



Lab Manual

Code: LQM_o3(1)

Preface:

- 1- Safety Guidelines:
 - a. Requirement of safety protocols.
 - b. Safety guidelines for personal.
 - c. Safety guidelines for laboratories.
 - d. Incidents and accidents.

- 2- Production lab guidelines:
 - a. Fixed production lab guidelines.
 - b. Removable production lab guidelines.
 - c. Digital production lab guidelines.

- 3- Histopathology lab guidelines.

- 4- Radiology lab guidelines.



Safety Guidelines

Laboratory Safety requirements

- The laboratory activities can be performed safely, efficiently, and ergonomically only in presence of enough floor space.
- The normal movement of students, staff, materials, and waste can be performed safely without disturbing or affecting ongoing work in laboratories.
- In case of an emergency, there is sufficient space for personnel to move quickly, or be assisted, carried, or even dragged if illness or injury has occurred.
- Hidden spaces or surfaces, such as behind or underneath furniture and equipment, can be accessed for maintenance, cleaning, and decontamination.
- There is adequate space and access for any necessary safety equipment, such as isolation switches, fire extinguishers and safety showers.
- Floor space must be allocated for additional facilities for personnel use, such as toilets/ bathrooms, eating/drinking areas, and office facilities. This space must be located outside of the working space of the core requirement laboratory.
- Spaces for personnel to leave and store personal items, outer garments (coats) and clean laboratory coats must be provided.
- Specialized storage cabinets need to be available for hazardous reagents and chemicals, such as those with flammable, oxidizing or corrosive properties.
- Space for emergency supplies such as eye washes, first-aid materials must also be provided and be appropriately located.
- Enough floor space must be provided to enable safe and secure storage of waste before it is decontaminated or transported for disposal.
- Materials used for walls and floors must be easy to clean, and impermeable and resistant to the chemicals and disinfectants used in the laboratories. For example. vinyl or linoleum are suitable materials for floors
- Hand-washing facilities must be provided in each room of the laboratory. These facilities should be located as close as possible to the exit door. This area should be dedicated to hand washing only and kept separate from any sinks where chemicals or contaminated liquids are processed.
- Provision of dermatological products such as hand lotions/moisturizers should be considered.
- Taps which can be operated without touching by hand; soap dispensers containing suitable liquid soap; a sufficient supply of disposable paper towels; a container for used paper towels.
- Electrical supplies must be of sufficient capacity and reliability for safe and effective operation of all electrical and electronic devices. These supplies

include cabling, fuses, and outlets, which must be earthed to prevent shocks in case of malfunction.

- A pleasant and comfortable working environment encourages safe working practices. Minimum requirements for the general workplace environment, such as lighting, temperature, heating, and ventilation, are set out in the Workplace
- Lighting must be adequate for all activities. The specific lighting needs may vary for different areas of the laboratory. Therefore, the lighting requirements of procedures should be assessed so that those needing more light (or low light levels) can be appropriately lit (or shaded) using artificial means
- environmental controls, including comfort cooling and/or heating systems (to provide a comfortable temperature) and air conditioning (to control the condition of the air), may be necessary as a temperature and/or humidity control measure to ensure a comfortable working environment for students and staff to perform their tasks safely and with optimal efficiency.
- There may be situations where student work alone in the laboratory, particularly outside normal working hours. Systems should be set up to monitor lone workers to ensure they remain safe. These may include periodic visits to the laboratory by supervisors and providing means of raising the alarm in the event of an emergency.
- All laboratories need arrangements for supervising work, checking that health and safety measures remain effective and standard operating procedures are observed.
- Ventilation: All lab rooms shall exhaust to outside, and there shall be no return of lab exhaust back into the building.
- Everyone working in the lab should take care of their own health and safety and that of others.
- Everyone working in the lab should report specified accidents, dangerous occurrences, and cases of ill health like, cases of specified infectious diseases such as hepatitis, tuberculosis.

Standard operating procedures

- Laboratories should have standard operating procedures (SOPs) for the general work of the laboratory.
- By fully integrating health and safety arrangements into the SOPs, staff can also ensure they meet acceptable standards of health and safety in the day-to-day running of the laboratory. SOPs are an ideal place to record the significant findings of risk assessments.
- SOPs need to reflect the safe working practices required to control risks. They are most likely to work well if they are prepared in consultation with staff, the local safety committee and safety representatives.
- The standard operating procedures should specify how to use an equipment safely and effectively. It is helpful to display operating instructions beside each equipment.

Effective standard operating procedures should set out clearly

1) Eye protection

- Suitable eye protection to British Standard BS EN 166: 1996 22 is needed where splashing is likely to occur. If contaminated, eye protection should be thoroughly cleaned and disinfected before reuse.
- There should be a suitable means of eye irrigation near the washbasin and a mirror, so that people can see what they are doing in the event of eye contamination.

