



AST Recommended Standards of Practice for Laser Safety

Introduction

The following Recommended Standards of Practice were researched and written by the AST Education and Professional Standards Committee and have been approved by the AST Board of Directors. They are effective April 1, 2010.

AST developed the following Recommended Standards of Practice to support health care facilities (HCF) reinforce best practices, related to laser safety in the perioperative setting. The purpose of the Recommended Standards is to provide an outline that surgical team members can use to develop and implement policies and procedures for laser safety. The Recommended Standards are presented with the understanding that it is the responsibility of the HCF to develop, approve and establish policies and procedures for laser safety, according to established HCF protocols.

Forms B1 and B2, and Tables F1 and F2 reproduced with permission from *ANSI Z136.3-2005 American National Standard for Safe Use of Lasers in Health Care Facilities*. Copyright 2005, Laser Institute of America, Orlando, Florida. The Laser Institute of America disclaims any responsibility or liability resulting from the placement and use in the described manner.

Rationale

The following are Recommended Standards of Practice related to laser safety in the perioperative setting. It is recommended that laser safety practices be meticulously followed by all surgical personnel, who are involved in the use of lasers in order to protect themselves and the patient. Risk factors identified with the use of lasers include fire, physiologic damage to the eyes and biological hazards, such as laser plume, which are addressed by safety standards. Several organizations have been involved in the development of standards related to the use of lasers, including the American National Standards Institute (ANSI), American Society for Lasers in Medicine and Surgery (ASLMS), Laser Institute of America (LSA), National Fire Protection Association (NFPA), National Institutes of Health (NIH), National Institute for Occupational Safety and Health (NIOSH), and Occupational Safety and Health Administration (OSHA), as well as the Canadian Centre for Occupational Health and Safety (CCOHS). Surgical personnel should be familiar with the safety standards of these organizations, including implementation of safety practices. The following Recommended Standards of Practice are broad based and not intended to replace the laser standards established by the previously mentioned organizations; rather, these Recommended Standards serve to reinforce the industry-established standards and reference those documents that address laser safety in the surgical environment. It is recommended that HCFs have a copy of the following two defining documents for the safe use of lasers available in all areas and departments of the facility where lasers are used: *ANSI American National Standard for Safe Use of Lasers in Health Care Facilities* and *OSHA Guidelines for Laser Safety and Hazard Assessment*. All members of the surgical team should be involved in the process of developing and implementing HCF policies and procedures for laser safety.

Standards of Practice I

CSTs and CSFAs involved in the use of lasers should demonstrate knowledge and competency of the control measures and safety procedures that are pertinent to their role.

1. CSTs and CSFAs should be knowledgeable of the hazards that lasers present to the patient, themselves, and other health care personnel.¹⁰
 - A. The presence of the patient creates a unique situation related to lasers that demands CSTs and CSFAs recognize potential hazards and the implementation of unique control measures that are specific to the use of lasers in order to maximize the safety of the patient and surgical team.

Standard of Practice II

Health care facilities (HCF) should establish a laser safety program, according to ANSI standards. (See Appendix A for a Laser Safety Education Program example)

1. ANSI standards state that the HCF laser safety program should minimally include the following criteria.¹
 - A. The HCF should designate an individual, who has the training and experience to administer a laser safety program as the Laser Safety Officer (LSO)..
 - (1) The LSO should have the authority and responsibility for supervising and administering the laser safety program.
 - B. A Laser Safety Committee (LSC), or its equivalent, should be formed to advise on laser activity, as well as ensure compliance to the laser safety policies and procedures by surgical personnel.
 - (1) The LSC should be representative of the various health professions, including the LSO, risk management, HCF administration, surgeons, anesthesia, Certified Surgical Technologists (CSTs) and Certified Surgical First Assistants (CSFAs), other allied health professionals, who work with lasers, and nursing.
 - C. HCF should establish criteria and authorization procedures for all health care personnel, who enter and/or work in the laser nominal hazard zone (NHZ).
 - (1) However, authorization, approval and credentialing of health care personnel to work in the NHZ is the responsibility of the HCF.
 - D. HCF, LSC and LSO should ensure that laser hazards have been identified and protective measures are applied according to ANSI recommended control measures.
 - E. HCF should have procedures in place for the management and reporting of laser incidents (accidents and adverse events).
 - (1) Procedures should be in place for addressing laser incidents including preparation of action plans to prevent recurrence.

- F. HCF should have policies and procedures in place for reporting health care personnel, who violate safety regulations to the LSO and the incident reviewed by the LSC.
- G. HCF should conduct continuing education and training of health care personnel who work in the NHZ regarding assessment and control measures of laser hazards as well as overall knowledge of the HCF laser safety program.
 - (1) The LSO should document the continuing education and training completed by health care personnel.

