College of Chiropodists of Ontario

LASER

Guideline for Registrants of the College of Chiropodists of Ontario

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Purpose

This document sets out guidance to support the safe and effective use of lasers by College registrants. It emphasizes best practices, safety precautions, and compliance with regulatory requirements for laser types commonly used in chiropody and podiatry.

Refer to **Appendix A: Laser Classification and Safety Guide** for a general listing of laser types used by registrants.

Low Level Laser Therapy (LLLT) – Class 3B Laser

Also called **photobiomodulation**, LLLT uses red or near-infrared (NIR) light to reduce pain and inflammation and promote tissue healing.

See **Appendix B:** LLT Parameter Indications for Wound Healing and Musculoskeletal Injuries.

Applications:

- Musculoskeletal therapy
- Inflammation reduction
- Wound healing.

Assignment:

- May be assigned according to the College's **Assignment, Orders and Delegation Policy**.
- If not treating the patient directly, the registrant must perform pre- and post-treatment checks.
- Registrants must specifically obtain and document patient consent to assignment of the procedure being performed by someone other than the registrant.

Training:

- Registrants must have appropriate training to administer LLLT safely.

Personal Protective Equipment (PPE):

- Wavelength-specific protective goggles required for both patient and practitioner.

Documentation:

- Signed informed consent
- Charting must include: type of laser, wavelength, power density, location of application and session duration. Note any adverse effects or clinical findings.

Protocol:

- Post a laser warning sign
- Ensure patient keeps laser safety glasses on until treatment is over.

Refer to **Appendix A** B: LLLT Parameter Indications for Wound Healing and Musculoskeletal Injuries.

Fungal Nail Laser Therapy – Class IV Laser

Laser therapy is used as an adjunct or alternative to antifungal drugs to treat onychomycosis.

Important:

- Some laser devices have obtained Health Canada approval to provide **temporary cosmetic improvement** in nail appearance (i.e. increased clear nail growth), not to cure fungal nail infections.
- Health Canada has clarified that, while some laser-based medical devices are licensed in Canada to temporarily increase the clarity of the nail in patients with a fungal nail infection, none have been licensed to cure these infections.
- Registrants must clearly communicate this to patients when obtaining informed consent before initiating treatment.

Refer to **Appendix C:** Comparison Chart of Laser Therapies for Onychomycosis.

Application:

- Improving the appearance of infected nail plates and nail beds, provided the treatment is medically necessary.

Assignment:

- May be assigned according to the College Assignment, Orders and Delegation Policy.
- Registrants must perform pre- and post-treatment checks with patient, if not treating the patient directly.
- Registrants must specifically obtain and document patient consent to assignment of the procedure being performed by someone other than the registrant.

Training:

- Registrants must ensure competence with the specific laser, understand contraindications, and know how to manage any adverse effects.

PPE:

- Laser specific protective goggles must be worn by everyone in the treatment room
- Gloves
- No plume is generating in this application

Documentation:

- Risks and benefits of the proposed treatment must be explained and documented, consistent with the College's Consent Guideline.
- Medical record must include: type of laser, wavelength, power density, location of application and session duration, and other such parameters, any adverse effects or clinical findings.

Protocol:

- Post laser warning sign
- Ensure patient wears safety glasses until treatment is over.
- Provided follow-up appointment.

Surgical Lasers - Class IV Laser

Application

- Cutting and ablation of soft tissue lesions (e.g., warts, nail root matrices).

Training

- Only registrants with demonstrated knowledge, skills and judgement for Class A procedures under the College's Surgical Competencies Standard, can use surgical lasers.
- Registrants must also have partial prescribing privileges.

Assignment

- Procedures must be performed by registrants.
- Assignment limited to supportive tasks, for example, attending to the plume evacuator equipment.

Hazards

- Eye Injury: High risk from direct/diffuse reflections.
- Skin/Tissue Burns: Significant risk requiring careful beam management.
- Laser Plume: Contains hazardous airborne materials.
- Fire Risk: Elevated near flammable materials.

