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NON-HOSPITAL MEDICAL AND SURGICAL FACILITIES ACCREDITATION PROGRAM

Accreditation Standards

Procedural Pain Management – X-ray Modality

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Accreditation Standards

Procedural Pain Management – X-ray Modality

INTRODUCTION

The procedural pain management (PPM) standards are outlined in several documents:

- procedural pain management (core) standards
- imaging modality (e.g. X-ray, ultrasound) standards
- emergency cart standards

The PPM X-ray modality standard applies to all radioscopic equipment (i.e. fluoroscopy, C-Arm, mini C-Arm) used for target visualization, needle guidance and image capture during PPM procedures.

RADIATION SAFETY

PPMXR1.0 APPROPRIATE MEASURES ARE IN PLACE TO PREVENT UNNECESSARY RADIATION EXPOSURE TO STAFF AND VISITORS

PPMXR1.1	**Procedure room staff are aware of the risks of ionizing radiation and manage the risks appropriately.** *Intent: Anyone in the room while an X-ray is being performed is considered procedure room staff. Direct radiation exposure of staff by the primary beam and deliberate irradiation of an individual for training purposes or equipment evaluation is not permitted.*	
PPMXR1.1.1	**M**	Only essential individuals are present in the procedure room when irradiation is carried out.
PPMXR1.1.2	**M**	All entrance doors to an X-ray room are closed while making an X-ray exposure.
PPMXR1.2	**Radiation exposure to staff is monitored through the use of personal dosimeters.**	
PPMXR1.2.1	**M**	All operators of X-ray equipment and other procedure room staff have their radiation exposures monitored with the use of a personal dosimeter. *Guidance: All personnel in the procedure room wear a personal dosimeter during PPM procedures when X-ray is used. This includes the use of mini C-Arms. Personal dosimeters are not shared among staff.*

PPMXR1.2.2	**M**	Personal dosimeters are worn and stored according to the recommendations of the dosimetry service provider. *Guidance: At least one (1) personal dosimeter is worn at waist level under the protective apron. If a second dosimeter is worn, for the purposes of measuring eye lens dose, the second dosimeter is worn outside of the lead thyroid collar.*
PPMXR1.2.3	**M**	When a protective apron is worn, the personal dosimeter is worn under the apron.
PPMXR1.2.4	**M**	Results of personal dosimeters are reviewed and monitored by a radiation safety officer or designate on a regular basis. *Guidance: The results (report) are signed and dated by the reviewer. An investigation is initiated when a high reading is reported and includes documentation of the action(s) taken to improve techniques and protective measures. Dosimetry monitoring reports are retained for the period the worker is employed plus 10 years.*
PPMXR1.2.5	**M**	Dosimeter results are made available to staff. *Guidance: Results are posted or circulated to staff (i.e. communication book/board, staff meeting minutes, health and safety committee meeting minutes).*
PPMXR1.3	**Radiation warning signage is clearly visible to alert patients, staff and visitors of the risks associated with radiation.**	
PPMXR1.3.1	**M**	Rooms with X-ray equipment are identified with warning signs incorporating the X-ray warning symbol. *Guidance: Refer to Health Canada Safety Code 35 Appendix VI for acceptable X-ray warning symbols (http://www.hc-sc.gc.ca/ewh-semt/pubs/radiation/safety-code_35-securite/index-eng.php#app6). The X-ray warning symbol must be displayed in two contrasting colours, be legible for a distance and bear the words "CAUTION: X-RAYS-ATTENTION: RAYONS X"*
PPMXR1.3.2	**M**	Rooms with X-ray equipment are identified with signage stating "Unauthorized Entry Prohibited." *Intent: Signage must be affixed on or adjacent to the X-ray room door to ensure no individual inadvertently enters the room during X-ray use.*
PPMXR1.4	**X-ray equipment is safely operated.**	
PPMXR1.4.1	**M**	X-ray equipment is operated by appropriately qualified personnel. *Guidance: X-ray equipment (i.e. full C-Arm) is operated by technologists certified with the Canadian Association of Medical Radiation Technologists (CAMRT). Physicians do not operate conventional or full-size X-ray equipment (i.e. full C-Arm). Mini C-Arms may be operated by a physician provided they have documented training in the safe operation of the mini C-Arm equipment being used, the manufacturer-specified quality assurance procedures, radiation protection procedures and measures and techniques to optimize image quality and documentation on this training is on file. In addition, their competency must be assessed by a CAMRT certified medical radiation technologist and documentation of the competency assessment is on file.*
PPMXR1.4.2	**M**	All individuals required to be immediately adjacent to the patient during the procedure wear protective aprons. *Intent: All personnel in the procedure room wear protective equipment (i.e. apron) during PPM procedures when X-ray is used. This includes the use of mini C-Arms. The protective apron includes thyroid collar, vest/jacket and apron/skirt. Lead shields or curtains mounted on the X-ray unit are* ***not a sufficient substitute*** *for the wearing of personal protective clothing such as lead aprons.*