Standard of Practice III

HCF should have policies and procedures in place for the provision of laser safety training to be completed by health care personnel who use or work with Class 3B and 4 lasers. (See Appendix B for a Laser Safety Training Program example and Appendix C for a Laser Operator Skills Validation example)

1. Health care personnel who use or work with lasers should be required to complete laser safety training provided by the HCF.
 - A. The laser safety training program should reflect the HCF's policies and procedures as well as ANSI, state, local and federal regulations and standards.
 - B. At the minimum, the following health care personnel should complete laser safety training:
 - (1) LSO
 - (2) Users
 - (a) Physicians
 - (b) CST
 - (c) CSFA
 - (d) Other allied health professionals involved in the use of lasers
 - (e) Nurses
 - (3) Laser technical support staff, eg biomedical technicians
 - C. Health care personnel should be required to periodically demonstrate laser competency on all laser types that are used in the HCF.
 - (1) The LSO should document the method(s) used for verifying competency, when competency verification was completed and kept on file at the HCF.
 - D. Health care personnel should be required to complete continuing education and demonstrate competency when new lasers, laser equipment, and safety equipment has been purchased by the HCF.¹⁰
 - (1) The LSO should document the method(s) used for verifying competency, when competency verification was completed, and kept on file at the HCF.
 - E. The laser safety training program should provide health care personnel with a thorough understanding of the procedures and safety equipment required to establish and maintain a safe environment in all areas of the HCF where lasers are used.¹

- (1) The laser safety training program should focus upon and be specific to the lasers that are in use at the HCF and the surgical procedures that are being performed.
- (2) Fire safety training should include the actions to be taken for an airway explosion, surgical drape fire, and laser system fire; responsibilities of each member of the surgical team.¹⁰

Standard of Practice IV

A NHZ shall be established in the laser treatment controlled area (LTCA) where the laser system is used and access to this area should be controlled.

1. The LTCA is the room where the laser is being used, and the NHZ should be identified and communicated to health care personnel working in the LTCA to avoid unintentional exposure to the laser beam.
 - A. The LTCA shall be examined by the LSO and health care personnel assigned to work in the LTCA for the presence of highly reflective surfaces, such as mirrors, windows or other glass objects.
 - (1) The items should be removed or covered.
 - B. The LSO shall determine the NHZ and communicate the information to the health care personnel working in the LTCA.
 - C. The LSO shall be responsible for ensuring that health care personnel working within the NHZ are following safety procedures and practices.
 - D. The LTCA should only be occupied by the patient and surgical team members, who have completed the HCF laser training course.
2. Warning signs must be displayed in a conspicuous manner on all doors used for entering the LTCA to warn surgical personnel entering the room that a laser is in use and to take the proper safety precautions.
 - A. When the laser system is not in use, the warning signs should be taken down or covered.
3. Windows and doorways should be covered with some type of barrier such as screens or curtains to prevent surgical personnel outside the room from inadvertent laser beam exposure.

Standard of Practice V

The HCF should have established procedural and equipment control policies to avoid potential hazards, when a Class 3B or 4 laser system is in use. (See Appendix D for a Perioperative Laser Safety Checklist example)

1. Surgical personnel involved in the operation of a laser should complete training and demonstrate knowledge of the location and use of operating the emergency control stop for each type of laser system used at the HCF.
2. Procedural control policy should address communication between surgical team members to confirm that the laser system ready function is enabled only when the surgeon is ready to treat the target tissue.
 - A. During the surgical procedure the laser unit should be in the stand-by position at all times except when the handpiece is in the hand of the surgeon and ready to be activated.⁵
3. Procedural control policy should address the control of the laser keys.

