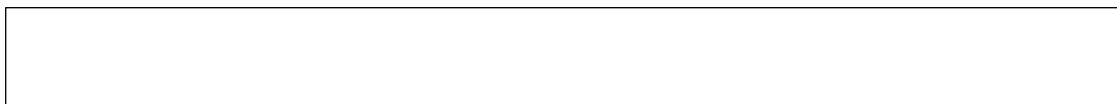


Describe the legal requirements for ionising radiation within dental settings	OC 1.1R1a-d
<p><b>Legal requirements</b></p> <p>a) The current Ionising Radiation Regulations – The current Ionising Radiation Regulations are put in place for the protection of workers and patients regarding radiation. A principle called ‘as low as reasonably practicable’ is implemented which means that a patient should only be exposed to radiation if it is necessary, and it must have a valid justification. As part of this, risk assessments must be carried out and recorded to make sure there are no hazards and that the correct amount of radiation is being put out when a x-ray is taken. In addition, equipment must be examined and maintained regularly, and the Health and Safety Executive must be informed of the use of radiation equipment or any changes such as movement or ownership of the equipment.</p> <p>b) The current Ionising Radiation (Medical Exposure) Regulations - the current Ionising Radiation Medical Exposure Regulations is put in place for the safety of patients. There are duties for the employer, referrer, practitioner and operator to follow to ensure that patients are kept safe when being exposed to radiation. For the employer, they have the overall responsibility in regard to the safety of the installation of equipment, practice and procedures and ensuring that all staff follow the regulations. They must also make sure that a radiation file and local rules are kept together, as well as providing a framework of written procedures for medical exposures.</p> <p>A referrer is entitled to refer a patient for a medical exposure however they must supply enough information to justify the exposure. The operator is the person who identifies the patient, positions the film, sets the exposure parameters, presses the exposure switch, processes the films and evaluates the radiographs.</p> <p>c) Local rules- Local rules are put in place to help protect staff and patients and to keep exposure to radiation to a minimum. The things that should be included as part of the local rules are: identification and description of the control areas, the names of the RPA and RPS, standard radiation warning signs at each control area, contingency plans in the case of malfunction or failure of the x-ray machine, and all the people who are appropriately trained/qualified to operate/assist in the process of taking a radiograph.</p> <p>d) Radiation protection file- The radiation protection file contains all documents regarding radiation, including the local rules. It also includes things such as records of all servicing and audits that have taken place, risk assessments for all equipment and evidence of staff having the correct training on how to safely use all radiation equipment. A yearly check must be done to ensure that all documents and information in the radiation protection file is up to date.</p>	
Summarise the risks associated with ionising radiation	OC1.2 R2 a-e
<p><b>Risks</b></p> <p>a) Primary beam- the primary beam is the initial beam of radiation that is emitted, and it is the main source of exposure. The risks with this include burns to the skin or damage to tissues. In severe cases this could lead to cell mutations or cancer.</p> <p>b) Scatter radiation- Scatter radiation is the radiation that bounces off surfaces and scatters</p>	

<p>in different directions, coming into contact with different objects or possibly another person or another part of the patient's body. The risks with these small amounts of unnecessary exposure are that staff or surrounding people that are present while an X-ray is being taken, could over time become exposed to large amounts of radiation which could eventually destroy cells in the body or cause radiation sickness.</p> <p>c) Absorption by the patient- absorption of radiation could lead to red/inflamed skin, damage or destruction to cells and tissue in the body, burns to the skin, skin conditions such a dermatitis, or even illnesses such as leukaemia or cancer.</p> <p>d) Equipment failure- All radiography equipment, especially X-ray machines or anything that gives off radiation, must be regularly serviced and audited to ensure they are working properly and giving out the correct dosage of radiation. If equipment malfunctions, this can put patients and staff in danger of being exposed to radiation unnecessarily, or in high quantities.</p> <p>e) Accidental exposure (to patient or self)- Accidental exposure to radiation to patients or staff could be caused by things such as staff or people accompanying a patient to their appointment not standing outside the controlled area while radiation is being emitted, therefore being exposed to radiation unnecessarily. It could also occur if an X-ray is taken when it is not completely necessary.</p>	
<p>State the purpose of the controlled area</p>	<p>OC 1.3</p>
<p>The purpose of the controlled area, which is 2 metres away from the primary beam, is to control who can enter the area and under what condition, as well as to restrict radiation exposure.</p>	
<p>-State the importance of an isolation switch</p>	<p>OC1.4</p>
<p>The isolation switch cuts the power supply to the X-ray machine to prevent any leaking radiation. Therefore, its position should be outside of the controlled area so it can be switched off without any risk of radiation exposure in the case of an equipment malfunction.</p>	
<p>State the purpose of lead foil in a traditional radiographic film</p>	<p>OC1.5</p>
<p>The lead foil in a radiographic film captures the scatter of radiation past the film to maintain image contrast, as well as reducing the dose of radiation absorbed by the tissues behind the film packet.</p>	
<p>State the purpose of an intensifying screen in an extra-oral cassette</p>	<p>OC1.6</p>
<p>Intensifying screens are used in an extra-oral cassette to intensify the effect of the x-ray photon by producing a larger number of light photons. It reduces the radiation required to produce a particular density and therefore reduces the patient radiation dose.</p>	