PPMXR1.4.3	**M**	All individuals not required to be immediately adjacent to the patient during the procedure stand back as far as possible from the X-ray equipment. If possible, the staff stand behind a protective shield. *Guidance: In addition to wearing protective equipment (e.g. apron), all personnel in the procedure room that are not required to be immediately adjacent to the patient during the procedure stand back as far as possible from the X-ray equipment*
PPMXR1.4.4	**B**	Leaded glasses are used. *Intent: Recent studies have shown the lens of the eye to be more radiosensitive than previously thought and therefore it is strongly recommended that leaded glasses be worn by staff that are located in close proximity of the patient during radiographic exposure(s). A risk assessment of staff should be conducted to determine if eye exposure levels approach established dose limits for staff involved in radioscopic procedures. Radioscopic equipment is X-ray equipment that implements a technique in which continuous or periodic sequences of X-ray patterns are produced and simultaneously and continuously displayed in the form of visible images. Fluoroscopic equipment is another commonly used term and includes radio fluoroscopy, fluoroscopy, and C-Arm equipment. The use of lead glasses should be considered by those personnel working within close proximity to the X-ray equipment.*

PPMXR2.0 APPROPRIATE MEASURES ARE IN PLACE TO PREVENT UNNECESSARY RADIATION EXPOSURE TO PATIENTS

PPMXR2.1	**Mechanisms are in place to prevent unnecessary radiation to patients.**	
PPMXR2.1.1	**M**	There is signage posted, at a minimum, in the reception and patient changing/waiting areas that is clearly visible to alert women who may be pregnant to notify the receptionist or physician.
PPMXR2.1.2	**M**	Shielding is used, where appropriate, to limit the exposure of body tissues and when clinical objectives will not be compromised. *Intent: It is particularly important to protect sensitive body tissues and children. Appropriate use of gonad shielding is advised when: the gonads are within close proximity to the X-ray beam; the patient is of reproductive age (11 to 55 years); and clinical objectives will not be compromised. Shields are of sufficient size and shape to exclude gonads completely from primary beam irradiation.*
PPMXR2.1.3	**M**	The X-ray beam is collimated to restrict the beam to the area of procedural interest.
PPMXR2.2	**Procedures are in place to protect female patients of childbearing age.** *Intent: Only essential investigations are taken in the case of pregnant or suspected pregnant women. Care is taken to protect the fetus from radiation during the X-ray examination of a pregnant women.*	
PPMXR2.2.1	**M**	Before performing X-ray procedures on females of child bearing age (11 to 55 years), the patient is asked whether there is any chance that they may be pregnant. *Guidance: If a patient's pregnancy status is uncertain, additional precautionary measures must be taken prior to imaging. These precautions may include obtaining and documenting the last menstrual period or conducting and recording the results of a pregnancy test. This may be performed as part of the intake assessment and is documented in the patient's medical record. The physician is notified when a patient has declared that she could be pregnant and/or results of a pregnancy test are positive.*
PPMXR2.2.2	**M**	The pregnancy status of female patients of childbearing age (11 to 55 years) is documented in the patient's medical record.
PPMXR2.2.3	**M**	When radiologic procedures of the lower back or sacrum are required, the exposure is kept to the absolute minimum.