- A. The laser key should only be available to authorized personnel. It should not be given to an unauthorized or unqualified health care provider.
- B. The laser key must not be left in the laser when it is in storage.
- C. Laser key should not be placed in the laser and the laser operated, unless the LSO is present.
4. An equipment control policy should address the use of multiple, foot-pedal switches in the O.R.
 - A. The laser foot pedal must be available only to the surgeon, who will be using the fiber or handpiece to deliver the laser energy. The surgical team member who is placing the foot pedal on the floor should verbally identify the foot pedal and placement to the surgeon. A guarded pedal switch or guarded finger-trigger switch should be provided for use by the surgeon.¹
 - B. All other types of foot pedals should be placed away from the laser foot pedal and verbally identified by the surgical team member who is positioning the pedals.
 - C. The smoke evacuation pedal should be positioned for activation by the surgical technologist.
 - D. All foot pedal electrical cords should be inspected before each use for fraying, cracks or breaks that could cause an electrical shock or fire.
5. Accessory attachments, such as endoscopes, remote controls and handpieces, must be compatible with the laser system and meet safety standards for use in the O.R.
6. An equipment control policy should address communication among the surgical team members confirming laser filters are in place when an operating microscope will be used to protect the eyes of the surgeon, surgical technologist and surgical assistant.
7. Labels that are affixed to the laser system equipment should be visible at all times and not covered or removed.
8. Written standard operating procedures for the alignment of laser optical systems that includes safety precautions should be obtained from the manufacturer, approved by the LSO for all Class 3B and Class 4 laser systems and kept on file for access by all surgical personnel.
 - A. The surgical technologist or surgical assistant should be responsible for aligning the laser optical system, eg beam, beam deflectors, mirrors, and lenses, prior to using the laser system to prevent inadvertent eye exposure during the procedure.
 - (1) Lasers should not be used without an aiming device. Alignment should be achieved by testing the laser beam alignment and quality, using an appropriate testing device, such as a wet tongue depressor prior to the start of the surgical procedure.
 - (2) The beam quality should be assessed by observing the burn pattern on the tongue depressor. If necessary, the delivery optics should be cleaned and laser fiber replaced according to manufacturer's instructions to improve the beam quality.

- B. A Class 1 or Class 2 low power visible laser should be used for path simulation of higher power lasers for alignment of higher power visible or invisible lasers.¹
- 9. The LSO should supervise the completion of an annual facility and equipment safety audit to include protective eyewear, surgery department area controls, plume removal devices, and warning signs, as well as labels on the laser system(s) and other equipment safety features.¹
 - A. The LSO should document the audit that includes results and any actions taken to resolve any identified discrepancies.

Standard of Practice VI

Precautions must be taken to protect patient's eyes from inadvertent laser beam exposure.

- 1. The patient's eyes must be protected from injury by inadvertent exposure to the laser beam.
 - A. The LSO should approve the methods to be used to protect the patient's eyes.
 - B. Methods for protecting the patient's eyes include protective goggles, glasses, eye pads and corneal shields.
 - (1) When surgery is being performed on the facial area, in particular near the eyes and eyelids, corneal shields with the appropriate optical protection should be used.

Standard of Practice VII

Laser personal protective equipment must be worn by surgical personnel, who are within the NHZ during laser system use.

- 1. Laser protective eyewear includes goggles, face shields, spectacles and prescription eyewear for protection against laser beam radiation.
 - A. The laser system manufacturer should provide written information to aid in the selection of appropriate laser protective eyewear that should be worn, including performance specifications that should be met by the eyewear.
 - B. The laser protective eyewear should withstand direct and diffuse scattered laser beams.
 - (1) Goggles with side shields are recommended for use by the surgical technologist and surgical assistant since protection is provided against back reflection and side entrance of inadvertent laser beams.
 - C. The laser system manufacturer should provide written information, verifying the laser protective eyewear meets the standards for resistance to flammability.
 - D. Upon selection and purchase of laser protective eyewear, the following information should be included by the manufacturer and kept on file:
 - (1) Optical density as related to wavelengths.
 - (2) Manufacturer's recommendations on shelf life, storage conditions and cleaning methods.

- E. The optical density (OD) and wavelength must be clearly and permanently marked or labeled on the laser protective eyewear.
 - F. Prescription eyewear must be worn with special filter materials or contain approved reflective coatings, or both, when worn in the presence of a Class 3B or Class 4 laser system.
 - G. The surgical technologist and surgical assistant should complete periodic cleaning and inspection of personal laser protective eyewear to ensure the maximum condition of the eyewear.
 - (1) The eyewear lenses should be gently cleaned according to manufacturer's instructions to avoid damage.
 - (2) Prior to every use, the surgical technologist and surgical assistant should inspect:
 - (a) lenses for pitting, cracking, scratches, and discoloration, including light leaks and coating damage that would allow for eye injury due to viewing of the laser beam;
 - (b) the frame to ensure proper functioning;
 - (c) straps or other devices used to hold the eyewear in place for excessive wear or damage.
 - H. Damaged or faded laser protective eyewear should not be used and immediately discarded.
2. Laser personal protective equipment includes scrub suits, gloves and surgical gowns to protect the skin from laser radiation.
- A. The laser system manufacturer or LSO should specify the appropriate laser personal protective equipment for the protection of the skin against ultraviolet (UV) radiation.
 - (1) A standard surgical glove usually provides adequate protection against UV.¹
 - (2) A surgical gown provides adequate protection for the arms.¹ However, the use of a fire-retardant surgical gown should be used in the presence of a laser system.
 - (3) The circulator should wear an appropriate scrub suit jacket that is flame retardant and covers the arms.⁸

Standard of Practice VIII

Surgical personnel who will be working routinely in a laser system environment should undergo a health assessment examination with a focus on ocular performance and dermatological risks.

1. The surgical technologist and surgical assistant should complete a health examination of the eyes in order to establish a baseline level of visual performance that can be used as a measure, if the individual is involved in a laser incident that involves the eyes.
 - A. The baseline visual information aids in establishing the presence of pathological changes in the level of visual acuity possibly due to the laser accident, which provides a basis for documenting the information in the incident report and aids in developing a treatment plan for the affected individual.

- B. The surgical technologist or surgical assistant, who is involved in a laser incident that may have affected the eyes should complete an ocular examination at the time of the incident.
- 2. The surgical technologist and surgical assistant should complete a dermatological health assessment examination to determine if he/she is at any risk for ultraviolet hazards.
- 3. The health assessment examination records must be maintained according to health care facility policies and state and federal government regulations.

Standard of Practice IX

Surgical personnel should be trained in the use of preventative measures for fire hazard associated with the use of laser systems.

- 1. Surgical personnel should be trained to respond to a fire by completing training on disconnecting the electrical equipment from the power source.¹⁰
 - A. The sterile surgical team members should be trained in the use of the emergency shutoff switch. The switch should be available to the surgeon, surgical assistant or surgical technologist.
- 2. Surgical personnel should be trained in the use of a fire extinguisher in response to a fire.¹⁰
 - A. A Halon fire extinguisher is recommended for laser unit fires. It should be stored in such a manner, so it is immediately available for use by surgical personnel in the O.R., but the storage also meets local, state and federal regulations, as well as National Fire Protection Association's Standard 10.¹⁰
 - B. A Halon fire extinguisher should not be used for putting out a surgical drape fire.
- 3. The surgical technologist must have a basin of sterile water available on the sterile field in the event of surgical drapes or other flammable items igniting.
 - A. Dry combustible items such as sponges and towels should never be placed on the sterile field when a laser is in use.
 - (1) The four non-disposable towels used to square off an incision should be moistened with sterile water prior to placement.
 - (2) Sponges should be moistened in sterile water or saline.
 - (3) The surgical technologist and/or surgical assistant should monitor the moisture level of the sponges and towels to prevent their drying out.
- 4. The use of laser-retardant surgical drapes is recommended.
 - A. Cloth and paper drapes should not be used due to their high flammability.
 - B. Based on studies, polypropylene drapes are the least flammable and recommended for use as compared to polyester drapes that contain wood pulp and are more flammable.¹¹
 - C. The manufacturer should submit the fire retardancy ratings of each type of drape purchased by a health care facility.
- 5. Flammable solutions and materials must not be used or present on the sterile field when a laser system will be used.

- A. Patient skin preparation solutions should be allowed to dry to prevent the vapors from collecting and being trapped under the surgical drapes.
 - B. Iodine-based solutions should be wiped off if the surgeon is incising the skin with a laser wavelength that can be absorbed by pigmentation.
 - C. Surgical team members and the patient should not use hair spray, styling gels, or mousses, which increase the flammability of hair.¹⁰
 - (1) The patient should receive preoperative instructions not to use hair spray, styling gels or mousses the day of surgery.
 - (2) The surgical team members must ensure that their hair, including facial hair, is fully covered during the surgical procedure.
 - (3) If the patient's hair is near the laser impact site, it should be covered with wet sponges or towels to prevent ignition.
 - D. If laser surgery is being performed near the patient's teeth, such as a microlaryngoscopy, a teeth protector that is non-flammable and can withstand laser impact should be used to protect the teeth from an inadvertent laser beam that can pit a tooth.
6. Proper measures should be taken to prevent a methane gas explosion when using the laser in the rectal area.¹⁰
- A. A preoperative enema should be performed on the day of surgery.
 - B. The surgical technologist should provide the surgeon with suction tip and tubing to evacuate residual methane gas from the rectum prior to starting the procedure.
 - C. The rectum may be packed with saline-soaked, counted radiopaque 4 x 4 sponges to prevent the escape of methane gas. This is a surgeon's preference; some surgeons do not pack the rectum arguing the technique can cause peristalsis, which leads to an increase in the escape of methane gas into the surgical wound.
7. Surgical technologists who assist the anesthesia provider should confirm that the proper endotracheal tube (ET) will be used during oral or upper airway surgery.
- A. An unprotected polyvinyl (PVC) ET tube must never be used during surgery on the oral cavity or upper airway.
 - B. Laser-resistant ET tubes are available for use.
 - (1) Manufacturer's instructions must be followed and care taken to ensure that the wattage limitations of the ET tube are not exceeded during use of the laser system.
 - C. A red rubber tube that is wrapped with a special material to decrease the flammability of the tube is available for use.
 - D. The surgical technologist should have counted small pledgets available that are moistened for placement around the ET tube to provide additional protection against the laser beam.
 - (1) The surgical technologist or surgical assistant should periodically moisten the sponges to prevent drying to decrease the chance of ignition.
 - E. The anesthesia provider should have sterile saline and methylene blue dye available to inflate the ET cuff.

