LASER AND INTENSE LIGHT SOURCE SAFETY

POLICY©

DOCUMENT SUMMARY/KEY POINTS

- This is a SCHN Policy.
- At SCH, refer to the following POW policies:
  - Laser Safety Policy
    http://www.seslhd.health.nsw.gov.au/Policies_Procedures_Guidelines/Clinical/Radiation_Safety/Documents/SESLHDPD161-LaserSafetyPolicy.pdf
  - Laser Safety – managing the hazards procedure
    http://www.seslhd.health.nsw.gov.au/Policies_Procedures_Guidelines/Clinical/Radiation_Safety/Documents/SESLHDPD162-LaserSafetyProcedure.pdf
- At The Children's Hospital at Westmead (CHW) this Policy provides a framework for the safe management of Medical Laser use.
- **Mandatory compliance** applies to CHW staff who:
  - Controls the delivery of the laser radiation to the working area[3].
  - Operates laser controls (e.g. parameter settings, actuation switch)[3].
  - Deliver Laser energy to the intended target.
  - Work in an environment where lasers are utilised.
  - Supervise or manage a department where Lasers are utilised.

Approved by:	SCHN Policy, Procedure and Guideline Committee	
Date Effective:	1st January 2019	**Review Period:** 3 years
Team Leader:	Radiation and Laser Safety Officer	**Area/Dept:** Nuclear Medicine

CHANGE SUMMARY

- Updated to include:
    - Requirements of the *AS/NZS 4173:2018 Safe use of lasers and intense light sources in health care*
    - New equipment
    - Clarification under the *Responsibilities* section

READ ACKNOWLEDGEMENT

- Training/Assessment Required – Laser Operators, Laser Users, Laser Safety Officers, Laser Site Supervisors, Laser Safety Nurses, and Biomedical Engineering staff.
- All staff who work in an environment where Lasers are used are to read and acknowledge they understand the contents of this policy.

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Responsibilities

Chief Executive

The Chief Executive is responsible for the health, safety and welfare of persons within all facilities of the SCHN. AS/NZS IEC 60825.1:2014 recommends the appointment of a Laser Safety Officer (LSO) to advise and assist an employer in fulfilling their responsibilities for laser safety. Although the Chief Executive may delegate responsibility for laser safety within the LHD to the LSO, ultimate responsibility for implementation of the laser safety program and compliance with the legislation and standards rests with the Chief Executive.

CHW Laser Safety Committee

A Laser Safety Committee is recommended by AS/NZS IEC 60825.1:2014 for assisting the Chief Executive in fulfilling the legislative responsibilities for Laser safety within the Hospital. It is responsible for addressing laser safety issues at their meetings as a standing agenda item and will be provided with periodic reports, by the Laser Safety Officer, on laser incidents, compliance with training requirements, PPE, audits and credentialing.

Laser Safety Officer (LSO)

The Laser Safety Officer (LSO) will assist in the safe and effective use of lasers at CHW by ensuring compliance with relevant standards and legislation:

- Ensure safe work practices, staff training, safety equipment and control measures, in conjunction with staff using lasers based on level of responsibility.
- Ensure laser units are maintained in conjunction with Biomedical Engineering.
- Lead any investigation into Laser incidents, near misses or accidents.
- Undertake audits of compliance with this Laser Safety Policy and present reports of these audits to the Laser Safety Committee.
- Assisting with National Standards and the NSW MoH WHS audit preparation.
- Survey all new laser facilities for safety hazards before operations can commence. The LSO shall be consulted in the planning stages of any new laser facility, including procurement of new lasers, to ensure appropriate environmental hazard management.
- Update laser policies and procedures including hazard evaluation, signage and control measures; site inspections, audits and presenting audit reports to the Laser Safety Committee.

SCH staff should contact the POW LSO.

Laser Safety Officers have the authority to stop any unsafe operations or proposed actions involving laser radiation that come to their attention and implement any necessary urgent actions following the occurrence of a laser accident.

Department Heads and Managers

Department Managers are responsible for the management of laser safety within their department.