2) Personal hygiene

- Everyone working in laboratories should pay scrupulous attention to good personal hygiene. The main route for laboratory-acquired infection is via hand to mouth, therefore hand washing is of primary importance, and is essential before leaving the laboratory. Workers should avoid contact between their hands and eyes, nose, or mouth. Eating, drinking, smoking, applying cosmetics etc. should be forbidden in the laboratories.
- Before starting work, staff need to protect any cuts, abrasions, dermatitis, or other open wounds with waterproof dressings and/or disposable gloves. Barrier creams are not suitable for this purpose.
- The posters of Guidelines for Hand Hygiene should be posted on the walls of the labs near the washing area.
- The standard operating procedures for the laboratory will say when you should wear gloves and what type to wear. If you think that your hands or gloves may have been in direct contact with blood, body fluids or other biological material, stop work at once, discard the gloves, if wearing them, and wash your hands. If a glove becomes perforated during work, even if you are not injured, stop work immediately, remove it and dispose of it into the appropriate bag. Wash your hands and put on new gloves

3) Sharps

- Sharp objects may cause cuts, puncture, or stab wounds. Objects such as knives, scissors, scalpel blades, needles, pointed forceps, and broken glass should be handled with great care. Sharps should never be left lying around. Immediately after use staff should either dispose of sharps safely, or make sure that they are cleaned, disinfected and/or sterilized as appropriate.
- All sharps should be discarded in an appropriate sharps box which either meets the requirements of BS 7320 and/or is UN type-approved. The box should either be incinerated or undergo maceration and suitable heat or chemical treatment prior to disposal. Staff should not put sharps boxes in other containers such as yellow bags.
- **Precautions required for dealing with needles safely:**
 - 1) Avoid using needles as far as possible.
 - 2) Make use of alternatives such as irrigating or blunting needles where possible.
 - 3) Do not re-sheath needles.
 - 4) Dispose of needles safely in an appropriate sharp container.
 - 5) To prevent overfilling, replace sharps containers as they become 3/4 full
- **Action after sharps injury or contamination with blood or other body fluids:**
 - 1) Staff should stop procedures for dealing with sharps injuries, and contamination with blood or other body fluids. These should include the immediate steps to be taken following a needle stick/sharps injury: Encourage wound to bleed. Do not suck. Wash with soap and water. Dry, and apply waterproof dressing.
 - 2) Wash out splashes to the eyes using tap water or an eye wash bottle and to the nose and mouth with plenty of tap water. Do not swallow.
 - 3) Record the source of the contamination/needle stick;
 - 4) Report incident to line manager or senior staff in department. An accident form will need to be completed:
 - 5) If the source of the sharp is unknown, or is likely to be contaminated with hazardous material, e.g., blood from a patient known or suspected to be carrying a blood-borne virus, the advice of an occupational health physician or medical microbiologist should be sought immediately

4) Non-infection risks associated with equipment

- Hand, arm, shoulder, neck and back problems have been associated with regular, repetitive use of equipment. Awkward static postures, forceful movements and highly repetitive work with insufficient recovery time are all recognized risk factors for the development of pain, discomfort in various parts of the body. Therefore, students and staff need to consider:
 - 1) Appropriate selection of equipment.
 - 2) Limiting the extent of daily use and providing breaks.
 - 3) using automated delivery systems.
 - 4) Organizing the design and layout of the workstation to prevent awkward body posture.

5) Periodic checking and testing and maintenance

- Periodic checking and testing consist of a programmed checking and testing designed to demonstrate that the equipment's performance is satisfactory.
- The Periodic checking and testing carried out at quarterly, biannually or yearly intervals.
- Periodic checking and testing require specialized equipment and skills and should be carried out only by a properly qualified, trained person. Records of these inspections should be kept.
- Staff and students should report any troubleshoots from the equipment immediately and take that out of use until the defect is rectified.
- Maintenance staff should be made fully aware of all risks associated with work in the laboratory and with laboratory equipment. They should check if they need a permit to work or if equipment has a certificate of decontamination before starting work

6) Review and revise practices and procedures

Staff or the assigned body should review practices and procedures regularly to check that they are still valid. It may include verifying that:

- Standard operating procedures and containment level strategies are relevant to current work in the laboratory.
- Staff have received appropriate information and training about their work.
- Staff and students are following the standard operating procedures appropriately.
- The system for reporting and responding to accidents, incidents, near misses and ill health are in place and being followed.

If the review identifies deficiencies in any of the practices and procedures, Staff or the assigned body should revise them and implement any necessary further changes and precautions.

7) Cleaning, decontamination and waste disposal

- Every laboratory should have a strictly administered policy for cleaning, decontamination and waste disposal. The concerned authority should review and update this policy on a regular basis.
- The disinfection policy should state which disinfectants are used and for what purposes.
- Waste should, as far as possible, be discarded 'dry' rather than be placed in disinfectant. Containers used for discarded material should have solid sides and bases, be made of metal or autoclavable plastic, and allow adequate steam penetration throughout the material within the container
- Benches, dental stools and other work surfaces should be cleaned with a suitable disinfectant as required.
- Priority should be given to the use of low hazard materials. Suitable gloves should always be worn for decontamination.
- Reusable equipment and glassware arising from work in the laboratory should be made safe to handle by autoclaving or disinfection as defined in the standard operating procedures.

8) Disposal of laboratory waste

Arrangements for handling and disposal of laboratory waste should be clearly defined in local standard operating procedures. These should be compatible with the overall policy for risk management which covers clinical waste. Staff should receive instruction on the correct methods for safe handling, segregation, storage and disposal of waste. If errors occur, they should be reported immediately to a designated member of staff and there should be an agreed policy to deal with such situations.