- (1) If the cuff is ruptured during the procedure the presence of the blue dye on the sponges alerts the anesthesia provider.
- (2) The saline that is released from the ruptured cuff aids in putting out the airway fire.

Standard of Practice X

The surgical technologist should confirm the use of nonreflective instruments to decrease the chance of laser beam reflection when the instruments are used near the laser impact site.

1. The surgical technologist should provide ebonized or anodized surgical instruments to the surgeon for use during a laser procedure.
 - A. Laser instruments should not be etched for HCF identification purposes. Etching disrupts the surface coating allowing for laser reflection.
 - B. The surgical technologist should inspect the instruments prior to each use for scratches and breaks in the surface coating.
 - C. Periodically the instruments may need recoating due to normal wear.
 - D. Studies have indicated the best surface coating to decrease reflection is a roughened, ebonized surface coating with a fluoropolymer material.¹²

Standard of Practice XI

The surgical technologist should have the appropriate sterile backstops and mirrors for use by the surgeon.

1. Titanium and quartz rods are recommended as effective backstops that can withstand the laser beam impact and decrease the chance of reflection.
 - A. Glass rods should not be used due to shattering from the absorption of heat.
 - B. Metal rods should not be used due to absorbing the heat, which can injure adjacent tissue.
 - C. Nonstick rods should not be used due to melting from the heat, and a toxic plume is produced with laser beam contact.⁴
2. Mirrors made of rhodium or stainless steel must be provided to the surgeon for use.
 - A. The mirror should be inspected by the surgical technologist prior to use for scratches, cracks and breaks in the surface that would prevent effective reflection of the laser beam.
 - B. The manufacturer's instructions must be followed concerning the laser wattage limitations to prevent damage to the mirror.⁴
 - C. Glass-surfaced mirrors must not be used; the glass will shatter due to heat absorption from the laser energy.⁴

Standard of Practice XII

Specific precautions must be taken by the surgical technologist and surgical assistant when a fiber is used with the laser system during an endoscopic procedure.

1. The surgical technologist and surgical assistant should confirm that the end of the fiber extends past the end of the endoscope by a minimum of 1 centimeter.

2. The surgical technologist can protect the sharp end of the fiber by using a small length of medical-grade tubing with the tip recessed inside the tubing; after the tip is extended past the end of the endoscope, the tubing can be withdrawn and the tip can be visualized.⁴

Standard of Practice XIII

Surgical technologists and surgical assistants should be knowledgeable of and complete training as related to the electrical safety requirements for the use of laser systems.

1. Solution bottles must never be placed on the laser unit to prevent spillage that could cause internal damage to the laser circuit.
2. The proper grounding of the laser unit must be used.
 - A. The manufacturer's instructions should be followed for the grounding of the laser unit.
3. Surgical team members and the LSO must confirm there is no electromagnetic interference that will occur between the laser system and other electrical equipment.⁵
4. Manufacturer's labels or HCF labels should be affixed to the laser unit providing electrical rating, frequency and wattage information. The labels should never be removed or covered.
5. Surgical team members should complete training in regard to checking the connections to water-cooled lasers are tight to prevent water overflow onto the O.R. floor.⁴
6. The power output of the laser system should be checked prior to the start of the procedure with an appropriate power meter as well as frequently checked throughout the surgical procedure.¹
7. Only authorized surgical personnel, such as the LSO and biomedical technicians, should remove the laser system outside cover; they have completed the appropriate training to prevent electric shock.

Standard of Practice XIV

Laser plume evacuation and filtering must be performed during a laser surgical procedure.

1. Research has consistently confirmed the presence of particles, toxins and steam in laser plume; particles consist of carbonized tissue, blood and DNA from viruses and bacteria. Refer to the bibliography for a comprehensive listing of journal articles publishing research results over a span of several years.
2. The smoke evacuation system must be appropriate to the amount of laser plume that may be produced during the surgical procedure.
 - A. If small amounts of plume are anticipated, such as during a minor procedure, the use of an in-line suction filter is recommended that is positioned between the suction canister and wall or ceiling connection. The in-line filter should be replaced according to manufacturer's instructions.

