CALIFORNIA CORRECTIONAL HEALTH CARE SERVICES

VOLUME 4: MEDICAL SERVICES	Effective Date: 6/1/12
CHAPTER 30: MEDICAL IMAGING	Revision Date(s):
4.30.6 RADIOLOGICAL EXAMINATION AND RADIATION SAFETY	Attachments: Yes ☒ No ☐

I. PROCEDURE OVERVIEW

All California Correctional Health Care Services (CCHCS) Medical Imaging Services (MIS) examinations shall be conducted to achieve the maximum diagnostic information from radiographic procedures and minimize exposure to the patient-inmate and the MIS employees.

II. PURPOSE

To provide guidelines for a radiation safety and protection program to comply with federal and state laws and regulations.

III. RESPONSIBILITIES

The Chief Executive Officer is responsible for the implementation of this policy at the local level.

IV. PROCEDURE

A. Technique Charts

1. Technique charts are available from X-ray equipment manufactures or may be constructed in various forms. Technique charts are designed to aid the radiologic technologist (RT) in selecting the appropriate values of optima factors, such as peak kilovoltage (kVp), milliamperage (mAs), and exposure time for each radiographic examination.
2. Technique charts are based on precise measurement of the body part being X-rayed, correct measurement with a caliper is essential (i.e., caliper placement on the part being measured usually is at the point where the central ray enters the part).
3. Technique charts are only a good starting point. At least 10 to 25 percent of cases require minor technique adjustments, and 10 percent require major technique adjustments. The RT shall take into consideration anatomical abnormalities, any disease/pathology process that may require an increase or decrease in technique, and the patient-inmate's age, height, weight and physical condition.

B. The RT shall use collimation of the primary X-ray beam, proper filtration, appropriate kVp/mAs, grids, and appropriate imaging device.

C. As Low As is Reasonably Achievable Program

1. All RTs shall use, to the extent practicable, procedures and controls based upon sound radiation protection principles to achieve occupational doses and as well as doses to members of the public that are as low as is reasonably achievable.
2. All RTs are responsible for the protection of individuals that enter the operator's controlled areas. A designated licensed RT is also responsible for ensuring that the public is protected and that the public dose does not exceed the limits in accordance with the Code of Federal Regulations, Title 10, Part 20.

D. Dosimetry Program

1. The employee monitoring device has four purposes:
   a. Records employee occupational exposure to ionizing radiation.
   b. Measures the accumulated occupational exposure over a period of time.
   c. Provides some indication of working conditions and habits of employee monitored.
   d. Provides an acceptable record of personnel occupational exposure.
2. Each facility shall provide employee monitoring for occupational exposures (radiation areas such as X-ray suite, fluoroscopy suite or surgery suite where X-ray or mobile fluoroscopy equipment is routinely used). CCHCS will provide film badges to employees that require monitoring.
3. Dose equivalents shall be recorded in rems or millirems, and dose equivalents rates in rems or millirems, per hour.
4. Required records of radiation occupational exposures such as dose equivalents, received by an individual shall be kept indefinitely.
   a. Film badges shall be exchanged monthly.
   b. Employee monitoring devices must be worn at the unshielded location on the upper body. When a protective apron is worn, the location of the monitoring device is worn at the neck (thyroid).
   c. Each employee monitoring device shall be assigned to, and must be worn by, only the assigned employee.
   d. Employee monitoring devices which are not being worn, as well as the control monitoring device, are to be stored in an assigned area that is away from rooms where radiation equipment is in use.
   e. Each institution shall appoint a knowledgeable employee to be responsible for the occupational dose records, and for exchanging the employee monitoring devices per institutional requirements. The employee monitoring device readings (film badge reports) shall be maintained in the MIS department at the institution where the employee works.
   f. An employee working at multiple locations must be assigned only one monitoring device, not one for each location. No employee is allowed to receive more than 50 msv (5rem) in a calendar year from all employment during that year.
5. Pregnant Employees

   If any employee is pregnant or becomes pregnant, she may voluntarily inform the designated RT or supervisor in writing of the pregnancy. When this occurs, the department shall monitor the employee to ensure that the dose to the embryo/fetus does not exceed 5mSv (500 mrem) during the entire pregnancy, and no more than 0.5 mSv (50 mrem) in any month. The dose to the monitoring device worn at the waist level is considered to be the fetal dose. Pregnant employees shall be monitored for radiation exposure, and can be monitored the following ways:

   a. If the employee chooses to wear a lead apron and have dosimetry, two monitors are recommended; one device to be worn at the neck and the second under the apron at the waist level.

b. If an apron is not worn, only one monitor may be assigned, and that shall be worn at the waist level.