9) Immunization

- All the staff and students working in the laboratory, **the Occupational Health Department needs to** obtain and record baseline information, including an assessment of immunization status
- The need for immunization (vaccination) will be determined as part of the risk assessment, but invariably should include protection against Hepatitis B, tetanus, and tuberculosis. Staff and students should be immunized as soon as possible and ideally before they start work. Immunization should only be seen as a useful supplement to reinforce procedural controls and the use of protective equipment.
- Staff and students have responsibilities to protect others who might be put at risk from their work activities, eg patients, visitors and members of the public. Vaccination can help prevent the spread of infection to such individuals. It is recommended that employers / occupational health provider keep a vaccination record

10) Incidents and accidents

The Management Regulations require procedures for responding to serious and imminent danger.

- Accidents and incidents should be reported and recorded. Both incidents and near misses need to be investigated to help everyone learn from experience. This depends on having an effective system of reporting and recording incidents and is only effective if everyone involved understands what is expected of them. Investigation should identify the underlying root causes of an incident, and the implications should be extrapolated to other work activities. The internal reporting system needs to take account of all incidents and accidents which may occur in the laboratory, not just the more serious ones.
- If you have, or are involved in, an accidental breakage of equipment, report the incident to a senior member of the laboratory staff at once.
- If you have an accident and puncture your skin while at work, the wound should be gently encouraged to bleed while washing with running water. Do not scrub a wound, as this may encourage biological agents to enter the bloodstream. The wound should be properly treated and dressed - seek medical advice if necessary. Report the accident at once to one of the senior laboratory staff no matter how small the wound is. Independent medical advice may be considered necessary.
- Fire extinguisher should be readily available in the laboratory
- First aid box should be readily available in the laboratory.

Guidelines for clinical, scientific, technical, and medical laboratory staff working in the laboratory

1- General guidelines:

- Use protective clothing and equipment (i.e., gloves, aprons, eye protection, etc. as appropriate for the risk to which you are exposed
- Mouth pipetting is forbidden. Always use the pipetting devices provided.
- Wash your hands at the end of each job or when they become contaminated during bench work, and always before leaving the laboratory, even when going to an office within the laboratory.
- Sustaining a puncture wound or cut at work is particularly dangerous. Ensure you follow the procedure at paragraph above. Minimize your use of sharp objects. When such use is unavoidable handle tools, equipment and especially any glass objects with extreme caution. Wherever possible use plastic instead of glass. Do not leave 'sharps' lying around - put them in a safe container.
- Keep your workbench as clear as possible. Use racks or trays to contain instruments.
- Clear up spillages immediately using the agreed laboratory procedure.
- Dispose of used consumables safely. Dispose of waste safely. Never leave it lying around and make sure that the approved methods for dealing with spillage or breakage are always used.
- Wear disposable gloves when there is a possibility that your hands may become contaminated with blood, body fluids or other biological materials.

2- Guidelines for laboratory office staff:

In addition to following the general precautions outlined above, should also take the following safety measures:

- If you work in an office that has direct access into the laboratory, wear a coat or gown.
- Wash your hands after you have been into the laboratory and may have come into contact with laboratory items or materials that could be infectious.
- Never lick stamps or labels. Use a roller pad, damp sponge or self-adhesive labels.
- If you are required to package specimens, only do so if the containers are in a sealed transport bag. If there is any sign of breakage or leakage do not touch the bag. Report it to senior laboratory staff immediately.

3- Guidelines for cleaning staff in the laboratory

As well as the general precautions outlined above, cleaning staff should also observe the following safe working practices:

- Always wear the overall provided for your protection when working in the laboratory and fasten it properly.
- Never take your overall out of the laboratory or take it home to wash. Like everyone else in the laboratory you should take off your laboratory overall before you leave and hang it on one of the hooks by the door.
- Wash your hands often while at work, especially after you have handled laboratory equipment or materials that you have been instructed to move or clean, and always before leaving the laboratory or going to the toilet or the staff room. Cover cuts and grazes with impervious waterproof dressings. You may sometimes be instructed to wear gloves.
- Do not touch any bottles, tubes, dishes, or equipment on the laboratory benches. Do not dust or clean any work benches unless you have been specifically directed to do so by a member of the laboratory staff.
- Laboratory staff should make arrangements to let you know what they want you to clean
- If you have an accident of any kind, or knock over or break any bottle, jar or tube, or piece of equipment, tell your supervisor and one of the laboratory staff at once. You should make sure that the matter is reported because the accident may have caused infectious material to be spilled. Do not attempt to clear up after any accident with laboratory items or materials.
- Never empty any laboratory waste containers unless you have been told to by a member of laboratory
- When collecting waste from disposal points, make sure that it is labelled showing where it has come from and properly bagged or otherwise safely contained according to standard operating procedures. If it is not, refuse to handle it.
- Be very careful when handling sharps containers because both the sharp points and the liquids can cause infection. Always wear heavy-duty gloves and check them for damage before you put them on. If any of the liquid spills on you then you should change it. If any gets on your gloves, wash them at once.