For departments in which lasers are used, the specific responsibilities include:

- Ensure that all workers, clinicians, contractors and/or visitors in their department comply with this Policy, by completing in-services and/or approved training courses, and that Laser Users and Laser Operators hold valid facility credentialing/accreditation.
- Ensure that all employees in their department receive appropriate induction and continuing laser safety training, and that records of this training are maintained.
- Providing all staff, who may be exposed to laser radiation, the appropriate personal protective equipment
- Actively participates in the investigation of Laser near misses, incidents or accidents, under the supervision of the LSO.

Laser Site Supervisor (LSS)

To provide local supervision to laser utilising environments, a Laser Site Supervisor (LSS) will be designated to ensure that the policy and procedures are implemented within each department (Clubbe Ward, Operating Theatres, Eye Clinic and Grace Centre for Newborn care).

The LSS is responsible for:

- Ensuring that all employees working in the department receive appropriate induction and continue laser safety training and that records of this training are maintained.
- Ensuring that all staff that may be exposed to laser radiation are provided with appropriate personal protective equipment to use.
- Completing regular spot checks to ensure that an adequate supply of protective eyewear for all lasers in use are available to staff.
- Ensuring that only those clinicians who are credentialed/ accredited to use lasers undertake work involving lasers, and liaising with the LSO on this matter.
- Ensuring that all laser incidents are investigated to determine preventative and/ or corrective actions.
- Liaising with the Laser Safety Officer on such matters as hazard identification and evaluation.
- Reporting of known or suspected near misses, incidents or accidents and ensuring that medical examinations of staff involved are arranged, if required.
- Escalating any incidents to the Department Head or Manager.Ensures identification and allocation of a Laser Safety Nurse for cases involving the use of lasers.
- Completes regular spot checks of all documentation relating to the use of the laser, to ensure they are complete.

The LSS may also fulfil the role of the Laser Safety Nurse.

Note: Physiotherapy Department does not require an LSS

Laser Safety Nurse (Operating Theatres and Eye Clinic Only)

To assist with local supervision in a particular treatment area, a Laser Safety Nurse will be designated to ensure compliance with local procedures. A Laser Safety Nurse shall be a registered nurse (RN).

The laser safety nurse is responsible for:

- Identifying themselves to the Laser User/Operator
- Set up the Laser equipment, ensuring correct Laser, signage, eye protection and Laser curtains are in place.
- For any procedures that generate surgical plume a smoke/plume evacuation system must be used as per MOH directive[6].
- Liaison with the LSS on any matters related to laser hazard and safety identification and evaluation.
- Reporting of known or suspected near misses, accidents or incidents through IIMS and the LSS.
- Verify that all documentation relating to the use of the laser is completed by the Laser Operator.

Laser Operator and Laser User

Laser Operators and Laser Users are clinical staff trained and hold local facility accreditation in the use of a particular type of laser for surgical / medical procedures.

The laser operator/user is responsible for:

- Identification of the LSN[#] in the room and ensuring their presence throughout the time the laser is in use, in applicable areas.
- Only permitting operation of the laser when the LSN[#] is present and there is adequate control of laser hazards.
- Confirming the correct laser and that the test fire of the laser is completed to their satisfaction prior to the anaesthetising of the patient. <u>For the Eye Clinic</u> laser only, the laser must be test fired prior to the patient entering the room. <u>For Clubbe Ward and Physiotherapy only,</u> the laser must be warmed up as per unit requirements prior to the patient entering the room.
- For any procedures that generate surgical plume a smoke/plume evacuation system must be used as per MOH directive[6].
- Informing all staff in the procedure area when the laser is in operation.
- Reporting of known or suspected near misses, accidents or incidents through IIMS.
- Provide direct supervision to non-accredited medical staff in the treatment area, including supervision during training in laser operation. A Registrar can only be a LO/LU under the complete supervision of an approved clinician.
- Ensuring that all documentation relating to the use of the laser is completed.

 # LSN and/ or Laser Operators may not be required in all departments, where only the Laser User and patient are present and the Laser User operates the Laser (e.g. Eye Clinic, NICU/Grace or Clubbe Ward).

Biomedical Engineering

Biomedical Engineering is responsible for the laser technical support program that includes evaluating hazards and advising on plume extraction, power and fire safety requirements of existing or proposed laser installations, in consultation with the LSO.

The Biomedical Engineering Department is responsible for:

- Managing the performance testing of all Laser devices, to ensure that all Laser devices are electrically safe for operation.
- Maintaining service records for all Laser devices in operation.
- Actively participates in the investigation of Laser near misses, incidents or accidents, under the supervision of the LSO.

