RADIATION AND IMAGING STANDARD

The College of Dental Surgeons of Saskatchewan

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LEGISLATION

Radiation safety has long been a priority in Saskatchewan. This province, the first in Canada to have radiation safety legislation, passed The Radiological Health Act on March 15, 1961. The Act underwent a major revision in 1985 at which time it was renamed The Radiation Health and Safety Act, 1985. As well as protecting operators of radiation equipment, the Act was designed to protect patients and the general public from excessive radiation exposure. The Radiation Health and Safety Regulations, 2005 are the result of collaborative work by the provincial Radiation Health and Safety Committee, owners and users of radiation equipment, other stakeholders and the public.

CDSS REGISTRANTS

Registrants connected to and operating in CDSS approved Dental Facility must ensure that radiation exposure to staff, patients and the public in general is kept as low as reasonably achievable (ALARA principle). The Radiation Health and Safety Act (Appendix 1) and Regulations (Appendix 2) require the following in dental clinics:

Dental Clinic

1. “Dental Clinic” means a place in which radiation equipment is used by or under the direction of a dentist, as defined in The Dental Disciplines Act, for diagnostic or therapeutic purposes with respect to a patient. (The Radiation Health and Safety Regulations, 2005)

Approval

2. An accurate plan of the proposed installation or alteration must be submitted, and approval obtained from the Radiation Safety Unit prior to installation or alterations.

Certification

3. Prior to turning the x-ray equipment over to the owner, the vendor or installer of the equipment must complete an electrical and mechanical inspection of the x-ray unit and perform a calibration of the x-ray equipment to certify that the unit meets all specifications. A copy of the report must be submitted to the owner and the Unit within thirty days of the installation. This applies to the installation of both new and used x-ray units.

Registration

4. The x-ray unit(s) must be registered with the department using the prescribed form, within one month of the installation or its alteration. It must subsequently be re-registered each year.

Qualifications

5. Only those persons adequately trained qualify to operate dental x-ray equipment.

Quality Assurance

6. The owner must establish a quality assurance program to ensure the safe operation of the equipment and diagnostic quality of the images.

Inspections

7. The owner must arrange for each x-ray unit to receive a Safety Preventive Maintenance (SPM) inspection by a qualified service person at least once every three years.

Safety

8. The owner and/or operator must make sure that adequate safety precautions are taken to ensure that patients, general public and staff are not unnecessarily exposed to ionizing radiation.

Ionizing Radiation Installation

9. "Ionizing Radiation Installation" means the whole or any part of a building or other place in which ionizing radiation equipment is manufactured, used or placed or installed for use, and includes that ionizing radiation equipment

Owner

10. "Owner" means a person having management and control of a radiation installation or radiation equipment, or both;

11. An owner of dental ionizing radiation installation or any ionizing radiation equipment used for diagnosis or treatment relating to human beings shall ensure that each operator is a dentist, dental assistant, dental hygienist or dental therapist as each is defined in The Dental Disciplines Act ; or a student who is under the direct supervision of a person who possesses the qualifications set out above.

12. No person shall manage or control (own) an ionizing radiation installation or any ionizing radiation equipment used for diagnosis or treatment relating to human beings unless the person:
    a. is qualified pursuant to an Act to provide persons with care and treatment by means of ionizing radiation equipment; or
    b. employs an individual who meets the requirements of clause (a) to attend to the operation of the ionizing radiation installation or ionizing radiation equipment.

13. No person shall manage or control an ionizing radiation installation or ionizing radiation equipment that is used for a purpose other than diagnosis or treatment relating to human beings or animals unless:
    a. the person:
        i. Understands the procedures for which the equipment is to be used; and
        ii. possesses the knowledge necessary to adequately manage or control the ionizing radiation installation or ionizing radiation equipment and knowledge of the necessary safety procedures; or
    b. Employs an individual who meets the requirements of clause (a) to attend to the operation of the ionizing radiation installation or ionizing radiation equipment.

Ionizing Radiation Equipment

14. "Ionizing Radiation Equipment" means a device capable of emitting ionizing radiation, but does not include:
    a. equipment operated at less than 15 kilovolts and not designed principally to produce useful radiation;
    b. equipment that is in storage, in transit or not being used or equipment operated in such a manner that it cannot produce radiation;
    c. any radioactive substance; or
    d. any other equipment or class of equipment specified in the regulations;

Operators

15. "operator" means a person who uses or controls the use of any radiation equipment;

16. All operators must know of radiation hazards and be able to adequately protect themselves, patients and others.

17. All operators must have an adequate knowledge of radiation physics, techniques and their own equipment to be able to produce radiographs of diagnostic quality with the least patient exposure practicable.