PPMXR3.0 PATIENT RADIATION DOSE IS EFFECTIVELY MANAGED

PPMXR3.1	**Mechanisms are in place to manage patient radiation dose.**	
PPMXR3.1.1	**M**	Patient radiation dose is measured in the form of reference point air kerma or fluoro time. *Guidance: All new equipment, purchased after 2016, must be able to record reference point air kerma. For X-ray equipment that is unable to record patient dose, the kVp, mAs and SID of each exposure is recorded.*
PPMXR3.1.2	**M**	Patient radiation dose is recorded in the patient's medical record. *Guidance: Prior to performing any procedures, dose limits are identified and documented. In the event of an excessive radiation dose, procedures for the management and investigation of an excessive patient radiation dose are initiated and the details of the communication with the physician and patient regarding the excessive dose and the nature of problems and associated risks is also documented in the patient's medical record.*
PPMXR3.1.3	**M**	The protective apparel used, and the area(s) protected is documented in the patient's medical record.

PPMXR4.0 EQUIPMENT IS MAINTAINED AND MONITORED IN A MANNER THAT ENSURES PERFORMANCE SPECIFICATIONS AND RADIATION SAFETY ARE MET

PPMXR4.1	**All new, used and refurbished medical X-ray equipment conforms to Radiation Emitting Devices (RED) regulatory requirements.** *Guidance: As part of acceptance testing procedures, there is verification of compliance to RED regulations for diagnostic X-ray equipment (Part XII).*	
PPMXR4.1.1	**M**	At time of purchase, all new, used and refurbished medical X-ray equipment conforms to RED regulations. *Guidance: As part of acceptance testing procedures, there is verification of compliance to RED regulations for diagnostic x-ray equipment (Part XII).* *Note: Only a few of many important regulations are listed below.*
PPMXR4.1.2	**M**	The X-ray system has an irradiation switch that requires continuous pressure by the operator for the entire period of any irradiation and enables the operator to terminate the recording of serial X-ray images at any time.
PPMXR4.1.3	**M**	The X-ray system has a visual indicator that continuously displays the X-ray tube voltage and the X-ray tube current.
PPMXR4.1.4	**M**	The X-ray system has a high-level irradiation control that is activated by separate means that requires the continuous pressure by the operator to emit X-rays.
PPMXR4.1.5	**M**	The X-ray system has an audible signal that is emitted when the high-level irradiation control is in use.
PPMXR4.1.6	**M**	The X-ray system has a device that limits the focal spot to skin distance. *Guidance: The focal spot to skin distance is not less than 30 cm for mobile equipment, or 20 cm for radioscopic equipment designed for special applications that would be impossible at 30 cm. In the case of small-format, low-intensity radioscopic equipment, the minimum focal spot to skin distance is the distance at which the equipment is capable of delivering an air kerma rate of 50 mGy/min.*

PPMXR4.1.7	**M**	The X-ray system has a last image hold system which keeps on display the last X-ray image obtained.
PPMXR4.2	**All new, used and refurbished medical X-ray equipment is registered with the Non-Hospital Medical and Surgical Facilities Accreditation Program (NHMSFAP).** *Guidance: The registration of X-ray equipment includes mini C-Arm, full C-Arm, Fluoroscopy.*	
PPMXR4.2.1	**M**	The X-ray equipment is registered with the NHMSFAP. *Guidance: The registration information includes facility name and address, name of owner, name of radiation safety officer, type of equipment, manufacturer, year of manufacture, model, device master serial number, tube 1 insert number, tube 2 insert number.*
PPMXR4.3	**Personal protective equipment provides protection to patients, staff and visitors.**	
PPMXR4.3.1	**M**	All protective equipment (e.g. apron, gonad shields, gloves) provides attenuation equivalent to at least 0.5mm of lead at 150 kVp.
PPMXR4.3.2	**M**	The lead equivalency thickness of the protective material used is clearly marked on all protective equipment and protective screens.
PPMXR4.3.3	**M**	Protective equipment is stored and maintained according to manufacturers' recommendations. *Guidance: All protective equipment is stored flat or on hangers designed for lead storage. The protective equipment is not folded or bent.*
PPMXR4.3.4	**M**	Protective equipment is cleaned and disinfected regularly in accordance with manufacturer's instructions for use.