- B. If a large amount of plume is anticipated, an individual smoke evacuator unit should be used.
- 3. It is recommended that a high-efficiency particulate air (HEPA) or ultra-low penetration air (ULPA) be used to capture the plume.^{6,9}
- 4. The surgical technologist or surgical assistant must hold the plume/smoke evacuator wand less than 1 centimeter from the laser-tissue contact site to remove as much of the plume as possible.^{1,7}
 - A. The surgical technologist and surgical assistant should be aware if a purge gas flow will be used with a CO₂ laser which causes the plume to spread. The surgical technologist or surgical assistant must hold the smoke evacuator wand as close to the tissue target site as possible when a purge gas flow is used.
- 5. If a smoke evacuation foot pedal is used it, should be activated by the surgical technologist or surgical assistant.
- 6. Only trained surgical personnel should change the smoke evacuator filters.
 - A. Manufacturer's recommendations should be followed for changing filters, including how often they should be changed.
 - B. Surgical personnel, who change the filter, should wear personal protective equipment, eg high-filtration mask and gloves.
 - C. The used filter should be placed in a bag marked with the biohazard symbol and disposed of according to HCF policy.¹
 - D.

Standard of Practice XV

High-filtration masks must be worn by all surgical team members during surgical procedures when a laser system is used and produces laser plume.

- 1. High-filtration masks with filtering capability of particulate matter as small as 0.1 µm must be worn by the surgical team members.
 - A. Regular surgical masks must not be worn due to filtering capability of 5 µm or larger.⁷
 - B. Double masking must not be allowed, since it does not provide proper protection against particulate matter in the laser plume.
- 2. The high-filtration mask should be worn properly covering the nose and mouth as well as conforming to the face.

Standard of Practice XVI

Proper body mechanics must be used by surgical personnel when moving the laser system to prevent body injury, in particular to the lower back.

- 1. Laser units can be heavy, requiring proper body mechanics during transportation from the storage area to the O.R. or O.R. to O.R.
- 2. Extreme care must be taken during transportation of the laser unit to avoid striking against a wall or the sides of a doorway to prevent damage to the unit and laser arm.
 - A. The laser unit should be slowly transported to the O.R

Competency Statements

Competency Statements	Measurable Criteria
<p>1. Certified Surgical Technologists (CSTs) and Certified Surgical First Assistants (CSFAs) are knowledgeable of the risks, patient hazards, surgical personnel hazards and safety factors associated with the use of laser systems.</p> <p>2. The CST and CSFA are qualified to perform the patient care concepts as related to the use of laser systems.</p> <p>3. The CST and CSFA are qualified to operate those components of the laser system in which they have completed training.</p>	<p>1. Educational standards as established by the <i>Core Curriculum for Surgical Technology</i> and <i>Core Curriculum for Surgical Assisting</i>.^{2,3}</p> <p>2. The subject of laser systems is included in the didactic studies as a surgical technology and surgical assistant student, including concepts of patient care, laser hazards, and safety that are appropriate to the role of the surgical technologist and surgical assistant.</p> <p>3. Surgical assistant students demonstrate knowledge of the surgical assisting role and duties in the use of the laser system during clinical rotation under the supervision of the surgeon.</p> <p>4. Surgical technology students may or may not have the opportunity to perform the role and duties of the surgical technologist in the use of the laser system during clinical rotation under the supervision of the preceptor, instructors and surgeon.</p> <p>5. As practitioners, CSTs and CSFAs operate the components of the laser system in which they have received training and according to their specific role.</p> <p>6. CSTs and CSFAs complete continuing education to remain current in their knowledge and skills in the safe use of laser systems, including review on a periodic basis the policies and procedures of the health care facility and training in the use of laser systems as required by the employer.</p>