18. All operators must be of 18 years of age or older.

19. All operators must be licensed or certified according to a standard recognized by the College of Dental Surgeons of Saskatchewan.

20. Any female operator who suspects she is pregnant should inform her employers and together with him/her ensure that for the remainder of her pregnancy her duties are compatible with minimum radiation exposure.

Operators-In-Training

21. All operators-in-training or inexperienced operators must work only under direct supervision of an experienced operator. Operators beginning training at an age less than 18 years must not receive an annual dose equivalent exceeding 1.5 rem (15 mSv).

Building and Equipment

22. All aspects of equipment manufacture or import installation and shielding must conform to the Federal and Provincial Acts and Regulations that govern these items.

Films and Processing

23. Digital Radiation equipment is recommended.

24. In installations using film, High speed film (E, F speed) must be used.

25. Films should be stored in a cool, dry place away from chemicals and radiation.

26. Films must be processed under light-tight conditions in a darkroom or daylight hood.

27. Manufactures' directions must be followed in the preparation and use of processing chemicals, including concentration of solution, time and temperature.

28. Safelights should be installed as per manufactures directions and compatible with all films used. Red bulbs are not acceptable. Screen film such as pantomographic films are more sensitive to light than intraoral dental films. Care must be taken to ensure that no light of incorrect wave length reaches these films.

29. Films should be handled carefully to avoid creasing, scratching and static electricity.

Radiation Protection for Office Personnel

30. Registrants are responsible for ensuring that proper radiation hygiene procedures are understood and followed by staff within facilities they are 'connected' with.

31. An operatory (room) must not be used for more than one radiographic procedure simultaneously.

32. No person whose presence is not essential must be in the room during exposure.

33. Persons other than the patient must keep as far away as practicable from the primary beam. Personnel must not be exposed to the useful beam. Deliberate exposure d for training purposes only must not occur.

34. Personnel must take full advantage of the protective devices available.

35. If necessary for the operator to be in the room during special procedures, protective clothing must be worn.

36. Where possible, film holding devices should be used during exposure. If necessary, the patient should hold the film. The operator should not hold the film; if this is necessary (this should not become a habit), protective clothing including gauntlets should be used.

37. If weak patients or children need support, holding devices should be used. If parents, escorts, or other personnel are required to assist, they must be provided with adequate protective clothing and be positioned outside of the primary beam. No one person should regularly perform these duties.

38. The x-ray housing must not be held by hand during operation. Housing that drifts or vibrate excessively should have their supports adjusted.

39. All operators of x-ray equipment, personnel who regularly participate in radiological procedures or others who might receive more than 1/10th for the yearly maximum permissible doses should wear personnel dosimeters. When worn with a lead apron it must be worn under the apron.

40. Energized x-ray machines must not be left unattended in a freely accessible location.

41. Where radiation doses in excess of 25% of the maximum permissible doses are being received regularly by any one-person, appropriate remedial steps must be taken to improve techniques and protective measures.

The Patient

42. One of the largest contributors of man-made radiation exposure of the population is diagnostic radiology. It has been stated by some that some of this is unnecessary and should be eliminated.

43. It is the responsibility of the dentist and under direction from him, his staff, to ensure that patients receive no more radiation than necessary. The recommendations and procedures in this section should prove guidelines to the dental practitioner to allow him to meet these goals. (see Chart 1)

44. Radiographs should be made only after clinical evaluation and should be for the purpose of obtaining information not readily otherwise available.

45. Radiographs should not be taken on a “routine” basis, but only on the basis of the above (see Chart 1).

46. The dentist should check if recent films are adequate or can be used to alter the type and number of films required. They should be examined at the time of clinical evaluation.

47. When a patient transfers, or is referred from one practitioner to another, relevant films or copies should be forwarded t the new practitioner and be reviewed by him/her. They can be copied and returned to the first practitioner when they have served their purpose.

48. The number of radiographs required should be kept to the minimum practicable, consistent with obtaining the required information.

49. The fastest films or screen-film combinations consistent with obtaining the required information should be used. The beam should be well collimated.

50. Repeat exposures should not be prescribed merely because the film is not of the “best” diagnostic quality if the radiograph contains the required information.