PPMXR5.0 AN EVALUATION OF THE RADIATION SAFETY OF THE FACILITY IS CONDUCTED AT APPROPRIATE FREQUENCIES

PPMXR5.1	**Radiation protection surveys are conducted to ensure the safety of personnel and patients.**	
PPMXR5.1.1	**M**	Radiation protection surveys are conducted to assess safety when there is a new installation. *Intent: For a new facility, it is particularly advantageous to make visual inspections during construction to ensure compliance with specifications and to identify faulty material or workmanship, since deficiencies can be resolved more economically at this stage than later. Such inspections include determination of thickness of lead and/or concrete thickness and density, degree of overlap between lead sheets or between lead and other barriers, as well as thickness and density of leaded glass used in viewing windows.*
PPMXR5.1.2	**M**	A radiation protection survey is conducted once every four years. *Guidance: Radiation protection surveys are conducted once every four years as a minimum. They are completed sooner if new X-ray equipment is acquired, when existing X-ray equipment is used in a different space (i.e. new operating/procedure room), if the X-ray equipment is damaged or modified, when there is an indication of an unusually high exposure of a worker to ionizing radiation and when there are renovations or damage to barriers (i.e. walls) that could impact radiation exposure to staff or the general public in or around the facility (e.g. changes to the occupancy of adjacent rooms, lead glass replacement). Radiation protection surveys are retained for a minimum period of 10 years.*

PPMXR5.2	**The radiation protection survey report provides results and recommendations based on the surveyor's findings.** *Guidance: The survey report presents in a clear and systematic way the details and results of the measurements carried out, as well as the conclusions drawn and recommendations made by the surveyor. Any unusual findings about the equipment itself, the facility, or operating procedures, which could affect the safety of operators or other persons in the vicinity of the X-ray room, are clearly identified.*	
PPMXR5.2.1	**M**	The survey report includes a sketch of the facility, showing the location of the X-ray equipment within the facility as well as identifying the nature and occupancy of the areas adjoining the facility.
PPMXR5.2.2	**M**	The survey report includes identification of the X-ray equipment (e.g. the name of the manufacturer, model designation and serial number).
PPMXR5.2.3	**M**	The survey report includes the actual or estimated total workload of the facility.
PPMXR5.2.4	**M**	The survey report includes the results of radiation measurements carried out both inside and outside the controlled area under "typical" operating conditions and the locations at which the measurements are made.
PPMXR5.2.5	**M**	The survey report includes a review of the available personal protective equipment, mobile protective barriers and other protective devices.
PPMXR5.2.6	**M**	The survey report includes an indication of the estimate of potential exposures to personnel and general public in or around the X-ray room.
PPMXR5.2.7	**M**	The survey report includes the results of investigation of any unusually high exposures from previous personnel dosimetry reports and recommendations on whether other persons are to be included in the personnel dosimetry service.
PPMXR5.2.8	**M**	The survey report includes a review of the facility's quality assurance program to ensure it exists and is maintained, including quality control testing records.
PPMXR5.2.9	**M**	The results of surveys, including conclusions drawn by the surveyors, are submitted to the owner, radiation safety officer or responsible user in a written report.