Guidelines for maintenance staff and equipment service engineers in the laboratories

Although laboratory staff should ensure that the equipment is decontaminated and cleaned, maintenance staff and equipment service engineers may accidentally come into contact with infectious material. They should, therefore, always follow the general precautions as well as the additional instructions outlined below

1- For work in laboratories

- Maintenance work on building fabric, services, drainage, fixtures, fittings, plant, or equipment, should usually be covered by a permit to work system. This should specify that appropriate cleaning and decontamination procedures have been carried out. Alternatively, where decontamination is not possible, you should be informed of this and receive special instructions concerning protective measures that you should take while working.
- Report to the laboratory safety officer to receive any such special instructions before commencing any work in the laboratory.
- You should wear the protective clothing deemed necessary by the laboratory or safety officer.
- Any tools or test equipment used in the laboratory should be inspected afterwards and, when considered necessary, they should be decontaminated before being returned to the workshop. You may need technical advice from laboratory staff about how to decontaminate equipment.

2- Guidelines for visitors to laboratories

- Most visitors to a clinical laboratory will not be conversant with the general precautions or standard operating procedures associated with the workplace.
- Visitors should not be allowed to enter the laboratory area unless accompanied by a senior member of staff who will be responsible for their welfare. Visitors should:
- Wear an approved coat or gown, properly fastened.
- Be instructed not to touch anything while in the laboratory, unless their visit demands such action, in which case they should comply with the standard operating procedures. In some cases, frequent hand washing may

be necessary, but visitors should, in any case, wash their hands thoroughly after removing their protective coat, before leaving the laboratory.

- Prohibit the use of personal items such as pens or pencils while in the laboratory if they have handled any laboratory equipment and should be instructed not to smoke etc. before entering.
- Visitors should not be taken into areas of the laboratory where they could become exposed to a risk of infection.
- Visitors should not be left unsupervised while they are in the laboratory. It is the responsibility of the employer to decide where visitors may and may not go unless additional precautions are taken.

Guidelines for students to laboratories

- 1- Students should wear accepted attire with identification nameplates while attending the session to be considered present in the session.
- 2- Students should have their manual present with them for every Lab session.
- 3- Students should strictly follow all the guidelines of the college to attain professionalism.
- 4- Students should clean their working area before leaving the laboratory.
- 5- Students should replace the instruments to the same places where from they have been taken.
- 6- Any material or instruments bought personally should be used in the lab only after prior information and permission from the staff.
- 7- Each student should be provided with a separate Phantom table. Use of extracted or cadaver teeth should be considered only after the prior consent.
- 8- Students should work in accordance with training and instruction given by their supervisors.
- 9- Students should leave the lab 10-15 minutes before the working time so as to allow time for cleaning between the sessions.



Production Lab Guidelines

Fixed Production Lab Guidelines

Guidelines for incoming cases:

- 1- please register the incoming case in the lab reception.**
- 2- Disinfect the case thoroughly (wash under water and spray with disinfectant spray).**
- 3- Make sure there are well written instructions of the procedure.**
 - a. For impressions: Pour the impression with the appropriate dental stone
 - b. For porcelain try-in: disinfect and steam the framework properly.
 - c. For wax ups: Disinfect and make sure there is well written instruction.
- 4- Don't accept the case during the following criteria:**
 - a. If there is not clear instructions.
 - b. If the impression is not well made.
 - c. If there is no bite registration record.
 - d. If the framework is not intact (there is a hole or defects)

Guidelines for outgoing cases:

1. Register the outgoing case in the lab reception
2. Make sure to follow the written instruction in the lab form.
3. return the case if there are adjustments needed to be done in the patient mouth.
4. Double check on the quality of outgoing cases before sending it to the reception.

Removable Production Lab Guidelines

Guidelines for incoming cases:

- 1- please register the incoming case in the lab reception.**
- 2- Disinfect the case thoroughly (wash under water and spray with disinfectant spray).**
- 3- Make sure there are will written instructions of the procedure.**
 - a. For impressions: Pour the impression with the appropriate dental stone
 - b. For porcelain try-in: disinfect and steam the framework properly.
 - c. For wax ups: Disinfect and make sure there is well written instruction.
- 4- Don't accept the case during the following criteria:**
 - a. If there is not clear instructions.
 - b. If the impression is not well made.
 - c. If there is no bite registration record.
 - d. If the framework is not intact (the is a hole or defects)

Guidelines for outgoing cases:

1. Register the outgoing case in the lab reception
2. Make sure to follow the written instruction in the lab form.
3. return the case if there are adjustments needed to be done in the patient mouth.
4. Double check on the quality of outgoing cases before sending it to the reception.

Digital Production Lab Guidelines

Guidelines for incoming cases:

1- please register the incoming case in the lab reception.

2- Disinfect the case thoroughly (wash under water and spray with disinfectant spray).

3- Make sure there are will written instructions of the procedure.

- a. For surgical guide: Pour the impression with the appropriate dental stone or scan the impression if requested.
- b. For fabrication of occlusal device: please make sure the case is articulated and there is clear instruction of the design.
- c. For digital planning: Do the design according to the written lab form.
- d. For digitization of the case: Please digitize the case according to the written lab form.

4- Don't accept the case during the following criteria:

- a. If there is not clear instructions.
- b. If the impression is not well made.
- c. If there is no CBCT scan (for surgical guides).
- d. If there is no clear design of occlusal device or surgical guide.

Guidelines for outgoing cases:

- a. Register the outgoing case in the lab reception
- b. Make sure to follow the written instruction in the lab form.
- c. Make sure you get the approval from the treating dentist about the design before printing or milling the case.

