

Things to Consider before a CBCT Radiation Inspection

General Overview

The practice of Dental Radiography has embraced Cone Beam Computed Tomography. It is a valuable diagnostic tool that has become a permanent part of many dental practices. Patients can, and do benefit enormously from the application of this technology.

A recent review of the number of systems acquired, the manner in which they are operated, and their frequency of use has given those involved with Radiation Safety in Dental Radiography sufficient information to determine that regular safety inspections are necessary.

Discussions between the B.C. Dental Association, WorkSafeBC, the Radiation Protection Division of the B.C. Center for Disease Control, Innovative Biomedical Engineering and many operators of CBCT systems have formed the basis of the present inspection program. The program is designed to mirror as closely as possible the present dental radiation survey program which has completed several thousand successful inspections. Parties involved in the development include software developers, hardware developers, regulators, our government, dental service and supply companies, The College of Dentists, the B.C. Dental Association and Biomedical Engineering.

At all times, the primary focus of the program has been patient safety, worker safety and public radiation safety. The designers of the program have kept in focus the need to gather accurate information in a way that limits impediments to the workflow of dental practices.

Many dental practices have had their CBCT systems in operation for a considerable time prior to receiving a full radiation inspection. Most have installed their equipment in a properly shielded room and this has provided protection to staff and others from the radiation emitted from these systems. Only systems that have been approved for use by Health Canada have been installed. These factors have provided a good basis for general radiation safety.

However, it is now recognized that additional attention has to be directed toward staff education, patient information, recording of exposure data, quality assurance and dose metrics than has been previously been done by Dental practices.

These now form the basis of the inspection program.

Some Specifics

A new dose metric, the Kerma Area Product (KAP) has been introduced. It is a measure of the radiation energy absorbed per unit mass of tissue multiplied by the area of tissue exposed. Its' units are MilliGray Centimeters² (mGy-cm²) and it relates in a more meaningful way than patient dose alone the manner in which the x-radiation interacts with the patient. This term, along with the dose measured by the measuring instrument is now included in all survey data. If your practice has been inspected using the present survey program, you will see CBCT, BW, PAN and Cephalometric patient radiation data presented in terms of KAP. You can use this data to determine the value of the KAP for all common dental radiographic examinations. In general, KAP values for CBCT examinations are higher than for most other dental radiographic examinations. In time, you will learn ways to control and minimize the KAP values for each of your CBCT and other examinations.

Q and A

The following questions have been repeatedly asked of us who conduct radiation inspections of CBCT facilities. We have included these in this document so that you can be better prepared to achieve a successful inspection when the surveyors arrive at your site.

Q. How do I prepare for a CBCT X-ray radiation inspection of my facility?

A. There are a number of new requirements for CBCT operation that will have to be undertaken by the dentist and the operators of the X-ray machine in the facility. The best way to prepare for the inspection is to read the rest of this document:

Much of the inspection is technical in nature and relates to the actual operation of the equipment and condition of its surroundings. There is little that users can do ahead of the inspection in this regard.

Q. What are the new requirements for the use of CBCT X-ray machines?

A. There are a number of new points relating to the operation of CBCT units that need to be addressed. You may have already addressed some of these but for completeness we have identified all of them. A questionnaire forms part of your survey and we have identified with either a “fail” or a “Warning” those which are commonly overlooked. This document does not address all points raised by the questionnaire. Only those which are often overlooked. Some additional information follows:

Site Safety Assessment.

Q. Are you aware of your responsibilities for radiation safety?

A. WorkSafeBC requires that you have access to Safety Code 30. It is available on our website www.innovativebiomedical.com and you can either download it and keep a copy or simply know where to get it. Section 3.1 of the Code and the attached CBCT guidelines section 1.1 to 1.6 are your source documents for Site Safety. These guidelines are also listed on our website. Review these and give the correct answers to questions from the surveyor. You should also be prepared to take the BCDA CBCT course when it becomes available.

Patient Protection:

Q. How do I record exposure techniques that become a permanent part of the patient exposure records?

A. Some CBCT machines record this automatically. If that is the case, that is all that is needed. If not, then use a form that is available on the BCDA website. Keep the written records and ensure access to electronic records. If you download the BCDA form, you should be able to fill it in electronically which will make record keeping neater.

Q. Where do I get a warning sign advising pregnant patients of radiation risk and where should it be displayed?

A. You can download this warning sign. You can “Google” “Pregnancy Radiation Signs” then download one that suits your needs. It should be displayed in an area where a patient can see it before the examination begins. Some examples are: Change room if this is used, inside the CBCT room where the patient can see it during positioning, possibly the reception desk, in the waiting area etc.