PPMXR6.0 PLANNING ACTIVITIES ENSURE ADEQUATE SHIELDING IS IN PLACE TO PROVIDE THE NECESSARY LEVEL OF RADIATION PROTECTION

Intent: In the planning of any medical X-ray room, the main priority is to ensure that persons in the vicinity of the room are not exposed to levels of radiation which surpass the current regulatory exposure limits. In the early stages of designing and planning a medical X-ray room, three steps are taken to ensure adequate shielding is in place to provide the necessary level of radiation protection:

- *preparation of office plans*
- *considerations for room design and layout*
- *determination of parameters governing shielding requirements*

PPMXR6.1	**Appropriate steps are taken to ensure shielding is present in controlled and uncontrolled areas.**	
PPMXR6.1.1	**M**	The radiation levels in controlled areas that are occupied routinely by personnel are such that no personnel is occupationally exposed to more than 20 mSv per year.
PPMXR6.1.2	**M**	The radiation levels in uncontrolled areas are such that no person receives more than 1 mSv per year.
PPMXR6.1.3	**M**	Shielding calculations are performed by trained individuals with current in-depth knowledge of structural shielding design (e.g. knowledge of radiation protection requirements and radiation shielding barriers) and using the acceptable methods of performing these calculations.
PPMXR6.2	**Preparation of the facility plans includes preparing a facility floor plan.**	
PPMXR6.2.1	**M**	The facility floor plan includes the dimensions and shape of the room where the X-ray equipment is operated and the physical orientation of the room (e.g. a mark indicating North).
PPMXR6.2.2	**M**	The facility floor plan includes the location where the X-ray equipment is planned to be placed and the range of movement of the X-ray tube(s).
PPMXR6.2.3	**M**	The facility floor plan includes the location, use, occupancy level and accessibility of adjacent rooms, as well as the rooms above and below the facility.
PPMXR6.2.4	**M**	The facility floor plan includes the designation of the adjacent rooms, whether to be designed as a controlled or uncontrolled area.
PPMXR6.2.5	**M**	The facility floor plan includes the position of all windows, doors, louvers, etc. that may affect radiation protection requirements.

PPMXR6.2.6	**M**	The facility floor plan includes the planned and existing materials used to construct the walls, floor, ceiling, control booth and their thickness, including additional materials currently being used, or planned for use, as radiation shielding barriers. *Guidance: All new and/or renovated facilities are required to meet the CSA Z8000 standards for Canadian Health Care Facilities which state that a qualified physicist or radiation specialist shall be used to specify the type, location, and amount of radiation protection required in accordance with the final equipment selection and layout. Existing facilities must be assessed by a qualified physicist or radiation specialist to determine if the existing materials used to construct the walls, floor, ceiling, control booth and their thickness meet standards as radiation shielding barriers. Existing facilities that do not meet standards for radiation shielding barriers, if recommended by a qualified physicist or radiation specialist, may be granted a variance by the NHMSFAP Committee for the variance term specified by the committee to allow time for upgrading the facility to meet radiation shielding barrier standards.*
PPMXR6.2.7	**M**	The facility floor plan includes the application of the protective barriers (e.g. mobile or permanent screens).
PPMXR6.3	**Radiation safety planning includes consideration for room design and layout.**	
PPMXR6.3.1	**M**	The rooms containing the X-ray equipment are designed to provide adequate working space for the equipment operator and to allow for ease of patient movement.
PPMXR6.3.2	**M**	The X-ray equipment is positioned in the room in such a way that during an irradiation, no one can enter the room without the knowledge of the equipment operator.
PPMXR6.3.3	**M**	Shielding is constructed to form an unbroken barrier, and if lead is used, it is adequately supported to prevent “creeping.”