Guidelines for Outgoing Fixed Cases to the Production Lab

1- For primary impression

- a. Make sure to disinfect the impressions
- b. Seal the impressions in clean sterilization pouch.
- c. Write clear instruction on the lab form and get it signed from the course instructor.
- d. Register the case in the lab reception.

2- For final impression:

- a. Make sure to disinfect the impressions.
- b. Make sure you have captured the area of interest well and then get it approved from the course instructor.
- c. Disinfect and send bite registration record.
- d. Seal the impressions and bite registration record in a clean sterilization pouch.
- e. Write clear instruction on the lab form and get it signed from the course instructor.
- f. Register the case in the lab reception.

3- For metal/zirconia framework:

- a. Make sure to disinfect the framework.
- b. Write the shade on the lab form and sign it from the course instructor.
- c. Disinfect and send bite registration record with the framework.
- d. Register the case in the lab reception.

4- For porcelain characterization and glazing:

- a. Make sure to disinfect the case.
- b. Write the characterization shade shade on the lab form and sign it from the course instructor. (Provide picture is possible)
- c. Register the case in the lab reception.

Guidelines for Outgoing Removable Cases to the Production Lab

1- For primary impression

- a. Make sure to disinfect the impressions
- b. Seal the impressions in clean sterilization pouch.
- c. Write clear instruction on the lab form and get it signed from the course instructor.
- d. Register the case in the lab reception.

2- For final impression:

- a. Make sure to disinfect the impressions.
- b. Make sure you have captured the area of interest well and then get it approved from the course instructor.
- c. Send the case in a sealed clean sterilization pouch.
- d. Write clear instruction on the lab form and get it signed from the course instructor.
- e. Register the case in the lab reception.

3- For record base:

- a. Make sure to disinfect the denture base/framework.
- b. Write the shape and shade of denture teeth.
- c. Disinfect and send bite registration record with the record base.
- d. Register the case in the lab reception.

4- For wax trial denture:

- a. Make sure to disinfect the case.
- b. Write instructions of any desired modifications
- c. Register the case in the lab reception.

Guidelines for Outgoing Cases to Digital Production Lab

1- For surgical guides:

- a. Make sure to disinfect the impression.
- b. Make sure to send CBCT scans.
- c. Make sure you design the surgical guide before procedure (design, thickness, type of resin)
- d. Make sure to specify the implant company.

2- For fabrication of occlusal device:

- a. Make sure to disinfect the impressions/casts
- b. Make sure you design the occlusal device (specify the thickness and type of resin).
- c. Make sure you send the case articulated or you send the bite registration.

3- For digital planning:

- a. Make sure to disinfect the impressions/casts.
- b. Make sure to send CBCT scans.
- c. Specify what you want in the lab form.

4- For digitization of cases:

- a. Make sure to disinfect the impressions/casts.

Fixed Production Lab Guidelines

Guidelines for incoming cases:

- 1- please register the incoming case in the lab reception.
- 2- Disinfect the case thoroughly (wash under water and spray with disinfectant spray).
- 3- Make sure there are well written instructions of the procedure.
 - a. For impressions: Pour the impression with the appropriate dental stone
 - b. For porcelain try-in: disinfect and steam the framework properly.
 - c. For wax ups: Disinfect and make sure there is well written instruction.
- 4- Don't accept the case during the following criteria:
 - a. If there is not clear instructions.
 - b. If the impression is not well made.
 - c. If there is no bite registration record.
 - d. If the framework is not intact (there is a hole or defects)

Guidelines for outgoing cases:

- 1- Register the outgoing case in the lab reception
- 2- Make sure to follow the written instruction in the lab form.
- 3- return the case if there are adjustments needed to be done in the patient mouth.
- 3- Double check on the quality of outgoing cases before sending it to the reception.

Fixed Production Lab Guidelines

Guidelines for incoming cases:

- 1- please register the incoming case in the lab reception.**
- 2- Disinfect the case thoroughly (wash under water and spray with disinfectant spray).**
- 3- Make sure there are well written instructions of the procedure.**
 - a. For impressions: Pour the impression with the appropriate dental stone
 - b. For porcelain try-in: disinfect and steam the framework properly.
 - c. For wax ups: Disinfect and make sure there is well written instruction.
- 4- Don't accept the case during the following criteria:**
 - a. If there is not clear instructions.
 - b. If the impression is not well made.
 - c. If there is no bite registration record.
 - d. If the framework is not intact (there is a hole or defects)

Guidelines for outgoing cases:

- 1- Register the outgoing case in the lab reception
- 2- Make sure to follow the written instruction in the lab form.
- 3- return the case if there are adjustments needed to be done in the patient mouth.
- 3- Double check on the quality of outgoing cases before sending it to the reception.



Histopathology Lab Guidelines

Histopathology Lab Regulations

Every individual that enters the laboratory should behave in a manner that does not compromise the safety of other users .

- Eating or drinking are not allowed in the Lab .
- Enclosed footwear must be worn - (thongs and open sandals are not allowed).
- No slides or cultures are to be removed from, or brought into the lab without permission of the Histology teaching staff.
- Students are allowed to use the histology equipment in the laboratory under the supervision of the teaching staff.
- Cleaning the workstations and the surrounding floor before leaving the laboratory.
- The student must report any equipment if it is not working properly.
- Always ask if you are unsure about the safe operation of any tools or equipment.
- Any disrespect to the staff member or fellow student will not be tolerated and disciplinary action will be taken.
- Before start working and before leaving the lab always wash your hands with soap and water and scrub your hands thoroughly.



Radiology Lab Guidelines

The Design of Dental Imaging Rooms

- When we look to design a dental imaging use, we can install a standard intra-oral x-ray in a dental treatment room. On the other hand, panoramic/cephalometric and cone-beam computed tomography require their own spaces.
- Warning Signs, Lights and Locking of Rooms: A sign should be placed at each entry point to the radiography room to indicate the existence risk of radiation. Additionally, a sign indicating that the X-ray room is a controlled zone.
- The doors that lead to radiography facilities should carry a hard material warning post about the dangers of radiation in a local and international language.
- Warning lights to be located over the entrance that leads to the facilities, then such lights should be:
 - A yellow or white to indicate if the X-ray device is on and ready to be used; this light should bear the words “DEVICE OPERATIONAL”.
 - Red light to indicate if the radiological machine is producing radiation, this light should bear the word “NO ENTRY”.

Diagnostic x-ray facility

Diagnostic x-ray facility

- The requirements for the integration of safety and protection aspects are effectively developed when the facility is being designed (X-ray rooms alongside with other associated rooms). The three components (shielding, distance, and duration) need to be considered for dose reduction as required by the Saudi Food and Drug Authority (SFDA).
- The shielding specification should be dependent on the maximum voltage, which will be used within the X-ray device, the biggest radiation beam's field size in conjunction with the largest approximated workload for the device, Where different materials could be used for radiation shielding such as lead sheets, concrete, gypsum board, bricks,...etc.

Dental Units

1- Intraoral Dental X-ray Devices

For the intraoral X-ray, the patient should be the main interceptor for the primary beam. The distance should maintain at over 2 m between the user and the source. On other hand, the shielding structure would be irrelevant in the operation when the number of X-ray examinations is ≤ 20 films/images weekly, and the space between the patient and other barriers is about 2m. The X-ray unit has to set up in order to prevent the useful beam from shifting toward unshielded barriers such as windows or doors. The intraoral X-ray should be implemented with a long enough cable to the exposure switch or an exposure switch that is located separately to prevent the operator from coming closer to the patient's head or radiography tube. Wherever possible, the exposure switch needs to be in the operation room, however, the switch should be outside the controlled area.

2- Extraoral dental X-ray unit

For modern design, an extraoral radiography unit should be sited in the designated X-ray room. A suggested area of 12 m² is recommended for a panoramic dental X-ray. A protected operator's console advisable to be located in the imaging room, particularly for children or special needs patients. In case the room size is small, you can locate the exposure switch outside the radiography room and provide a door with small shielded glass for viewing.

Finally, radiation is harmful to people and with a proper design we can provide optimal safety for patients and end-users based on the usage, health technology manufacturer recommendations and international and local regulations for x-ray radiation protection guidelines taking into consideration the installation requirements for electrical, network, software and machine fixation.

In case where partition walls are used, lead plate with dimensions 1m x 1m and 1mm thick, should be attached to the wall. The height of the plate should be 0.5m above the floor in order to fully intercept radiation from the primary beam. This is required only in cases where for example the waiting room is adjacent to the X-ray room with patients sitting at distances less than ± 3 m from the tube head of the X-ray unit.

Diagnostic x-ray facility

1.1 Room size

General radiographic rooms should be approximately 16 m²
There should be sufficient space for a permanently built protective cubicle.
Special procedure rooms should be considered individually.

1.2. Doors and Walls

Access doors should be of the sliding type giving better radiation protection.
A clearing of 1.5 m is recommended. The overlap should be 100 mm each side.
The doors should be lined with leadsheet of 2 mm thickness.
The walls should be 230 mm kiln baked solid clay brick or 2 mm leadsheet sandwiched between partitioning or 115 mm brick with 6 mm barium plaster.

1.3 Ceiling and floors

X-ray rooms should preferably be sited on the ground floor of a building.
If the x-ray room is above ground level the solid concrete slab of density 2.35 g/cm³, must be of 150 mm thickness.
Thickness of ceiling slabs, if space above is occupied, should not be less than 100 mm.

1.4 Windows and air conditioning units

Windows and air conditioning units should be sited at least 2 m above the floor.
Alternatively access near the window must be prevented effectively.
Windows of upper floor x-ray rooms can be of normal height.

1.5 Protective cubicle

A protective cubicle allowing space for the control as well as the operator should be constructed in the x-ray room.
The cubicle should be located such that unattenuated direct scatter radiation originating on the examination table or the erect bucky do not reach the operator in the cubicle.
The x-ray control for the system should be fixed within the cubicle and should be at least 1.02 m from any open edge of the cubicle wall which is nearest to the examination table.
The cubicle should have at least one viewing window which will be so placed that the operator can view the patient during any exposure.
The size of the window should be at least 30 cm x 30 cm.
The minimum height of the cubicle is 2.2 meter.
The lead equivalence of the wall or panel as well as the protective glass should be at 2 mm, i.e., 230 mm brick or 115 mm brick barium plastered (6 mm) or 2 mm leadsheet.
The lead glass and protective material must overlap each other by at least 25 mm.

1.6 Change cubicles

Should the change cubicles lead into the x-ray room the doors must be lined with at least 1.5 mm leadsheet.
Access doors into the x-ray room must be lockable from the x-ray room side to prevent entrance during radiation exposures.

1.7 Radiation warning notices / lights

Warning lights are required at the entrances to fluoroscopy rooms.

The light must be connected to the generator in such a way that it will illuminate only during activation of the tube.

A radiation warning notice must be displayed at all entrances to x-ray rooms.

1.8 Computed tomography

Doors - lined with 1.6mm leadsheet

Walls - The walls should be 230 mm kiln baked solid clay brick or 1.6 mm leadsheet sandwiched between partitioning or 115 mm brick with 4 mm barium plaster.

Protective glass –1.5 mm lead glass(90 mm plate glass).

Warning lights are required outside all entrances to CT rooms. The light must be connected to the generator in such a way that it will illuminate only during activation of the tube.

1.9 CATH LAB

Doors - lined with 2 mm leadsheet

Walls - The walls should be 230 mm kiln baked solid clay brick or 2 mm leadsheet sandwiched between partitioning or 115 mm brick with 6 mm barium plaster.

Protective glass - The lead equivalence of the viewing window must be at least 1 mm of lead.

Warning lights are required outside all direct entrances to Cath labs. The light must be connected to the generator in such a way that it will illuminate only during activation of the tube.

2.0 PAN/CEPH Dental Unit

Doors - lined with 1 mm leadsheet

Walls 115 mm brick or 1 mm leadsheet

Radiation Safety / X-Ray Generating Equipment Safety

- Analytical X-ray equipment is used for x-ray diffraction analysis, fluorescence or direct x-ray
- Transmission analysis of materials. These analytical x-ray systems are comprised of components that utilize X-rays to determine elemental composition, or to examine the microstructure of materials. These analytical x-ray devices are used for non-medical purposes. The primary objective of this program is to keep occupational exposures to radiation as low as reasonably achievable (ALARA) while utilizing these types of equipment.
- Inspections, Surveys and Inventory
- X-ray machines and other ionizing radiation producing devices, such as electron microscopes, present a potential safety hazard to students, staff, and faculty if the device is not used and/or stored properly.
- Machines and operations on a periodic basis. For research and analytical devices this period is every 3 years
- The Deptt of Health will inspect all x-ray devices on a periodic basis (every 3 years). ODH has the authority to issue violations of the regulations.
- The Radiation Safety Officer shall perform inspections, surveys, and inventories with the appropriate frequencies as indicated in the appropriate section of the ODH regulations. RSO will also perform an annual inventory of all inoperable units.
- Responsibilities: The University Radiation Safety Officer has the responsibility to audit and survey all registered radiation generating equipment at King Khalid University. RSO is also responsible for maintaining an accurate registration of all units with Deptt of Health.
- The Radiation Safety Officer shall perform inspections, surveys, and inventories with the appropriate frequencies as indicated in the appropriate section of the ODH regulations. RSO will also perform an annual inventory of all inoperable units.

Protection from Radiation

There are three principles of radiation protection: Time, Distance and Shielding.

1. Time

Decreasing the amount of time spent in the vicinity of the source of radiation will decrease the amount of radiation exposure incurred. Radiation doses are approximately directly proportional to the time spent in the irradiated area. Reducing the time in the irradiated area to reduce exposure is a simple concept, it is a very effective concept.

2. Distance

Increasing the distance from the source of radiation will decrease the amount of exposure. Radiation doses will decrease as the inverse square of the distance from the radioactive source. In more simple terms the dose will decrease in magnitude to the amount of distance from the source.

3. Shielding

Increasing the amount of shielding around the source of radiation will decrease the amount of exposure incurred. Shielding for analytical x-ray units range from leaded glass to lead blocks.

Precautions and guidelines for use of x-ray generating equipment

- The operator of the x-ray device shall be responsible for the operations associated with the equipment, including radiation safety.
- All operators must be trained in x-ray safety and have their training document in the log book
for the x-ray device.
- The log book for the device will have personnel training records, dates of service, run times of the device with date and operator names. All run times will be averaged on a weekly basis in the log book.
- Radiation exposure will be in line with As Low As is Reasonably Achievable (ALARA).
- Personnel shall not expose any part of their bodies to the primary x-ray beam.
- All personnel shall be familiar with safety procedures as they apply to each device.
- Wear personnel monitoring devices, if applicable.
- All labs must have emergency contact information posted in the lab.
- In the event of a known or possible exposure to a beam, Notify the RSO immediately. Once the RSO has been notified arrangements for medical examination will occur. Be sure to notify the examining physician that exposure to X-rays may have occurred. The RSO phone number is -----, Cell phone number: -----.
- The RSO must be informed if a equipment failure has occurred with an x-ray device.
- Only manufacturer trained equipment technicians may repair/ service x-ray devices.
- Equipment will be secured so it will not be used or approached by unauthorized personnel.
- Never assume that the x-ray unit was left in a safe working condition by the previous user. Check the shielding and interlocks before turning the device on.
- Do not bypass any safety device on any x-ray unit When any safety system is defective, inform the lab manager and RSO. Post a sign on device with your name, date, and description of defect.
- Know what you are doing and where to expect problems. Be aware of the dangers. Do not work in a hurry or allow yourself to become distracted.
- Open beam configurations are to be avoided at kkU, Any such operation must be approved by the radiation safety committee

Radiation Safety Surveys

The following surveys are required for any X-ray device on campus.