Other Personnel and Visitors (including Medical & Nursing Students)

Other CHW personnel including porters, RNs, EEN's and EN's can be present for a laser procedure under the direct supervision of a LSN after attending a laser safety in-service.

Visiting medical professionals must receive in-service training prior to being present at any laser procedure at CHW. They can be present for a laser procedure under the direct supervision of a CHW LSN, Laser User or Laser Operator.

Visitors will comply with all *Laser Safety* policy and associated procedures, the *Third Party Access to SCHN Hospitals and Code of Conduct* policy and procedure, and the *Company Representatives visiting CHW* policy and procedure.

For nursing students within the Operating Suite: completion of an in-service will be recorded on the Operating Suite Educator's Sign-on Sheet for each session.

Medical students must attend the orientation in-service training prior to being present at any laser procedure at CHW. They can be present for a laser procedure under the direct supervision of a CHW LSN, Laser User or Laser Operator. The orientation sign-on sheet for that session and saved to the Laser Safety shared drive.

Contractors

Contractors must receive in-service training prior to being present at any laser procedure at CHW. They can be present for a laser procedure under the direct supervision of a CHW LSN, Laser User or Laser Operator. Contractors will comply with all *Laser Safety* policy and associated procedures, the *Third Party Access to SCHN Hospitals and Code of Conduct* policy and procedure, and the *Company Representatives visiting CHW* policy and procedure.

Completion of in-service will be recorded for that session and saved to the Laser Safety shared drive.

Staff Responsibilities

Staff working in areas where lasers are used must:

- Comply with the requirements of this Laser Safety Policy
- Wear any protective equipment provided by the facility
- Promptly report any incident involving a laser, or a potential laser hazard, to their direct supervisor and enter into IIMS within 24 hours. Refer to the Incident Management policy.
- Attend laser safety training as required by this policy
- Advise the LSO/LSS of any laser equipment that may be malfunctioning.

Implementation and Procedures

Safe Work Practices(SWP) / Safe Operating Procedures(SOP)

SWP's and / or SOPs shall be established and maintained for all medical lasers operated within CHW departments.

All personnel should be thoroughly familiar with the SWP/SOP for the specific laser in use. A copy of the SWP/SOP shall be available in close proximity to the laser unit.

Environmental Safety

- All personnel shall be made aware of the areas of laser use, and access to these areas is controlled to ensure a safe environment. The room in which a laser is in use is designated as a Laser Controlled Area (LCA)
- Unexpected entry into a laser area is not permitted.
- All patients and personnel should be protected from inhalation of the plume generated during the use of the laser, by means of a smoke evacuator.
- When the laser is not in use or there is a pause in proceedings, the laser is placed in "stand-by" mode. The key must never be left in an unattended laser unit.
- A secure area for storage of laser keys when not in use should be available, in a location separate from the laser unit.

Quality Assurance Program

To ensure a safe environment is maintained during laser procedures the following QC tests must be completed prior to commencing a procedure. In the event of a failure of a test, the LSS/LSO must be consulted before the equipment is used.

Test	Frequency (Minimum)	Tested by
Power and footswitch	Prior to each use or daily, whichever is least frequent	Operator/User
Convergence of aiming and main beam	Daily, and after repositioning or change of delivery system	Operator/User
Aiming beam quality	Prior to each procedure or change of fibre delivery system accessory	Operator/User
Articulated arm movement and physical checks	Commencement of each procedure	Operator/User
Physical check of fibre	Each change of fibre	Operator/User
Specialised accessories	Prior to each use	Operator/User
Protective Eyewear	Prior to each list by the LSN and by each individual once distributed by LSN	All individuals within the LCA
Emergency stop switches	6 monthly (unless prohibited by the manufacturer)	LSO/LSS
Beam power/pulse energy	At the time of preventative maintenance – tested by the supplier's technician	Service Provider
Preventative Maintenance	As scheduled by the manufacturer	Service Provider