PPMXR7.0 RESPONSIBLE STAFF ENSURES THE OPTIMUM LEVEL OF RADIATION SAFETY AND IMAGE QUALITY

PPMXR7.1		Radiation protection specialists act as an advisor for all aspects of radiation protection.
PPMXR7.1.1	**M**	There is a medical physicist or radiation safety officer to act as an advisor on all radiation protection aspects during the initial stages of construction of the facility, installation of the equipment and during subsequent operations. *Intent: This individual is typically a third party contactor; however, some duties can be performed by on-site personnel with proper training and education in radiation safety. Radiation protection specialists must have documented training in radiation safety, which includes an understanding of the work, hazards and control measures associated with ionizing radiation. This education is above and beyond basic radiation safety education provided by vendors. The responsibilities of the medical physicist or radiation safety officer include:* • *assessing the radiation safety of an installation at the time of planning and/or construction of the facility, or when modifications are planned and/or are being made to an existing facility;* • *ensuring that radiation protection inspections are scheduled and performed;* • *establishing safe working conditions according to the recommendations of Health Canada Safety Codes and the statutory requirements of federal or provincial legislation, where applicable;* • *reviewing radiation safety procedures periodically and updating them to ensure optimum patient and operator safety;* • *instructing X-ray equipment operators and other personnel participating in X-ray procedures in proper radiation protection practices;* • *carrying out routine checks of equipment and facility safety features and radiation surveys;* • *ensuring that appropriate radiation survey instruments are available, in good working condition, and properly calibrated;* • *keeping records of radiation protection surveys including summaries of corrective measures recommended and/or instituted;* • *declaring who is to be considered an occupationally exposed person (e.g. personnel who may receive a radiation dose in excess of 1/20th of the recommended dose limit for a radiation worker);* • *organizing participation in a personnel radiation monitoring service, such as that provided by the National Dosimetry Services, Health Canada;* • *ensuring that all occupationally exposed persons wear personal dosimeters during radiological procedures or when occupational exposures are likely;* • *reviewing, managing and maintaining records of occupational exposures received by personnel;* • *investigating each known or suspected case of excessive or abnormal exposure to patients and staff to determine the cause and to take remedial steps to prevent its recurrence; and* • *participating in the establishment of diagnostic reference levels. Diagnostic reference levels represent a range of acceptable radiation doses (upper and lower limits usually measured in air kerma product) for patients for a given examination.*

X-RAY PROCEDURES

PPMXR8.0 STANDARD PROTOCOLS RESULT IN IMAGES APPROPRIATE FOR THEIR INTENDED USE IN CLINICAL DECISION-MAKING

PPMXR8.1	**Procedures contain all the information necessary to perform the examination.** *Intent: Procedures ensure that examinations are performed consistently and accurately by all personnel within the medical office. Examination procedures may not be required for **single** physician practices.*	
PPMXR8.1.1	**M**	Examination procedures are readily available to technical staff operating the equipment during procedures.
PPMXR8.1.2	**M**	Manufacturer's documentation is only used as a supplement to the examination procedure. *Intent: There should be documentation for all X-ray procedures performed at the facility. Equipment or product information supplied by the manufacturer may be used to supplement procedural documentation but cannot be used as a substitute.*
PPMXR8.1.3	**M**	Protocols are reviewed every one to three years by qualified individual(s).
PPMXR8.2	**Protocols contain all the information necessary to perform the examination.**	
PPMXR8.2.1	**M**	Protocol information includes the radiation technique. *Intent: Loading factors and techniques (e.g. tube voltage, current, filtration) are documented for all examinations in a technique chart or separate imaging protocol. Techniques preprogrammed into the X-ray system are not an acceptable substitute.*
PPMXR8.2.2	**M**	Protocol information includes the ancillary equipment or supplies needed.
PPMXR8.2.3	**M**	Protocol information includes a description of patient positioning. *Intent: At a minimum, a description of patient positioning for interventional and specialized procedures is provided (e.g. supine, prone, sitting).*
PPMXR8.3	**Examinations are performed following established protocols.**	
PPMXR8.3.1	**M**	Protocols are readily available to staff performing the examination.
PPMXR8.3.2	**M**	Technique charts are available and reflective of the equipment used.
PPMXR8.4	**Image capture and storage is performed when X-ray is used for guidance or other interventional purposes.**	
PPMXR8.4.1	**M**	There is capture and storage of a minimum of one image per case.

PPMXR9.0 EQUIPMENT TESTING IS PERFORMED PRIOR TO CLINICAL USE

PPMXR9.1	**Acceptance testing is performed after purchase and prior to clinical use of X-ray systems.**	
PPMXR9.1.1	**M**	Acceptance testing includes visual and functional testing of the mechanical properties.