If an employee does not declare her pregnancy in writing, she is not considered to be pregnant for radiation safety purposes, and the 50 mSv (5rem) occupational limit applies.

E. Area Monitoring and Control

1. Radiation Area Monitoring
   a. The need for area monitoring shall be evaluated and documented.
2. Instrument Calibration and Maintenance
   a. An annual physicist evaluation is required if an institution has fluoroscopic and/or mammography equipment, but not if an institution has only general radiographic and dental equipment. Only an annual calibration by a qualified equipment service vendor is required for general radiographic and dental equipment. Maintenance of fluoroscopy equipment shall be addressed in accordance with Title 17 of the California Code of Regulations (CCR) § 30307. Maintenance of the machine should be addressed. This may be addressed in part by the operator's manual from the manufacturer.

F. Radiological Controls

1. Entry and Exit Controls
   a. Entry and exit from controlled areas must be adequate to ensure radiation safety.
   b. Light above the radiographic room must be lit when radiation exposure is on.
2. Posting
   a. Areas that are required to be posted should be identified in the radiation protection program, in addition to procedures for ensuring that such areas are properly posted, and procedures for ensuring that areas containing a source of radiation are posted with a sign (or signs) that read: CAUTION X-RAY.
   b. In accordance with Title 17 of the CCR § 30305, the following must be conspicuously posted. If posting of the documents below is not practicable, a notice may be posted that describes the documents and states where they may be viewed.
      1) A current copy of the CCR shall be kept within the MIS department.
      2) Incorporated sections of Code of Federal Regulations, Title 10, Part 20.
      3) Copy of operating and emergency procedures applicable to working with sources of radiation.
      4) Current copy of Department of Health Care Services Form RH-2364, Notice to Employees, shall be posted in a sufficient number of places to permit individuals working in or frequenting any portion of a restricted area to observe a copy on the way to or from such restricted areas.
      5) Any notice of violation involving radiological working conditions, or any order issued pursuant to the California Health and Safety Code, Chapter 8, Radiation Control Law and any required response from the institution. A notice of violation shall be conspicuously posted in the area where the violation occurred.

3. Other Controls
    a. Each institution should evaluate the need for other controls in addition to those mentioned above. The following items should be considered:
        1) Types of controls used to reduce or control radiation exposure, such as positioning aids, gonadal shielding, protective aprons, protective gloves, mobile shields, etc. Protective aprons shall be quality assessed to ensure optimal protection to the patient-inmate (refer to Attachment B, Annual Lead Apron Checklist).

G. Disposal of Equipment

1. Institutions shall report in writing to the California Department of Public Health (CDPH) of the sale, transfer, or discontinuance of use of any reportable source of radiation. (Refer to the California Department of Public Health, Radiologic Health Branch's website for *Guidance for Disposal of X-ray Machines*.)

H. Emergency Exposure Situations and Radiation Accident Dosimetry

1. An over-exposure of a film badge, or other type of dosimeter monitoring (i.e. personal monitoring device), which has been assigned to an individual is considered to be presumptive evidence of a radiation exposure incident to the individual. The total effective dose equivalent for an RT is 5,000 mrem or 5 rem per year. The effective dose equivalent is the dose to the whole body from penetrating X-rays that would impart the same lifetime risk of detrimental health effects as the sum of the actual dose to all of the tissues and organs of the body from all types of ionizing radiation.
2. A radiation exposure incident shall be reported to the supervisor and Chief of Medical Imaging Services. Notification of such an incident shall be done verbally and/or in writing and under the following guidelines:
    a. If the exposure range is greater than 25 mrem in a reporting period, the RT will be notified by their supervisor. Corrective Action: The RT shall review their personal radiation safety practice and make necessary adjustment to their personal safety methods.
    b. If the exposure range is greater than 26 mrem to 150 mrem in a reporting period, the RT will be notified and corrective action will be done. Corrective Action: The RT workflow will be observed by a Senior RT to determine if the RT is using appropriate personal radiation safety methods.
    c. If the exposure range is greater than 151 mrem to 250 mrem in a reporting period, the RT will be notified, and observed and retrained by the Radiation Safety Officer to appropriate personal radiation safety methods.

I. Record Keeping and Reporting

1. Each MIS department shall maintain accurate and complete records of any exposure incident. The records shall be kept on CDPH Form RH-2365, or in a manner that includes all of the applicable information required on the RH-2365. The records shall include the following:
    a. Results of each required calibration, survey, and test.
    b. Each receipt, transfer, and disposal of source radiation (X-ray machine).
    c. Radiation exposure of all individuals for whom employee monitoring is required.