References

1. AS/NZ IEC 60825.1:2014 Safety of Laser Products
2. AS/NZ 4173:2018 Safe use of lasers and intense light sources in health care
3. AS/NZ 1336:2014 Recommended practices for occupational eye protection
4. ACORN Standards for Perioperative Nursing Edition 14 2017
5. MOH Work Health and Safety – Controlling Exposure to Surgical Plume Guideline http://www0.health.nsw.gov.au/policies/gl/2015/pdf/GL2015_002.pdf
6. Work Health and Safety Act 2011 No 10
7. Work Health and Safety Regulation 2011
8. NSW PD2009_039 Risk Management – Enterprise-wide Policy and Framework – NSW Health
9. SCHN PD 0/A/12:9016-01:02 Third party access to SCHN Hospitals and code of conduct

Appendix A: Laser Safety Information

1 Introduction

The word "LASER" is an acronym for "Light Amplification by Stimulated Emission of Radiation". Laser devices emit an intense, coherent and highly directional beam of light which may or may not be visible, depending on the type of laser.

Laser devices are sources of non-ionising radiation (NIR). This form of radiation is distinguished from ionising radiation by a different mechanism of interaction with matter. Non-ionising radiation is so called because it does not carry enough energy to ionise atoms. Instead, it interacts with matter by, for example, generating heat.

Many different materials may be used as the laser medium and the laser type is commonly known by the particular medium used. Each medium produces light of an individual wavelength.

Intense light sources are sources of broadband non-laser light that are intended to cause a thermal or photochemical effect on target tissue.

Use of intense light sources, including IPLs is a rapidly growing technology in medical care, and while they are incoherent (i.e. not laser) sources, the patient and operator safety issues are very similar. Some laser users may also use intense light sources, and some clinical applications can use either technology. CHW owns and operates one combined unit Laser/IPL within the Operating Theatre.

All safety information pertaining to lasers throughout this document can be applied to the IPL unit in use at CHW.

For more specific information in regard to intense light sources (relevant to the IPL) please refer to Appendix C.

2 Properties of Lasers

Laser light has three unique characteristics that make it different to ordinary light:

1. **Monochromatic**

   Each laser produces light of one (or more) pure wavelength or colour. Sunlight, by contrast, is made up of multiple colours, or wavelengths of light.

   Wavelength is often abbreviated by the symbol λ. The units of wavelength used for healthcare lasers are nanometres (nm) or microns (μ).

2. **Low divergence**

   A laser emits its light in **one direction only in a nearly parallel beam**. It travels over very long distances with very little spread. In other words it has very low divergence.

3. Coherent

All individual waves of laser light are moving precisely together through time and space i.e. is in phase.

Together these properties allow power to be concentrated in a tiny area, yielding a very high power density.

This gives laser radiation a far greater potential to cause injury than light from any other source e.g. a light bulb.

3 Modes of Operation

Most lasers used in medicine operate in one of two modes:

- **Continuous wave**

  This is where the beam is present continuously while in operation.

- **Pulsed mode**

  This is where laser output is not continuous, but is confined to a very short period. This process can be repeated to produce a sequence of pulses.

  High-energy pulsed lasers can produce extremely high peak power output over very small time scales, and can cause tissue damage in less than a picosecond.

4 Laser Delivery Systems

All lasers require a means of transmitting the radiation to the treatment site – this is known as a *delivery system*.

The laser wavelength determines the type of delivery system. Five types are in common use:

1. Direct delivery
2. Articulated arm
3. Hollow flexible waveguide
4. Optical fibres
5. Handpieces and applicators

More specific information on laser delivery systems can be found in Appendix F

5 Biological Effects of Laser Radiation –

Lasers are able to produce a range of biological responses in tissue, determined by the various processes of energy conversion within bio-molecules. The mechanism by which laser radiation induces damage is similar for all biological systems, and may involve interactions of heat, thermo-acoustic transients and photo-chemical processes. The degree to which any of these mechanisms is responsible for damage may be related to certain physical parameters of the laser source including wavelength, exposure time, size of laser beam at point of incidence and irradiance (power density).

There are a number of ways radiation from a laser interacts with tissue. Laser tissue interactions include thermal, photo dissociation, electromechanical (or photomechanical) and photochemical.

5.1 Optical Interactions

When tissue is exposed to laser radiation, the laser radiation may undergo one or more of the following processes:

1. Reflection, either specular or diffuse
2. Scatter, change in direction of individual photons within a light beam
3. Absorption, where the energy is transferred to the tissue
4. Transmission, where no energy is lost during passage through tissue.