PPMXR9.1.2	**M**	Acceptance testing includes visual and functional testing of the safety systems.
PPMXR9.1.3	**M**	Testing includes evaluation of the accuracy of loading factors. *Guidance: Testing is performed on the kVp accuracy (e.g. X-ray tube voltage), current time product mAs and timer accuracy (loading time).*
PPMXR9.1.4	**M**	Testing includes evaluation of the radiation output reproducibility.
PPMXR9.1.5	**M**	Testing includes evaluation of the radiation output linearity.
PPMXR9.1.6	**M**	Testing includes evaluation of the (HVL) X-ray beam filtration.
PPMXR9.1.7	**M**	Testing includes evaluation of X-ray field and light field alignment.
PPMXR9.1.8	**M**	Testing includes evaluation of the X-ray beam collimation.
PPMXR9.1.9	**M**	Testing includes evaluation of the accuracy of the dose area product value.
PPMXR9.1.10	**M**	Testing includes evaluation of the radioscopic timer and chronometer.
PPMXR9.1.11	**M**	Testing includes evaluation of the grid performance.
PPMXR9.1.12	**M**	Testing includes evaluation of the uniformity and artifacts.
PPMXR9.1.13	**M**	Testing includes evaluation of the high contrast resolution (special resolution).
PPMXR9.1.14	**M**	Testing includes evaluation of the low contrast detectability (contrast detectability).
PPMXR9.1.15	**M**	Testing includes evaluation of the maximum air kerma rate.
PPMXR9.1.16	**M**	Testing includes evaluation of the typical image receptor air kerma rate.
PPMXR9.1.17	**M**	Testing includes evaluation of the automatic intensity control.
PPMXR9.1.18	**M**	Testing includes phantom dose measurements (phantom entrance dose rate).

PPMXR10.0 QUALITY ASSURANCE PROGRAMS ARE ESTABLISHED TO ENSURE THE ATTAINMENT OF INTENDED QUALITY

PPMXR10.1		**Daily quality control procedures are established and used to monitor performance of X-ray systems.**
PPMXR10.1.1	**M**	Daily testing includes performing equipment warm-up as per the manufacturer's recommendations. *Guidance: On each procedural day where the use of X-ray equipment is planned, daily testing is performed before the start of the case in which the X-ray equipment will be used and documented in a log.*

PPMXR10.1.2	**M**	Daily testing includes visual inspection of X-ray system cleanliness. *Intent: X-ray system procedures often use radio-opaque contrast media. The image intensifier or digital detector housing is checked for any such material which might produce artifacts on the images. X-ray systems are inspected for dust and dirt on or near the image reception area where they may negatively affect image quality. Daily testing is performed before the standard of the case in which the X-ray equipment will be used and documented in a log.*
PPMXR10.2	**Annual quality control procedures are established and used to monitor performance of X-ray systems.** *Guidance: Quality control procedures can be completed by the vendor, medical physicist or biomedical engineer*.	
PPMXR10.2.1	**M**	Annual testing includes an evaluation of the accuracy of loading factors.
PPMXR10.2.2	**M**	Annual testing includes an evaluation of the radiation output reproducibility.
PPMXR10.2.3	**M**	Annual testing includes an evaluation of the radiation output linearity. *Guidance: Output with mAs.*
PPMXR10.2.4	**M**	Annual testing includes an evaluation of the X-ray beam filtration.
PPMXR10.2.5	**M**	Annual testing includes an evaluation of the X-ray field and light field alignment. *Guidance: Congruency of X-ray beam and light field edges.*
PPMXR10.2.6	**M**	Annual testing includes an evaluation of the X-ray beam collimation. *Guidance: Congruency of X-ray beam and light field centres.*
PPMXR10.2.7	**M**	Annual testing includes an evaluation of the dose area product and reference point air kerma measurements. *Guidance: All available measures of dose are assessed and calibrated annually.*
PPMXR10.2.8	**M**	Annual testing includes an evaluation of the grid performance. *Guidance: Check uniformity and movement of grid.*
PPMXR10.2.9	**M**	Annual testing includes an evaluation of the high contrast resolution (spatial resolution). *Guidance: Line-pair or Leeds phantom.*
PPMXR10.2.10	**M**	Annual testing includes an evaluation of the maximum air kerma rate. *Guidance: The maximum air kerma rate must be less than the value listed in the Radiation Emitting Devices Act, subsection 28(1) at the reference point defined by subsection 28(2).*
PPMXR10.2.11	**M**	Annual testing includes an evaluation of the automatic intensity control. *Guidance: Tracking of detector dose with phantom thickness.*
PPMXR10.2.12	**M**	Annual testing includes an evaluation of the phantom dose measurements. *Guidance: Measure the entrance dose to a phantom for common procedures.*