2. Reports to Individuals
    a. If any person suspects that there has been an excessive or radiation incident such as unintentional exposure of the RT or another employee, immediately notify the designated supervisory RT who will then provide reports of individual exposure when requested in accordance with Title 17 of the CCR § 30255.

J. Operating and Safety Procedures

1. Each MIS department is required to have a written operating and safety procedure manual. This may be the operating manual that comes with a radiation unit which may include safety procedures. However, if safety procedures are not included in the manual, they must be developed. These safety procedures must be posted on the machine or where the RT and/or operator can observe them while using the machine.
2. In accordance with Title 17 of the CCR § 30255, each institution shall:
    a. Inform all individuals working in, or frequenting any portion of a controlled area, of the use of radiation in such portions of the controlled area.
    b. Instruct such individuals in the health problems associated with exposure to radiation, and in precautions or procedures to minimize exposure. Instruct such individuals in, and instruct them to observe, to the extent within their control, the applicable provisions of CDPH regulations for the protection of employees from exposures to radiation occurring in such areas.
    c. Instruct such individuals of their responsibility to report promptly to the institution any condition which may lead to or cause a violation of CDPH regulations or unnecessary exposure to radiation, and of the inspection provisions of Title 17 of the CCR, § 30255.
    d. Instruct such individuals in the appropriate response to warnings made in the event of any unusual occurrence or malfunction that may involve exposure to radiation, and advise such individuals as to the radiation exposure reports which they may request pursuant to Title 17 of the CCR, § 30255.
3. Regulations
    a. Maintenance of all applicable regulations is required.

K. Internal Audit Procedures

1. The designated licensed RT must audit their institution's radiation protection program on an annual basis. Documentation of the annual audits may be requested during inspection. The following items should be addressed depending on the scope of the radiologic health protection problems:
    a. Identification of inspection types and program audits conducted, including radiation machines, employees, and procedures.
    b. Identification of the individual(s) who are responsible for performing inspections and/or audits.
    c. Identification of where and at what intervals the inspections and/or audits are conducted.
    d. Procedures for conducting the inspections and/or audits.

V. CONTACT

The regulatory agency for radiation safety is the Radiologic Health Branch of the California Department of Public Health, and can be contacted at the following addresses and phone number:

California Department of Public Health
Radiologic Health Branch
P.O. Box 997414, MS-7610
Sacramento, CA 95899-7414
Email: RHBInfo@cdph.ca.gov
(916) 327-5106
www.cdph.ca.gov

VI. ATTACHMENTS

- Attachment A, Top Dosimetry Dos and Do Nots
- Attachment B, Annual Lead Apron Checklist

VII. REFERENCE

- Code of Federal Regulations, Title 10, Part 20
- California Code of Regulations, Title 17, §§ 30253, 30254, 30255, 30305, 30307 and 30308
- Health and Safety Code, Division 104-Environmental Health
- California Department of Corrections and Rehabilitation, Departmental Operations Manual, § 91060.12
- http://www.cdph.ca.gov/programs/Pages/RadiologicHealthBranch.aspx

ATTACHMENT A

Top Dosimeter DOs and DO NOTs

1. DO WEAR IT when working. It has no value in your locker or purse.
2. DO NOT WEAR IT when you are receiving X-rays for your own health care.
3. DO NOT WEAR IT away from the workplace.
4. DO NOT WEAR IT under your apron unless you are wearing two dosimeters. Leave your dosimeter in the same place every day when you leave work so that you know where it is located.
5. DO PLACE the control dosimeter in a radiation-safe area; dose to the control is subtracted from each dosimeter and needs to be accurate.
6. DO REPORT LOST OR DAMAGED dosimeters immediately. Prevent damage by not leaving your dosimeter in areas of high temperatures such as your dashboard or in the clothes dryer.
7. DO NOT PLACE a dosimeter in an area for testing of stray radiation. Additional dosimeters can be assigned for testing.
8. DO NOT PLACE a dosimeter in direct sunlight.
9. DO NOT SHARE dosimeters; this is illegal. An average for shared dosimeter is meaningless to each individual.
10. DO NOT TAMPER with your dosimeter or anyone else's. The reports are legal documents and are regarded as real exposures received. Tampering with dosimeters is grounds for dismissal.

ATTACHMENT B

Date:	Institution:
Department:	Date:

ANNUAL LEAD APRON CHECKLIST				
Apron #	Pass/Fail	Damage?	Removed	Comments:

RECOMMENDED RETENTION POLICY: This record should be retained for at least five (5) years.

Performed by:	Mgmt Review:
Date:	Date: