Laser Safety for Practitioners 2024

Objectives

Upon Completion of this Module, the participant will be able to:

- Identify three types of effects on tissue that can occur during laser use
- Define the practitioners responsibilities when using the laser
- Define the nominal hazard zone
- Identify appropriate eye wear related to the use of laser equipment
- Describe appropriate burn protection for both the practitioner and the patient
- Describe the issues with smoke within the procedural area
- List the electrical hazards within the procedural area
- Describe fire safety within the procedural area
- List information that should be documented for laser procedures

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LASER SAFETY

Practitioners that enter a procedural area where Lasers are utilized should be familiar with the unique features, operational aspects, and safety practices applicable to all lasers being used in their practice setting. The wavelength of a laser determines its unique effects on tissue and dictates what safety measures are

EFFECTS ON TISSUE

- **Photochemical effect:** laser energy is selectively absorbed by tissue containing a light-sensitive dye, leading to a chemical change that produces singlet oxygen, which ultimately causes tissue destruction.
- **Photothermal effect:** laser energy is absorbed by tissue, heating it.
- **Photochemical effect:** laser energy is selectively absorbed by tissue containing a light-sensitive dye, leading to a chemical change that produces singlet oxygen, which ultimately causes tissue destruction.

OTHER FACTORS AFFECTING ABSORPTION OF LASER ENERGY

- Consistency of target tissue
- Color of target tissue
- Water content of target tissue

PRACTITIONER RESPONSIBILITES

- Know, understand, and comply with facility policies, procedures, and practices
- related to safety, including laser safety.
- Practice sound, basic, and OR-specific safety.
- Monitor, identify, and report safety hazards

NOMINAL HAZARD ZONE (NHZ)

- Appropriate warning signs should be posted at every entryway into the laser treatment controlled area and serve to define the NHZ related to safety, including laser safety.
- Only the patient and authorized persons approved by the LSO should be in the vicinity of the NHZ
- All healthcare personnel in the vicinity of the NHZ should be trained in the implementation of all laser safety precautions to avoid exposure to laser hazards
- All personnel, including the patient, within the NHZ should use appropriate personal protective equipment (PPE)

EYE PROTECTION IN THE NOMINAL HAZARD ZONE

Everyone in the NHZ should wear appropriate eyewear approved by the Laser Safety Officer

Laser Protective eyewear may include:

- **Goggles**
- **Face Shield**
- **Prescription glasses with special filters or coatings**
- **Corneal shields**

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EYE PROTECTION IN THE NOMINAL HAZARD ZONE (continued)

Patients:

- **Eyes and eyelids should be protected from laser beams**
- **Conscious patients: can wear the same protective eyewear as the surgical team**
- **Sedated or anesthetized patients: should be protected with wet pads**
- **taped in place or laser-specific eye shields if the procedure is on or around the eye.**
- **Corneal eye shields may be necessary**

Practitioners: *(Eye Protection)*

- **Should be worn when using the laser through a microscope or endoscope, appropriate eye protection is also required.**
- **Should be labeled with the appropriate optical density and wavelength.**
- **Should be available outside the room near the posted warning sign designating the specific type of laser in use.**
- **Should be inspected for pitting, cracking, discoloration, coating damage, frame condition, and light leaks.**
- **If any of the above is found it is considered inadequate for eye protection, removed from use, and reported to the LSO.**

BURNS

- There is a potential for thermal burns when using high-powered lasers
- Overexposure to ultraviolet radiation from direct or reflected laser energy can lead to skin sensitivities or even burns
- Burns to the patient's trachea, larynx, pharynx, and oral cavity have occurred as a direct result of a misaligned beam
- All persons in the laser treatment area should be protected from laser beam exposure to their skin or other non-targeted tissues

BURN PROTECTION IN THE NOMINAL HARARD ZONE NHZ

All persons in the laser treatment area should be protected from laser beam exposure to their skin or other non-targeted tissues

Patients: (Burn Protection)

- Covering these areas with saline-saturated or water-saturated materials
- Materials must remain moist to absorb the energy of an inadvertent laser beam

Practitioners: (Burn Protection)

- Surgical gloves
- Tightly woven fabrics
- Flame retardant materials

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SMOKE EVACUTATION

Vaporization of tissues may release toxic substances, including carcinogens and viruses from the cells.

The laser plume contains:

- Water
- Carbonized particles
- Mutated DNA
- Intact cells

These substances should NOT be inhaled.