- Radiation Safety survey will be performed prior to use of any x-ray new device.
- Bi-annual safety Inspections will be conducted on all x-ray devices.
- Inspections will occur with any change in initial arrangement, number , or change in equipment.
- When maintenance/ servicing of x-ray equipment is scheduled prior and after.
- Safety assessment
 - The managing entity must conduct, document and keep up to date a safety assessment to:
 - identify the ways in which occupational, public and medical exposures could be incurred
 - determine the expected likelihood and magnitudes of exposures in normal operation and, to the extent reasonable and practicable, assess potential exposures including the possibility of unintended or accidental medical exposures
 - assess the adequacy of provisions for protection and safety in respect of siting, design and operation.
 - Incidents, accidents and emergencies
 - The managing entity must:
 - take all practicable steps to minimize the likelihood of accidents including, a multilevel system of sequential, independent provisions for protection and safety, commensurate with the likelihood and magnitude of potential exposures
 - take timely action to mitigate the consequences of any accident that does occur and restore radiological equipment to a safe condition
 - promptly investigate any incident, including by:
 - calculating or estimating doses a person has received and, if applicable, the dose distribution within them
 - identifying corrective actions required to prevent a recurrence
 - implement all corrective actions.
 - keep a written record of the incident, including the:
 - cause or suspected cause
 - calculations made.
 - corrective actions identified
 - details of the implementation of corrective actions.
 - ensure that the referring practitioner and the patient (or the patient's legal representative) are informed of any unintended medical exposure
 - promptly notify any reportable incident to the Director.
 - 16. If the safety assessment required indicates that there is a reasonable likelihood of an emergency affecting either workers or members of the public, the managing entity must prepare an emergency plan for the protection of people and the environment including:

- arrangements for promptly identifying an emergency
- determining the correct level of emergency response
- provision for individual monitoring, area monitoring and arrangements for medical treatment
- arrangements for assessing and mitigating any consequences of an emergency.
- Servicing engineer
- The servicing engineer must:
 - install and service radiological equipment competently.
 - cooperate with the managing entity to ensure that radiological equipment cannot be used clinically while it is being installed or serviced
 - after installing or servicing the equipment:
 - collaborate with the managing entity and medical physicists to ensure necessary quality control tests are completed successfully
 - ii) confirm that all radiation protection and safety features are in place and operating correctly before equipment is returned to clinical use
 - iii) provide a written report to the managing entity describing the equipment fault (if any), the work done, parts replaced, adjustments made and any changes that may affect protection and safety.
- Quality assurance
- The managing entity must establish a comprehensive quality assurance programme for medical exposures, including:
 - measuring the physical parameters of radiological equipment, including calibrating output in terms of appropriate quantities using internationally accepted protocols, made:
 - at the time it accepts and commissions the equipment, before practitioners use it clinically on patients
 - ii) periodically after that first check
 - iii) after any major maintenance procedure that could affect the protection and safety of patients
 - iv) after installing any new software or modifying any existing software that could affect the protection and safety of patients
 - performing quality control tests on ancillary equipment and personal protective equipment
 - adopting internationally accepted tolerance limits for the physical parameters, and implementing corrective actions if measured values fall outside those tolerance limits
 - verifying the appropriateness of physical and clinical factors used in radiological procedures
 - maintaining records of relevant procedures and results
 - periodically checking the calibration and conditions of operation of dosimetry equipment and monitoring equipment.
- 19. The managing entity must ensure that regular internal or external independent audits are made of the quality assurance programme for medical exposures.
- 20. The managing entity must ensure that:

- radiation reviews are performed periodically by radiation practitioners in cooperation with medical radiation technologists and medical physicists, to investigate and critically review the current practical application of the radiation protection principles of justification and optimisation for radiological procedures
- local assessments are made at regular intervals for those radiological procedures for which diagnostic reference levels have been established
- a review is conducted to determine whether the optimisation of protection and safety for patients is adequate, or whether corrective action is required if, for a given radiological procedure, typical doses or activities:
 - exceed the relevant diagnostic reference level
 - ii) fall substantially below the diagnostic reference level, and the exposures do not provide useful diagnostic information or do not yield the expected medical benefit to the patient.

Dental Radiology Infection Control

1. Wear gloves when exposing radiographs and handling contaminated film packets. Use other PPE (e.g., protective eyewear, mask, and gown) as appropriate if spattering of blood or other body fluids is likely.
2. Use heat-tolerant or disposable intraoral devices whenever possible (e.g., film-holding and positioning devices). Clean and heat-sterilize heat-tolerant devices between patients. At a minimum, high-level disinfect semicritical heat-sensitive devices, according to manufacturer's instructions.
3. Transport and handle exposed radiographs in an aseptic manner to prevent contamination of developing equipment.
4. The following apply for digital radiography sensors:
 - a. Use FDA-cleared barriers.
 - b. Clean and heat-sterilize, or high-level disinfect, between patients, barrier-protected semicritical items. If the item cannot tolerate these procedures then, at a minimum, protect with an FDA-cleared barrier and clean and disinfect with an EPA-registered hospital disinfectant with intermediate-level (i.e., tuberculocidal claim) activity, between patients. Consult with the manufacturer for methods of disinfection and sterilization of digital radiology sensors and for protection of associated computer hardware.