5.2 Thermal Interaction

The most common result of exposure to laser radiation is the production of heat. Because of the highly intense nature of the laser beam and its ability to be finely focused, heat can be generated in very large quantities, easily sufficient to coagulate or evaporate small volumes of tissue.

5.3 Photochemical Interaction

This is a chemical process that is dose related and initiated by the absorption of visible, ultraviolet or infrared radiation. This principle has been utilised in the treatment of malignant tumours in which light absorbing chemicals are taken up predominantly by the rapidly dividing malignant cells. Exposure to laser energy at the appropriate wavelength causes the chemical molecules to undergo a series of reactions which result in the destruction of the target tissue.

5.4 Photodissociation (Photoablation)

This involves direct breaking of molecular bonds and subsequent release of biological material.

Ultraviolet radiation is very strongly absorbed by biomolecules so penetration depths are small, of the order of a few micrometres.

5.5 Electromechanical Interaction

This interaction requires an extremely high power density delivered in an extremely short pulse, with a very short duration i.e. microseconds, nanoseconds, picoseconds or femtoseconds. Very high temperatures, lasting only the length of the pulse, are created, resulting in an explosive shockwave. A localised mechanical rupture of tissues usually occurs.

6 Hazards of Lasers

6.1 Eye exposure

For staff using lasers it must be stressed that eye damage is most likely immediate and often permanent - thus the local safety rules must be understood and adhered to by all staff involved. The risks of a laser accident occurring may be very small, but the consequences are often serious.

6.1.1 Wavelengths < 400 nm

The ultraviolet spectrum is divided into three specific regions which are related to different biological responses:

- **UV-A (315 nm – 400 nm)** is strongly absorbed by the lens of the eye. The harmful effects of exposure may not become apparent for many years (small lens opacities can become clinically significant after a period).
- **UV-B (280 nm – 315 nm)** is mainly absorbed by the cornea and conjunctiva. Such absorption may lead to inflammation of the cornea (photokeratitis) and conjunctivitis. Damage limited to the outer layer of the cornea is generally temporary, as the cells are rapidly renewed.
- **UV-C (100 nm – 280 nm)** is mainly absorbed by the cornea and conjunctiva. Such absorption may lead to inflammation of the cornea (photokeratitis) and conjunctivitis. Damage limited to the outer layer of the cornea is generally temporary, as the cells are rapidly renewed.

6.1.2 Wavelengths 400 nm – 1400 nm

Visible and near infra-red regions are called the retinal hazard range of wavelengths as they are readily transmitted through the ocular media and focussed onto the retina. Because of the focusing action of the eye, the retina may be exposed to a power density at least 100 000 times the power density at the cornea.

High power surgical lasers operating in this region present a potent threat to eyesight by direct exposure to the beam or by specular reflections from flat or shiny surfaces. Diffuse reflections from rough surfaces can also be hazardous.

6.1.3 Wavelengths > 1400 nm

Wavelengths above 1400 nm are absorbed by the anterior components of the eye (cornea and aqueous humour). Beyond 1900 nm, the cornea is considered the sole absorber. Heat in the anterior part of the cornea, from, for example, a surgical CO_2 laser, may be conducted further into the eye, causing thermal damage. A surgical CO_2 laser will continuously vaporise surface tissue; if accidentally exposed to this laser the cornea of the eye could be easily injured.