At certain concentrations, the following may be experienced:

- Ocular irritation
- Respiratory tract irritation

Smoke evacuation units or suction with high-efficiency filters, such as HEPA or ULPA should be used when large amounts of laser plume is expected

Wearing high-efficiency masks (high filtration) eliminates smoke inhalation during the procedure.

ELECTRICAL SAFETY

Visual inspection of electrical hazards when using the laser that may prevent injuries from occurring include:

- Frayed or cut electrical cords
- Faulty accessory equipment
- Delivery Systems issues
- Gas supply problems

General electrical safety to promote safety:

- No fluids placed on or near lasers
- Eliminate the use of extension cords to power lasers

FIRE SAFETY

- Water or saline and fire extinguishers should be readily available wherever lasers are used
- Use water-based ointment and not oil-based ointments in facial hair and other hair near the surgical site
- Avoid pooling of prepping solutions
- Use a laser–resistant endotracheal tube when using laser during upper airway procedures
- Place wet sponges around the tube cuff if operating in close proximity to the endotracheal tube
- During throat surgery, use moist sponges as packing in the throat
- Use moist towels around the surgical site when using a laser
- Do not use an ignition source to enter the bowel when distended with gas or in presence of flammable agents
- Only the person controlling the laser beam activates the laser
- Place the laser in “standby” mode or turned off when not in use
- Follow laser safety precautions when lasers used

Practitioners should be familiar with the procedural steps for managing fires in the O.R.

If a laser airway procedure is being done, staff should be familiar with the procedural steps for managing airway fires

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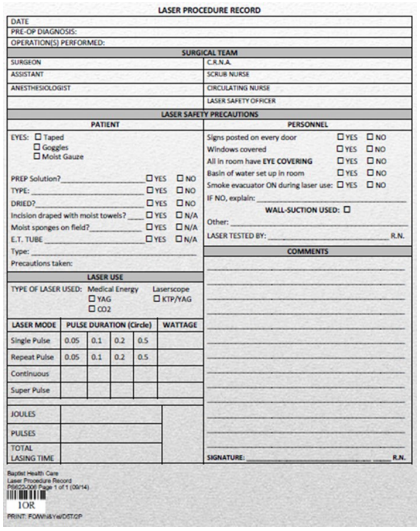
DOCUMENTATION



LASER PROCEDURE RECORD

DATE

PRE-OP DIAGNOSIS:

OPERATION(S) PERFORMED:

SURGICAL TEAM

SURGEON	C.R.N.A.
ASSISTANT	SCRUB NURSE
ANESTHESIOLOGIST	CIRCULATING NURSE
	LASER SAFETY OFFICER

LASER SAFETY PRECAUTIONS

PATIENT

EYES: ☐ Taped ☐ Goggles ☐ Moist Gauze

PREP Solution? ☐ YES ☐ NO

TYPE: ☐ YES ☐ NO

DRIED? ☐ YES ☐ NO

Incision draped with moist towels? ☐ YES ☐ N/A

Moist sponges on field? ☐ YES ☐ N/A

E.T. TUBE ☐ YES ☐ N/A

Type:

Precautions taken:

PERSONNEL

Signs posted on every door ☐ YES ☐ NO

Windows covered ☐ YES ☐ NO

All in room have EYE COVERING ☐ YES ☐ NO

Basin of water set up in room ☐ YES ☐ NO

Smoke evacuator ON during laser use: ☐ YES ☐ NO

IF NO, explain:

WALL-SUCTION USED: ☐

Other:

LASER TESTED BY: R.N.

COMMENTS

LASER USE

TYPE OF LASER USED: Medical Energy ☐ YAG ☐ CO2 Laserscope ☐ KTP/YAG

LASER MODE	PULSE DURATION (Circle)				WATTAGE
Single Pulse	0.05	0.1	0.2	0.5	
Repeat Pulse	0.05	0.1	0.2	0.5	
Continuous					
Super Pulse					

JOULES	
PULSES	
TOTAL LASING TIME	

SIGNATURE: R.N.

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PRINT: FORWARD/STOP

Closely following written laser safety precautions is crucial for safety and legal reasons, as with any hazardous equipment.

Specific notes about laser safety should be written on the laser procedure record and placed in the patient's medical record so that safety activities can be recorded.

Information, such as the laser used, power, pulse duration, and other laser parameters, as well as the use of smoke evacuation, fibers, and contact tips should be documented

REFERENCES

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