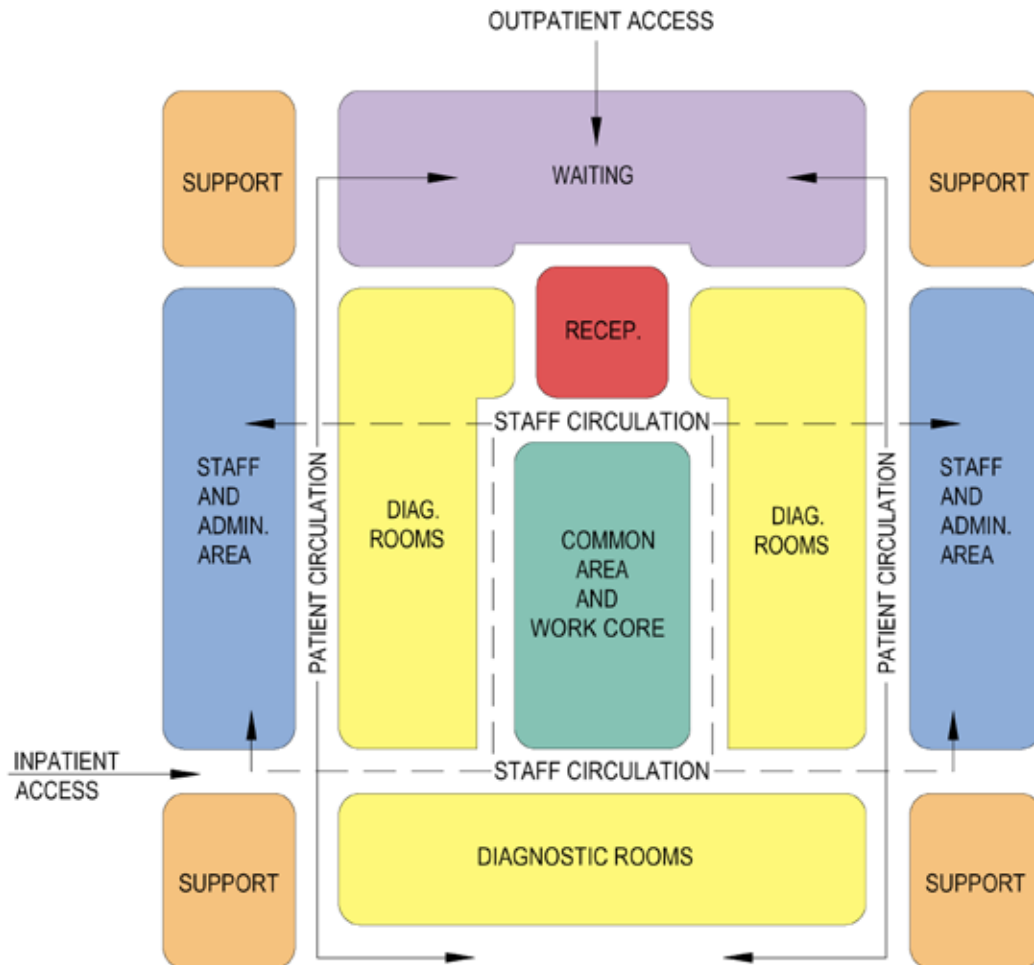
X. Separation Desirable

Reasons

(Use as many as appropriate)

- A. Common use of resources
- B. Accessibility of supplies
- C. Urgency of contact
- D. Noise or vibration
- E. Presence of odors or fumes
- F. Contamination hazard
- G. Sequence of work
- H. Patient's convenience
- I. Frequent contact
- J. Need for security
- K. Others (specify)
- L. Closeness inappropriate

8 FUNCTIONAL DIAGRAM 1: Radiology Service Area Relationship



9 FUNCTIONAL DIAGRAM 2: Radiology Service Area Relationship by Modality