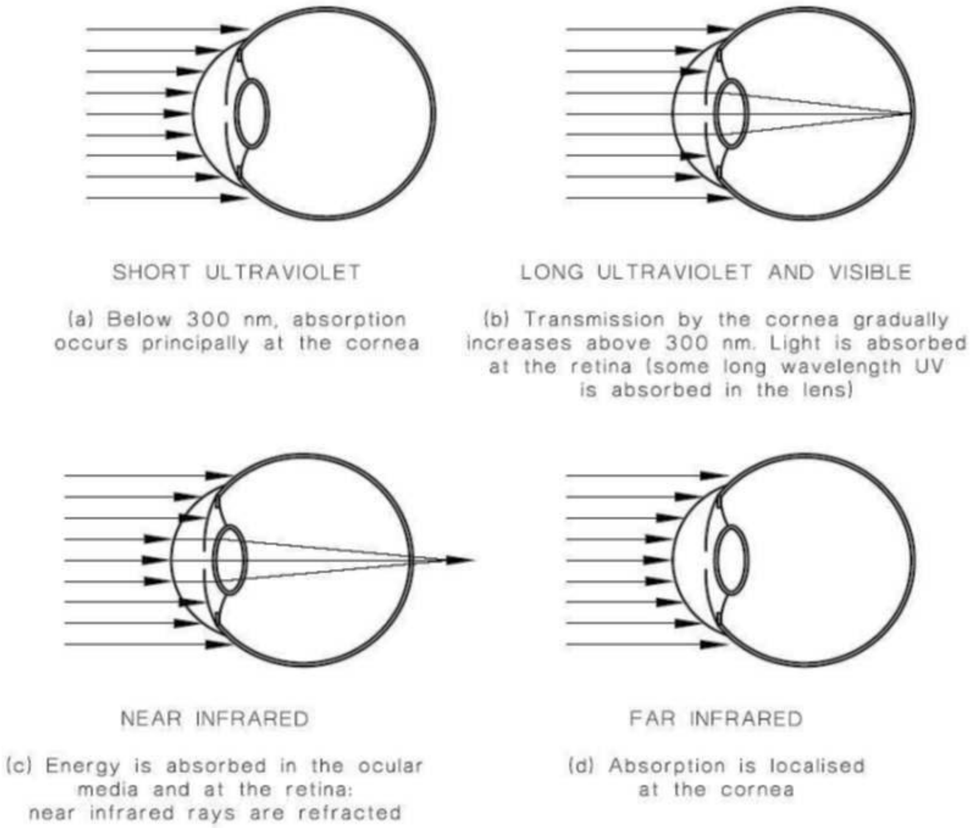

Figure 1. Mechanisms of Laser-induced damage[1]

6.2 Skin exposure

The penetration of optical radiation into the skin is dependent on its wavelength and is generally greater in the visible and near infra-red regions of the spectrum. As the penetration depth increases, so does the volume of tissue exposed and the amount of radiation required to cause injury is consequently higher. Ultraviolet and mid to far infra-red radiations do not penetrate the skin significantly and thus a very brief exposure can cause serious harm. For most acute laser injuries to the skin a localised laser burn will be the result.

Repeated or extended exposure to low intensity ultraviolet radiation can induce erythema, a photochemical reaction resulting in reddening of the skin (>sun burn). Prolonged exposure over time can initiate long term degenerative processes including premature ageing of the skin and skin cancers.

6.3 Surgical Plume

When a Class 4 laser is used to produce photothermal effects, resulting in the vaporisation of target tissue, the disruptive cells can release noxious airborne contaminants, including carbon, bacteria, viral particulates, cellular DNA, and a variety of noxious gases including benzene, toluene, carbon monoxide, acrolein and formaldehyde. These gases can produce headache, coughing, exacerbation of asthma or allergy, tears, nausea, abdominal cramping and vomiting and have the potential of transmitting infectious agents.

Surgical plume potentially contains viral particles having a mean aerodynamic diameter as small as 0.1 µm. Viral particles such as HPV are able to withstand combustion of tissues and remain viable and transmissible from patient to user. – can't follow this sentence. Office so noisy can't think what to say.

Laser surgical plume should, as close as is practical, be removed from the operative site. Appropriate means of plume evacuation should be used in all surgical cases where surgical plume is anticipated.

6.4 Airway Safety

When lasers are used in the airway there is a risk of an airway fire. To reduce the risk of fire/explosion, it is recommended that the lowest possible safe concentration of oxygen shall be used in laryngotracheal procedures. The use of intravenous anaesthetic techniques, rather than inhalation techniques, is recommended to prevent laser pyrolysis of anaesthetic agents.

6.5 Other hazards

Other hazards are fire (lasers can ignite flammable materials), skin burns, electrical hazard due to high power and potential hazards from plume generated by lasers used for tissue ablation (due to the possible presence of live viral material in the smoke plume).