Q. If I have a sign displayed, do I have to ask a person of child bearing age is she is pregnant?

A. Yes.

Operator Protection:

Q. I have received training in radiation as part of my schooling. Why do you ask if I understand the basics?

A. There are additional risks to all involved in the use of CBCT devices. Additional training in this subject is in preparation and you will be asked to take this training when it becomes available.

Q. Pregnant staff have special responsibilities to their employer and the fetus. It is in the interest of all concerned that proper actions be undertaken in this case. Why do I need to know this?

A. A draft policy document forms part of the report. It provides guidance for those who are pregnant and are working in the practice. It is suggested that this draft be introduced into the policy manuals for the practice so that all involved know what to do and which limits of exposure are considered to be acceptable. You can find a copy of this draft policy on our website www.innovativebiomedical.com

Public Protection:

Q. What does practice layout and construction have to do with radiation safety?

A. A lot. A shielding plan is required in order to offer an adequate level of protection for all concerned.

Q. Where do I get approved X-Ray warning signs?

A. You can Google "X-Ray Warning Signs", pick a suitable one, download it and print same. As for An approved sign, see the included "Guidelines" section 2.4.3.

Q. Where do I get dosimeter badges and who is required to wear them?

A. There are 3 companies that supply dosimeter badges; go to: www.innovativebiomedical.com. On the top of the home page click on the "Company" tab, drop down to "Services" and slide right to the "Dental Professionals" tab Click on that tab and look to the right side of the page that comes up. You will see where to find suppliers of personal dosimeter badges, also called Thermoluminiscent Dosimeter (TLD) badges. You are free to choose any supplier you wish. Only those persons who are considered to be "at risk" need wear the badges. This mainly includes those who operate the equipment and others who stand a reasonable chance of incidental exposure.

Q. How long must my staff wear these badges? We have never done so.

A. This is a WorkSafeBC requirement that applies to monitoring of occupational exposure. At this time, all at risk staff must wear these badges for a period of 1 year. If, after that time the records show that all exposure values are near zero or are close to but less than 1.0 mSv (a rare event that may be insignificant) then application can be made to WorkSafeBC for an exemption from this action. The exemption will remain in effect until the equipment or the facility is changed. Then things must be done again.

Q. Can I just purchase one badge, mount it near the machine and use that as my monitoring program?

A. No, this is contrary to WorkSafeBC regulations.

Q. What do I do if I receive a reading at, near, or slightly in excess of 1.0 mSV in any one monitoring interval?

A. We have provided you with a draft policy that explains your actions should this be the case. It is suggested that this be included in your policy manual. This is a de facto “action plan” as required by WorkSafeBC. Occasionally a false positive reading will occur and it is recommended that your surveyor look at this situation to ensure that nothing has gone amiss with the equipment or your day to day procedures. You can find a copy of this draft policy on our website www.innovativebiomedical.com

Q. Do I have to show the exposure records to the staff?

A. Yes. It is recommended that these be posted in the normal staff announcements area.

Q. Why is a Shielding Plan necessary before a CBCT machine can be installed in a room?

A. The radiation characteristics of these machines are such that improperly shielded spaces can easily permit persons to unknowingly receive excessive workplace exposure to x-radiation at the normal workload levels of CBCT machines. Hence, it is necessary that an individual with experience in radiation control be employed to design the shielding for these spaces.

Q. What sort of Quality Assurance tests are we required to undertake with CBCT machines and how often should they be carried out and by whom?

A. These are outlined in your operators’ manual and differ from manufacturer to manufacturer. The purpose is to ensure that the machines are operating in a proper fashion during each period. There are staff based QA checks and QA checks that must be carried out by qualified persons. Records of QA work must be maintained.

Q. After I achieve a “pass” for the entire inspection, what happens?

A. You will be issued a “Certificate of Compliance” that states that your operation is in compliance with a) the requirements Health Canada Safety Code 30, “Radiation Protection in Dentistry, Recommended Safety Procedures for the Use of Dental X-Ray Equipment” and b) the “Guidelines on Radiation Protection & Quality Assurance Applicable to Dental Cone Beam Computed Tomography (CBCT)”. This certificate is valid for a period of 3 years from the date of the original inspection.

Q. How do I obtain this certificate?

A. Once all the items in the report that are identified as either a “fail” or a “warning” have been addressed, you can email confirmation of this action to: xray@innovativebiomedical.com or dan@danhanson.net giving us the name of your practice and/or the name of the owner of the practice as identified on the report under “Facility Name” and we will send a copy of the certificate to your attention.

If you have specific questions, you can either email us at the above addresses or telephone 250-898-9089 and we will assist you with your concerns. We prefer email contact as we are usually busy testing in dental offices and telephone calls tend to interrupt our work and inconvenience the office in which we are working.

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