51. The quality of radiographs should be monitored routinely to ensure that they satisfy diagnostic requirements with minimal patient exposure.

ALARA

52. Radiation safety standards are based on internationally accepted principles of best practice and use of radiation. While there is not one research study that defines an absolute safe minimum for radiation exposure, most regulations are based on the Linear Non-Threshold Model (LNT) that assumes all radiation exposure carries some risk to the individual. However, the regulations are tempered with the ALARA principle, which means to keep radiation exposure As Low As Reasonably Achievable which is dependent on the type of radiation, the benefit derived from its use, and the amount of burden caused by implementing radiation safety practices.

Personal Protective Equipment

53. The routine practice of using lead garments and protective shielding is not required for the patient during the diagnostic intraoral, panoramic, and cephalometric radiographic procedures, if all other recommendations for limiting patient radiation exposure are respected. For CBCT procedures, the patient should be provided with a lead apron when it will not interfere with the required diagnostic information of the procedure.

54. It is reasonable for lead garments and protective shielding to be used to aid in patient comfort and choice regarding fears of radiation exposure. If the patient requests lead aprons or thyroid collars, the protective shielding should be utilized along with informative education and discussion on the advances of radiation technology and standards.

55. For lasers, the primary concern is eye exposure. Reflections from mirrors or stainless steel surgical equipment can cause accidental exposure. All personnel in the laser treatment area including the patient should use safety eyewear of the appropriate protective wavelength. Laser generated air contaminants are typically contained with conventional dental high-volume evacuation systems.

Quality Assurance

56. You have some options to ensure that you are in compliance with this regulation.
    i. Develop an in-house system that will outline the tests that you will do and where you will document the results of these tests. {If you do this, you will have to send your system to Saskatchewan Labour to get it approved – see clause 16(2)(a).}

    ii. Purchase an off-the-shelf QA System. {You should check to make sure that Saskatchewan Labour has approved it.}

    iii. Order a QA kit from the College of Dental Surgeon s of Saskatchewan. {With the assistance of the Saskatchewan Labour's Radiation Safety Unit, the College has developed a Quality Assurance Procedures Manual that contains all the procedures and testing equipment that you will need to be in compliance with section 16 of the Regulations.}

RECOMMENDATIONS FOR PRESCRIBING DENTAL RADIOGRAPHS (ADA)

These recommendations are subject to clinical judgment and may not apply to every patient. They are to be used by dentists only after reviewing the patient's health history and completing a clinical examination. Even though radiation exposure from dental radiographs is low, once a decision to obtain radiographs is made it is the dentist's responsibility to follow the ALARA Principle (As Low as Reasonably Achievable) to minimize the patient's exposure.

TYPE OF ENCOUNTER	**PATIENT AGE AND DENTAL DEVELOPMENTAL STAGE**				
	Child with Primary Dentition (prior to eruption of first permanent tooth)	**Child with Transitional Dentition** (after eruption of first permanent tooth)	**Adolescent with Permanent Dentition** (after Eruption of third molars)	**Adult, Dentate or Partially Edentulous**	**Adult, Edentulous**
New Patient* Being evaluated for oral disease	Individualized radiographic exam consisting of selected periapical/occlusal views and/or posterior bitewings if proximal surfaces cannot be visualized or probed. Patients without evidence of disease and with open proximal contacts may not require	Individualized radiographic exam consisting of posterior bitewings with panoramic exam or posterior bitewings and selected periapical images.	Individualized radiographic exam consisting of posterior bitewings with panoramic exam or posterior bitewings and selected periapical images. A full mouth intraoral radiographic exam is preferred when the patient has clinical evidence of generalized oral disease or a history of extensive dental treatment.		Individualized radiographic exam, based on clinical signs and symptoms.

	a radiographic exam at this time.			
Recall Patient* With clinical caries or increased risk of caries**	Posterior bitewing exam at 6-12-month intervals if proximal surfaces cannot be examined visually or with a probe		Posterior bitewing exam at 6-18- month intervals	Not applicable
Recall Patient* With no clinical caries and not at increased risk for caries**	Posterior bitewing exam at 12-24-month intervals if proximal surfaces cannot be examined visually or with a probe	Posterior bitewing exam at 18-36-month intervals	Posterior bitewing exam at 24-36-month intervals	Not applicable