Appendix B: Lasers and Intense Light Sources at CHW

LASERTYPE	WAVELENGTH	Region of EM spectrum	CLASS	APPLICATION
KTP 'Nuvolas'	532 nm	Visible (Green)	Class 4	ENT
Laser Diode 'Green'	532 nm	Visible (Green)	Class 4	Ophthalmology
Alcon Constellation Purepoint	532 nm	Visible (Green)	Class 4	Ophthalmology
Liquid Pulse Dye 'Candela'	595 nm	Visible (Yellow)	Class 4	Dermatology, Burns
Laser Diode 'Doppler LDI'	780 nm	Near infrared	Class 3R	Burns (Theatres)
Laser Diode "Doppler LDLS"	785 nm	Near infrared	Class 3R	Burns (Clubbe Ward)
Laser Diode 'Red'	810 nm	Near Infrared	Class 4	Ophthalmology
Riancorp LTU	904 nm	Near infrared	Class 1	Physiotherapy
Nd Yag 'Slit Lamp'	1064 nm / 532 nm	Near infrared/ visible (Green)	Class 4	Ophthalmology
Nd:Yag "YC-1800"	1064 nm	Near infrared	Class 3B	Ophthalmology (Eye Clinic)
Nd Yag /IPL 'Xeo'	1064 nm	Near infrared	Class 4	Plastics
Co_2 'Ultrapulse'	10600 nm	Far infrared	Class 4	Burns

IPL Safety Considerations

Laser safety requirements apply equally well to IPL as they do laser applications. There are electrical, fire, plume and explosion hazards. As IPL is a cosmetic medical device and is externally applied to the skin, the risk to eyes and skin from the beam of light are of high importance.

Specific IPL safety eyewear is required for the patient, operator and anyone else in the treatment room. Although IPL light is highly divergent and thus rapidly weakens with distance, it is mainly visible light and is very bright.

Appendix C: Hazard Classification

Classification of Laser hazards

Classification	Associated hazards
Class 1	Inherently safe
Class 1C	Ocular hazard prevented by engineering means. Designed for contact application to the skin or non-ocular tissue.
Class 1M	As Class 1, but beam not to be viewed with optical magnifiers
Class 2	Low hazard – aversion response sufficient protection
Class 2M	As Class 2, but beam not to be viewed with optical magnifiers
Class 3R	Visible radiation, direct viewing hazardous, blink reflex protection
Class 3B	Higher risk than Class 3R – direct viewing hazardous
Class 4	Direct and indirect viewing hazardous

Classification of Risk Group – ILS

Exempt Group	Risk Group 1	Risk Group 2	Risk group 3
Safe under reasonably foreseeable conditions	Low risk – does not pose a hazard due to normal behavioural limitations on exposure	Moderate risk – does not pose a hazard due to aversion response to very bright light sources or due to thermal discomfort	High risk – may pose a hazard even for momentary or brief exposure.

Appendix D: Protective Equipment

Protective Eyewear

Simple guidelines to effectively wearing protective eyewear include:

a. All eyewear should have some form of restraint, to both hold the eyewear in the appropriate position on the face, and to prevent it falling off the face.
b. Eyewear should fit snugly and be reasonably comfortable to wear
c. Eyewear should provide least restriction to vision and movement
d. Eyewear should be easily cleanable and durable
e. Do not use solvents (alcohol) to clean eyewear as these may damage the protective coating.
f. Controls and warnings should be clearly visible through the eyewear

Curtains/Window Coverings

To ensure that the NOHA is restricted to the room boundaries it is necessary to use window shielding. The type of shielding depends on the laser wavelength, irradiance and radiant exposure at the window etc and the fire or heat resistance of the shielding material.

Appendix E: Laser Log Form

Facility: CHW

LASER LOG

FAMILY NAME	MRN
GIVEN NAME	☐ MALE ☐ FEMALE
D.O.B. ______/______/______	M.O.
ADDRESS	
LOCATION / WARD	

COMPLETE ALL DETAILS OR AFFIX PATIENT LABEL HERE

SCN090001

Holes Punched as per AS2828.1: 2012
BINDING MARGIN - NO WRITING

Date:	
Name of Procedure:	
Name of Proceduralist:	
Name of Laser Nurse:	
Laser and Wavelength used:	

Pre-Procedure Laser Safety Checklist	
All doors/ windows covered and blinds closed	☐ Yes
Appropriate laser wavelength signs posted at all entrances	☐ Yes ☐ No
Goggle type for wavelength and integrity checked	☐ Yes ☐ No
Goggles available for all staff	☐ Yes ☐ No
Goggles available at entrances to laser controlled area	☐ Yes ☐ No
Open bowl of water and wet towels available in sterile field	☐ Yes ☐ No
Laser light Illuminated	☐ Yes ☐ No
Operating Suite Only	
Smoke evacuation used	☐ Yes
Laser safe/ anodised instrumentation used (Laser Safe Lindholm)	☐ Yes ☐ N/A
Site and adjacent area draped with wet packs	☐ Yes ☐ N/A
Laser test fire complete by:	