<p><b>Explain the diagnostic value of intra-oral radiographic images</b>  <i>Explain the reasons for the taking the following x-rays and reasons for uses and diagnostics</i></p>	<p>OC2.1 R1a-b</p>
<p>Intra-oral radiographic images  a) Bitewing  b) Periapical</p>	
<p><b>Explain the diagnostic value of intra-oral radiographic images</b>  <i>Explain the reasons for the taking the following x-rays and reasons for uses and diagnostics</i></p>	<p>OC 2.2 R2a</p>
<p>Extra-oral radiographic images  a) Dental pantomograph (DPT) / orthopantomograph (OPG) / panoral</p>	
<p>Evaluate the advantages of using digital radiography in the dental setting</p>	<p>OC2.3</p>
<p><b>Explain methods for processing radiographs</b></p>	<p>OC3.1 R1a-b</p>
<p><b>Methods</b>  a) automatic film processing  b) digital  i. direct  ii. indirect</p>	
<p><b>Describe the reasons for fault visible on radiographic images</b></p>	<p>OC3.2 R2 a-e</p>
<p><b>Reasons</b>  a) operator error  b) processing error  c) patient error and accessories (eg. dentures, glasses)  d) equipment error  e) storage of materials</p>	
<p><b>Describe the quality control system used in dental radiography</b></p>	<p>OC 4.1</p>
<p><b>Explain how the quality control system are carried out to comply with the principle of ALARP (radiation dose to be as low as reasonably practicable)</b></p>	<p>OC 4.2 R1a-d</p>
<p><b>Quality control systems</b>  a) Radiographic image grading process  b) Step-wedge test  c) Quality assurance of direct and indirect digital X-ray sensors/plates</p>	

**Evaluate methods for processing radiographs- Automatic-** Automatic processing goes through the same process as manual processing except a machine does all the procedures therefore it is much quicker and a dark room is not needed, however the chemicals still need to be changed. The unopened film is inserted through the sleeves and opened up inside the machine. The film then passes through the developer, fixer, wash and drier. The developed film then comes out the other end of the machine.

**Digital (direct)-** When the x-ray is taken, an electronic sensor (attached to the computer by a cable) that is placed in the patients mouth, captures an image digitally. This image is then displayed almost instantly on the computer. The image can then be zoomed in on or rotated to get a clearer view and help aid diagnosis, and also allows the patient to be able to view the image so they can have a better understanding. This method is the quickest method of processing radiographs.

**Indirect-** a phosphor plate inside a single use envelope is placed into a holder and placed inside the patients mouth. When the x-ray is taken, the phosphor layer of the plate absorbs and stores the x-ray energy. The plate is then placed into a reader which scans the plate with a laser beam, creating a digital image, which is then processed and displayed on the computer. This method is less costly compared to automatic processing as the phosphor plates can be used over and over again and no chemicals are needed. It also allows the patient and dentist to clearly view and enhance the image to aid with diagnosis.

**Describe the reasons for fault visible on radiographic images-**

**Operator error-** coning is when a part of the film does not have any image on it due to the collimator of the X-ray machine not being angled centrally with the holder. Elongation is when the image appears long/stretched out due to the collimator being angled too shallow. Foreshortening is when the image appears short/squashed due to the collimator being angled too steep.

**Processing error-** an old/expired film could cause a fogged image, a stained image could be caused by problems with the chemicals inside the machine such as something being stuck causing the machine to not be able to wash the chemicals off properly. If too many films are put into the processing machine at once, they may overlap causing only half of the image to appear.

**Patient error-** the patient moving while an image is being taken could cause a blurry image. Items such as glasses can get in the way of the image and cause shadows or artefacts on the image, or even cause scatter radiation. Not removing dentures before an X-ray is taken can affect the way the teeth next to the denture are shown on the X-ray and the denture will show up very white causing the dentist to have a less clear image and not be able to read it as well.

**Equipment error-** if the chemicals in the processing machine are not changed or at the correct levels, this could produce faulty images that are not properly developed. If the X-ray machine is not on the correct settings it could cause under/overexposed or distorted images. In the case of the conveyor belt in the processing machine malfunctioning, the X-ray film will get stuck in the machine. The lid of the machine would then have to be removed to manually remove the film, however the image will be damaged and no image would appear on the film. Any other films inside the machine will also have faulty images due to the light exposure from the lid being removed.

**Storage of materials-** if films are stored next to the collimator, they could be exposed to radiation before being used, which could mean that when they are used, the image could be faulty or difficult to read. If X-ray films are not stored with the newest films further back and the oldest films being used first, the older films could expire causing them to produce an image of less quality. Chemicals should be stored upright as if they leak it could cause damage to film. Films should be stored away in a cupboard or draw as light exposure could cause faulty images.



d) IRMER operator requirements

Explain the methods of mounting radiographic images