PPE

- High optical density, wavelength-specific goggles.
- High-filtration (N95) masks mandatory.
- Flame-resistant attire; wet gauze or towels.
- Mandatory plume evacuation systems.

Protocol

- Comprehensive pre-surgery checklist.

- Emergency protocols (fire/misfire procedures).
- Informed consent has been obtained.

Regulatory and Legal Obligations

- Ontario OHSA: Appoint Laser Safety Officer; mandatory training.
- Health Canada: Licensed medical laser devices only.
- CSA Z386: Adhere to safety guidelines, training, PPE, signage.
- ANSI Z136.1/Z136.3: Compliance with Class 3B/4 safety standards.

Record-Keeping

- Maintain accurate logs of servicing and maintenance.
- Document equipment safety checks.

Incident Management

- Complete formal incident reports immediately.

Appendix A

Laser Classification and Safety Guide

Reference for laser safety, classifications, and required PPE in clinical and technical environments.

Class 3R	Medium-power (1–5 mW). Direct eye exposure potentially hazardous but low probability of injury under short exposure.	Some presentation pointers, low-power therapeutic lasers.	Avoid eye exposure; use OD-rated goggles when aligning beams; restrict access during use.
Class 3B	Moderate power (5–500 mW). Direct or specular reflection can cause retinal injury; diffuse reflection typically safe. (ANSI Z136.1-2020; IEC 60825-1:2014).	Physiotherapy and podiatric LLLT units (e.g., Erchonia EVRL 635 nm). (FDA, 2023).	Protective eyewear required for operator and patient; controlled area and non-reflective instruments; warning signage required. (Laser Institute of America, 2023).
Class 4	High-power (> 500 mW). Dangerous to eyes and skin from direct or diffuse reflections; may ignite materials and produce plume. (ANSI Z136.1-2020; IEC 60825-1:2014).	Surgical, dermatologic, dental, and podiatric lasers (e.g., Nd:YAG 1064 nm, CO_2 10.6 µm, Diode 980 nm). (FDA, 2023).	Mandatory OD-rated eyewear, plume evacuation (N95 or ULPA filter), warning signage, restricted access, remove reflective jewelry, ensure flammables are cleared, operator trained in Class 4 laser safety. (Laser Institute of America, 2023).

Appendix B

LLLT Parameter Indications for Wound Healing and Musculoskeletal Injuries

Table 1: LLLT Parameters for Wound Healing Applications

Wound Type	Recommended Wavelength(s)	Power Density (mW/cm²)	Energy Dose (J/cm²)	Session Frequency & Duration	Application Notes / Outcomes
Diabetic Foot Ulcer	Red (~660 nm) or NIR (~890 nm)[1]	~50 mW/cm² [2]	~2 J/cm²[2]	e.g. daily or 3×/week; ~30 sec irradiation per point (non-contact, ~1 cm from wound)[2][3]; typically continued for several weeks (up to 8–12+ weeks) or until closure[3]	Significantly accelerates healing: meta-analysis shows LLLT doubled complete ulcer healing rate and reduced ulcer area/time to closure vs controls[4]. No adverse effects reported; effective as adjunct to standard wound care in chronic non-healing DFUs[4].
Pressure Ulcer (Bed Sore)	Red (~650 nm) diode[5]	*N/A* (100 mW output in scanning mode)[6] *(≈30–50 mW/cm²)*	~4 J/cm²[6]	~2×/week (every 3 days) for ~4 weeks; ~125 sec per session covering wound bed (non-contact scanning)[5] (≈6 sessions total)	Improved wound bed granulation and reduced slough noted; after 6 LLLT sessions the chronic ulcer bed was well-prepared for closure (healthy granulation tissue)[7]. No infections or adverse effects observed during LLLT course[8].
Surgical Wounds (Incisions & Scars)	Red (660 nm) or NIR (~830 nm) laser[9][10]	<100 mW/cm² (low-level, non-thermal)	~4–6 J/cm² per treatment[9][10]	Typically 3×/week for ~3–4 weeks post-op[9] (or daily for 1–2 weeks in some protocols[10]); ~60 sec irradiation per point along incision line[9] (multiple spots to cover entire scar)	Shown to promote faster incision healing and improved scar outcomes. For example, 660 nm LLLT thrice-weekly for 4 weeks significantly enhanced median sternotomy wound healing vs control[9]. Similarly, 830 nm LED therapy has been used to reduce post-thyroidectomy scar formation (better cosmetic scar appearance vs sham)[10].
Burn Wounds (2nd-degree)	Red (~650 nm) GaAs diode[11]	— (100 mW device, non-contact scanning)[12]	~4 J/cm²[12]	~2×/week (≥3-day intervals) until healed[11]; ~125 sec per treatment covering burn area[12] (on average ~3–4 sessions for superficial burns)	Achieved markedly faster re-epithelialization: superficial second-degree burns healed in ~11–12 days on average with LLLT[13] (vs ~2–3 weeks normally[14]). Patients treated with 650 nm LLLT showed reduced infection and an accelerated healing timeline, with no reported adverse effects[13].
Skin Lesions (General wounds/ulcers)	Visible red (600–700 nm) or NIR (800–900 nm)[15]	~5–50 mW/cm²[15]	~1–4 J/cm²[15]	Typically 2–3×/week (or even daily for acute lesions) for several weeks or until	Appropriate LLLT dosing in this range has been most effective at stimulating tissue repair[15] – promoting collagen synthesis, angiogenesis and faster wound closure. Studies indicate that