Patient Safety - Eye protection used

☐ Eye Tapes ☐ Wet Pack ☐ Goggles ☐ Lead Eye Shield ☐ Others (state)

Delivery Mode

☐ Microscope ☐ Fibre ☐ Slit lamp ☐ Handpiece ☐ Headset

Watts	Pulse length	Mode	Number of pulses	Joules	Site	J/cm²	DCD	Spot size

Laser Operator Signed: ______________________ Print: ______________________

Laser Nurse Signed: ______________________ Print: ______________________

Any laser incidents must be reported in IIMS and reported to the NUM/ Team Leader at the time of the incident.
The NUM/ Team Leader will notify the Laser Safety Officer of the incident.

SCN090001A 160916

LASER LOG

SCN090.001

NO WRITING Page 1 of 1

Appendix F: Sample Checklist

Laser Safety Nurse (LSN) Checklist

As the Laser Safety Nurse (LSN) you are responsible for ensuring that the following tasks are completed prior to the operation of any laser within the Operating Suite. Please use this checklist to verify your tasks.

□ You have identified the Laser Operator for the procedure

□ You have identified yourself as the Laser Safety Nurse to the Laser Operator and the staff in the room.

□ Laser Curtains are in place (both custom-fit and door coverings)

□ Laser signage is present at every entry/exit point

□ Ensure the laser is the correct laser requested

□ Correct protective eyewear is issued to staff, it is clean and the log book is completed. Eyewear must be cleaned and integrity checked at end of list.

□ Correct protective eyewear is secured on the patient at all times.

□ Laser key is held by the LSN until the Laser Operator is ready. Key returned to cupboard after use.

□ Laser Log form is completed

□ ***"Laser In Use"*** sign is illuminated when laser equipment is switched on.

□Spare laser protective eyewear is placed on entry door hook

□ LSN identifies the location of the emergency stop button and how to use it.

□ LSN ensures that a smoke evacuator is available for removal of surgical plume (where applicable)

□ LSN assists the Laser Operator in ensuring that laser safety is maintained throughout the case.

□ All laser incidents/near misses or malfunctions are reported directly to the NUM and the Laser Site Supervisor (who will inform the LSO), entered into IIMS and noted on the laser log form.

Appendix G: Delivery System Information

1. Direct delivery

Laser pointers, patient positioning lasers and ophthalmic lasers are types of direct delivery systems. Laser energy is delivered directly from the emitting aperture to tissue (with or without focusing lenses).

2. Articulated arm

Since longer wavelengths are absorbed by glass, they cannot be delivered through conventional glass fibres or lenses. An articulated arm has been developed which allows the laser radiation to travel through a series of hollow arms connected by a system of joints and reflecting mirrors.

Where the radiation from the laser is invisible, an aiming beam laser is attached (a low power visible laser either a green or red diode laser). The invisible and aiming lasers are optically combined to coincide at the applicator or handpiece. They are reflected from special mirrors placed at the front of each joint of the arm, and emerged as a coincident, collimated beam.

The articulated arm may be coupled to applicators, such as a handpiece, micromanipulator, rigid fibre delivery system, waveguide or rigid endoscope. The applicator can include a lens to focus the beam.

3. Hollow flexible waveguide

These have been developed for long wavelength infrared lasers. They consist of a thin hollow flexible tube with a reflective internal coating through which the laser energy can be delivered.

4. Optical fibres

Laser energy can be focused by a lens into an optical fibre and transmitted to emerge as a divergent beam at the fibre tip. The laser beam will automatically diverge when it leaves the fibre, at an angle of the order of 10 degrees. This allows for the power or energy density to be altered quite significantly over a small range of distance from the fibre tip.

5. Handpieces and applicators

- Applicators with focusing lenses: focusing lenses are frequently used in applicators to increase or dec4rease power density or reduce the diameter of the beam at the target tissue.
- Micromanipulators: may be attached to an articulated arm and operating microscope or colposcope, and incorporate a user-operated jog stick which controls a mirror and directs laser energy to the tissue to be treated.