References

1. *American National Standard for Safe Use of Lasers in Health Care Facilities* (ANSI Z136.3-2005). Orlando, FL: Laser Institute of America; 2005.
2. *Core Curriculum for Surgical Assisting*. 2nd ed. Littleton, CO: Association of Surgical Technologists; 2006.
3. *Core Curriculum for Surgical Technology*. 5th ed. Littleton, CO: Association of Surgical Technologists; 2002.
4. Ball KA. *Lasers the Perioperative Challenge*. 3rd ed. Denver, CO: Association of Perioperative Nurses; 2004.
5. Canada's National Occupational Health & Safety Resource. *Lasers – health care facilities*. 2003. http://www.ccohs.ca/oshanswers/phys_agents/lasers.html?print . Accessed July 28, 2010.
6. Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health. *Control of smoke from laser/electric surgical procedures*. 1998. (DHHS (NIOSH) Publication No. 96-128). <http://www.cdc.gov/niosh/hc11.html>. Accessed July 28, 2010.
7. Hazard of laser surgery smoke. (Health Hazard Information Bulletin). 1988. US Department of Labor, Occupational Safety & Health Administration. http://ifforms.osha-slc.gov/dts/hib/hib_data/hib19880411.html. Accessed July 28, 2010.
8. Occupational Safety & Health Administration. US Dept of Labor. *OSHA Technical Manual*. TED 01-00-015[TED1-0.15A]. http://www.osha.gov/dts/osta/otm/otm_toc.html Accessed July 30, 2010.
9. Ontario Ministry of Labour, Canadian Centre for Occupational Health and Safety. Information alert: Laser plume in surgical procedure (Info Alert 24). 1992. <http://www.ccohs.ca/otherhsinfo/alerts/alert61.txt>. Accessed July 28, 2010.
10. *Standard for Laser Fire Protection* (NFPA 115). Quincy, MA: National Fire Protection Agency; 2003.
11. Study rates polypropylene drapes least likely to go up in flames. *Clin Laser Mon*. 1993. 168-169.
12. Wood RL, Sliney DH, Basye RA. (1992). Laser reflections from surgical instruments. *Lasers Surg Med*. 1992; 12(6), 675-678.

Bibliography

1. Baggish MS, Poiesz BJ, Joret D, Williamson P, Refai A. Presence of human immunodeficiency virus DNA in laser smoke. *Lasers Surg Med.* 1991; 11(3), 197-203.
2. Byrne PO, Sisson PR, Oliver PD, Ingham HR. Carbon dioxide laser irradiation of bacterial targets in vitro. *J Hosp Infect.* 1987; 9(3), 265-273. Fires in the Operating Room. *J Am Coll Surg.* 1997; 82(8).
3. Garden JM, O'Banion MK, Shelnitz LS, Pinski KS, Bakus AD, Reichmann ME, Sundberg JP. Papillomavirus in the vapor of carbon dioxide laser – treated varrucae. *JAMA.* 1988; 259(8), 1199-1204.
4. Hallmo P, Naess O. Laryngeal papillomatosis with human papillomavirus DNA contracted by a laser surgeon. *Eur Arch Otorhinolaryngol.* 1991; 248(7), 425-427.
5. Nezhat C, Winer WK, Nezhat F, Nezhat C, Forrest D, Reeves WG. Smoke from laser surgery: Is there a health hazard? *Lasers Surg Med.* 1987; 7(4), 376-382.
6. NIH laser safety program. 2004. US Department of Health & Human Services, National Institutes of Health. http://search2.google.cit.nih.gov/search?site=NIH_Master&client=NIHNEW_frontend&proxystylesheet=NIHNEW_frontend&output=xml_no_dtd&filter=0&getfields=*&q=Laser+Safety+Program. Accessed July 28, 2010.
7. Sawchuck WS, Weber PJ, Lowy DR, Dzubow LM. Infectious papillomavirus in the vapor of warts treated with carbon dioxide laser or electrocoagulation: Detection and protection. *J Am Acad Dermatol.* 1989; 21(1), 41-49.
8. Smoking guns – Part 1 and Part 2. 2007. American Society for Laser Medicine & Surgery. <http://www.aslms.org/public/smokingguns1.shtml>. Accessed July 28, 2010.
9. Tomita, Y, Mihashi S, Nagata KI, Ueda S, Fujiki M, Hirano M, Hirohata T.
10. Mutagenicity of smoke condensates induced by CO₂ laser irradiation and electrocauterization. *Mutat Res.* 1981; 89(2), 145-149.
11. Walker NP, Mathews J, Newsom SW. Possible hazards from irradiation with the carbon dioxide laser. *Lasers Surg Med.* 1986; 6(1), 84-86.

Appendix A

Table F1 Laser Safety Education Program

- (1) The Laser
 - (a) Physics and biological effects
 - (b) Components of the laser system, delivery devices, and instrumentation
 - (c) Overview of clinical applications

- (2) Administrative Controls
 - (a) Laser committee
 - (b) Role of the LSO
 - (c) Development of policies/procedures
 - (d) Documentation methods
 - (e) Regulations, standards and recommended professional practices
 - (f) Certification criteria and skills validation
 - (g) Medical surveillance

- (3) Perioperative safety
 - (a) Controlled access
 - (b) Eye protection
 - (c) Reflection hazards
 - (d) Flammability hazards and draping
 - (e) Electrical safety
 - (f) Management of plume
 - (g) Management of anesthesia in airway surgery
 - (h) Equipment testing, aligning and troubleshooting

From ANSI Z136.3-2005 American National Standard for Safe Use of Lasers in Health Care Facilities. Copyright 2005, Laser Institute of America. All rights reserved.