STANDARD FOR RADIOGRAPHIC IMAGING AND CONE BEAM COMPUTED TOMOGRAPHY IMAGING

1. All forms of radiographic imaging have the following principles applied to them:
    a. Registrants connected to and operating in a College of Dental Surgeons of Saskatchewan (CDSS) licensed facility must ensure that radiation exposure to staff, patients, and the public in general is kept as low as reasonably achievable (ALARA).

    b. All registrants must follow the guidelines in The Radiation Health and Safety Act.

    c. All dental radiographic units must be registered with, and meet the requirements of, the Radiation Safety Unit, Ministry of Labour Relations and Safety, Government of Saskatchewan.

    d. All radiographic units must have an appropriate quality assurance program implemented.

    e. Lead garments should be used to protect patients from CBCT radiation whenever it is possible and does not interfere with the diagnostic image.

    f. The dentist/specialist who prescribes any radiograph is responsible for interpreting everything in the image in a timely manner. If the prescribing dentist/specialist is unable to interpret the image appropriately, it must be referred to a licensed professional who is able to.

    g. The frequency and technique for any radiographic exposure is left to the discretion of the dental professional in agreement with the patient. The goal of any radiographic exposure is to provide a sufficient amount of diagnostic information while exposing the patient to the least radiation that is reasonable. Any radiographic exposure must be selected based on what is best for that particular patient given specific considerations such as age, size, and previous imaging that has been completed.

    h. Any radiographic imaging must follow the appropriate taking of a medical history and case history as well as a clinical examination

    i. All dental personnel who expose a dental radiograph must have the appropriate training and license to do so. They must also have received proper training on the selected radiographic equipment.

Cone Beam Computed Tomography

2. As CBCT is a method of radiographic imaging for dental diagnosis, it falls under the same guidelines as all other forms of imaging listed in [1.] (above). In addition to the points outline in [1.] the following guidelines must be

followed for all Cone Beam Computed Tomography imaging regardless of the field of view or voxel size:

a. Any registrant of the CDSS who plans to operate a CBCT unit in his or her clinic(s), must have a valid Radiation Safety Unit Facility Permit for the CBCT unit (effective January 1, 2018).

b. CBCT imaging is not to be used for routine "screening purposes" and there must be a clinical indication for the acquisition of a CBCT image.

c. The registrant(s) listed on the Radiation Safety Unit Facility Permit must have training in safe operation of the CBCT. This can be obtained on-site or at an off-site location. This training must be documented.

d. All registrant(s) who want to:
   i. Prescribe any CBCT imaging must have attended a CE course of at least two (2) credit units that focuses on radiation hygiene as it relates to CBCT imaging and ensures the referral of all CBCT images to a licensed practitioner qualified and authorized to perform this advanced skill.

   ii. Interpret small field of view (<8cmx8cm) CBCT images must: (A) complete a training program that focuses on radiation hygiene as it relates to dental CBCT imaging and is designed to produce competency in the ordering, taking, interpreting, and reporting of dental small field of view CBCT images; and (B) obtain a CDSS CBCT Small FoV Interpreting Dentist Authorization.

   iii. Interpret large field of view (>8cmx8cm) CBCT images must: (A) complete a training program that focuses on radiation hygiene as it relates to dental CBCT imaging and is designed to produce competency in the ordering, taking, interpreting, and reporting of dental large field of view CBCT images; and (B) obtain a CDSS CBCT Large FoV Interpreting Dentist Authorization.

e. All dental personnel who will be exposing a CBCT image must have documented training on appropriate operation of the CBCT unit. This can be provided by the vendor or another professional who has been trained in safe operation of the appropriate CBCT unit.

f. All CBCT images that measure larger in size than 8cm x 8cm (in any dimension) must be interpreted by a professional who meets one of the following criteria:
   i. Completion of a post-graduate program in Oral and Maxillofacial Radiology or Medical Radiology and a current license in his or her designated specialty in any Canadian jurisdiction.

   ii. Completion of a post-graduate program in Oral and Maxillofacial Surgery or Orthodontics and a current license in his or her specialty in any Canadian jurisdiction.

** If there is a repeat image (of the same size or smaller) within one year of a previous image that has been interpreted, then (f) is not required but a report (see (g) below) must still be completed.

g. All CBCT images must have a proper report in the patient's chart that includes the following information:
   i. Patient Identification
   ii. Name of the prescribing registrant
   iii. Name of the interpreting dentist/specialist
   iv. Date of acquisition
   v. Field of View of the image
   vi. Findings from the CBCT Interpretation and any relevant diagnoses
   vii. Any recommendations for follow-up imaging or further diagnostic testing.