PPMXR10.2.13	**M**	Lead protective apparel testing is conducted and documented annually or when damage is suspected. *Guidance: Protective apparel testing may be performed by a third party (e.g. hospital radiology department). Lead protective apparel is decommissioned and properly disposed of when holes or cracks exceed the maximum aggregate area as published by the BC Centre for Disease Control.*

PPMXR11.0 POLICIES AND PROCEDURES CONTAIN ALL THE INFORMATION NECESSARY FOR THE SAFETY OF PATIENTS, STAFF AND VISITORS

PPMXR11.1		**Policies and procedures contain all the information necessary for the safety of patients, staff and visitors.** *Intent: Policies and procedures ensure that activities/procedures are performed consistently and accurately by all personnel within the non-hospital facility.*
PPMXR11.1.2	**M**	There is policy and procedures for the safe use of X-ray equipment. *Guidance: The policy and procedures outline the safe use of X-ray equipment including practices for keeping exposure to X-rays as low as reasonably achievable (ALARA), safe operation of the equipment, education and training of perioperative staff in proper radiation protection practices, correct use of any personal protective equipment including protection of patients of childbearing age (11 to 55 years) and dosimetry requirements. They are developed and revised/updated by personnel directly involved in X-ray operation in collaboration with the medical physicist or RSO, as appropriate, and approved by the medical director. The policy and procedures are reviewed annually and revised as necessary to ensure currency with standards, applicable regulations and professional guidelines.*
PPMXR11.1.3	**M**	There is policy and procedures for the management and investigation of an excessive radiation dose from any X-ray procedure. *Guidance: The policy and procedures outline when notification and guidance to medical practitioners and patients is required in the event of an excessive patient radiation dose. The policy and procedures also outline the investigation of any unusually high radiation doses (e.g. dose indicator values) by a medical physicist as necessary. Cases of excessive radiation dose should include a decision to consult with the patient and medical practitioner to provide guidance so that a possible effect is conservatively and proactively treated.*
PPMXR11.1.4	**M**	There is policy and procedures for the investigation of high personal dosimeter results. *Guidance: The policy and procedures outline who is responsible for reviewing and monitoring the personal dosimeter results and investigating a high reading including documentation of the action(s) taken to improve techniques and protective measures. Incidents that require reporting to regulatory authorities (e.g. WorkSafeBC, the College) are reported when required.*
PPMXR11.1.5	**M**	There is policy and procedures for radiation protection of pregnant personnel. *Guidance: The policy and procedures outline personnel responsibility for declaring a known or suspected pregnancy, radiation protection techniques (i.e. maternity or double-thickness apron) and dosimetry monitoring. Refer to Occupational Health and Safety Regulation (WorkSafeBC), section 7.21 Reproductive hazards and HCSC 35, procedures for minimizing radiation exposure to personnel.*

PPMXR11.1.6	**M**	There is policy and procedures for radiation protection of pregnant or potentially pregnant patients. *Guidance: The policy and procedures outline assessment of a patient's pregnancy status at time of admission to the facility (i.e. last menstrual period, pregnancy testing), notification of surgeon in the event of pregnancy or suspected pregnant patient and decision-making criteria on whether or not to proceed with a surgical procedure involving X-ray examination.*

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