Appendix B

**Table F2
Laser Safety Training Program**

		MD	RN	Tech	Service	LSO
1)	Laser Physics/Biological Effects	X	X	X	X	X
2)	System Components/Delivery Devices/Instrumentation	X	X	X	X	X
3)	Federal, State Local Regulations	X	X	X	X	X
4)	ANSI Z136.1, Z136.3 Standards	X	X	X	X	X
5)	Institutional Policy/Procedures	X	X	X	X	X
6)	Hazard Classification	X	X	X	X	X
7)	Access to Laser Key		X			X
8)	Medical Surveillance	X	X			X
9)	Documentation/Incident Reporting	X	X		X	X
10)	Anesthesia Hazards/Controls	X	X	X		X
11)	Personal Protective Equipment	X	X	X	X	X
12)	Patient Protection	X	X	X		X
13)	Operational Skills Workshops	X	X	X	X	X
14)	Procedure for Safety Audits					X

From ANSI Z136.3-2005 American National Standard for Safe Use of Lasers in Health Care Facilities. Copyright 2005, Laser Institute of America. All rights reserved.

Appendix C

Form B2

Example – Laser Operator Skills Validation

1. Applicant has read policies and procedures. _____
2. Certificate of attendance at an approved course of not less than _____ CEUs,
has been submitted. _____
3. Taken the baseline eye exam. _____
4. Attended equipment in-service training by LSO or designee. _____
5. Knows security procedure for obtaining keys. _____
6. Follows safety precautions while setting up the room and assembling
equipment. _____
7. Knows how to assemble laser delivery systems and accessory equipment. _____
8. Can perform daily maintenance procedures. _____
9. Operates control panel properly:
 - power settings _____
 - time exposure _____
 - standby/ready _____
 - emergency off _____
 - shutter _____
10. Test fires/calibrates laser output. _____
11. Assembles, checks, operates smoke evacuator systems. _____
12. Positions laser, footpedal, and delivery systems. _____
13. Completes all documentation. _____
14. Knows proper methods for cleaning and storing. _____
15. Demonstrates ability to monitor laser safe room. _____

From ANSI Z136.3-2005 American National Standard for Safe Use of Lasers in Health Care Facilities. Copyright 2005, Laser Institute of America. All rights reserved.

Appendix D

Form B1

Example – Perioperative Laser Safety Checklist

Date _____ Procedure _____

Surgeon _____ Anesthesia _____

Laser Operator _____

Scrub Person _____ Circulator _____

Equipment

Laser _____ Smoke Evacuator _____

Delivery System: Handpiece _____ Waveguide _____

Fiber _____ Microscope Lens _____

Pre-Operative

Door Signs/Goggle Posted _____ Fire Extinguisher Checked _____

Windows Covered _____ Keys Obtained _____

Water Basin Opened _____ Eyewear in Room _____

Laser Tested/Calibrated by _____ Time _____ OK _____

Smoke Evacuator Tested _____ Filter Changed _____

Intraoperative

Laser Eye Protection Needed _____ Yes _____ No

All persons in room wearing eye protective eyewear _____ Yes _____ No

If no, explain _____

Patient's eyes protected: Goggles _____ Wet Pads _____ Other _____

Site draped: Wet linen _____ Disposable _____ Other _____

Wet Rectal Pack _____ Yes _____ No

If no, explain _____

Laser Masks _____ ET Tube used _____

Smoke Evacuator used during Procedure _____

Dosimetry

Laser Time On _____ Time Off _____ Total Time _____

Watts _____ CW _____ Superpulse _____

Joules _____ Number of Pulses _____

Post-Operative

Laser Documentation Completed _____ Keys Returned _____

Laser and Accessories Cleaned and Stored Properly _____

Smoke Evacuator Cleaned and Stored Properly _____

Patient Discharge Instructions: Verbal _____ Written _____

Laser Malfunction: _____

Reported to _____ Action taken _____

Laser on Standby Only _____

Additional Comments _____

Laser Operator

From ANSI Z136.3-2005 American National Standard for Safe Use of Lasers in Health Care Facilities. Copyright 2005, Laser Institute of America. All rights reserved.