Wound Type	Recommended Wavelength(s)	Power Density (mW/cm²)	Energy Dose (J/cm²)	Session Frequency & Duration	Application Notes / Outcomes
				healed (depending on lesion severity)	using these parameters, LLLT can significantly enhance healing rates of various skin wounds (e.g. venous or leprosy ulcers) compared to standard care[15].

Table 2: LLLT Parameters for Musculoskeletal Injury Applications

Injury Type	Recommended Wavelength(s)	Power Density (mW/cm²)	Energy Dose (J/cm²)	Session Frequency & Duration	Application Notes / Outcomes
Tendinopathies (e.g. Achilles tendinitis, lateral epicondylitis)	NIR (780–860 nm) or 904 nm[16]	<100 mW/cm² (for superficial tendons)[17] *(up to ~600 mW/cm² for deep tendons)*[16]	~4–8 J per point (total dose per tendon in range 4–8 J)[16] *(deeper tendon protocols use ~3–9 J)*[16]	Daily for ~2 weeks, or every other day for 3–4 weeks[18] (typical treatment course ~6–12 sessions); apply to multiple points along the tendon (cover lesion area)	Proven to reduce chronic tendon pain and improve function when proper dose used. A 2022 meta-analysis found LLLT significantly reduced pain (~15 mm on 100 mm VAS) and disability in Achilles, patellar, and plantar tendinopathies in the short-to-medium term[19]. *Dosage matters:* using at least ~2 J/point (904 nm) or equivalent yields superior outcomes[20]. No adverse effects reported in trials[19].
Muscle Strains (tears, muscle injuries)	Red or NIR (660 nm for superficial, 808–830 nm for deeper muscle)[21]	~50–100 mW/cm² (moderate intensity for penetration)	~4–8 J/cm² per site (some protocols up to ~10–20 J for large muscle groups)[22]	Daily or alternate days for 1–2 weeks (acute phase); 1–2 min irradiation per point (depending on power) over injured muscle belly	Mixed evidence; LLLT may accelerate muscle recovery and reduce soreness. Some studies show improved muscle performance and faster post-exercise recovery with LLLT[23]. However, in acute muscle tears, not all trials show faster return-to-play – e.g. one RCT found similar rehab time (~23 days vs 24 days) with or without LLLT[24]. Optimal timing (immediate post-injury) and adequate energy seem key to efficacy in muscle healing.
Joint Pain / Osteoarthritis (e.g. knee OA, chronic joint disorders)	NIR (780–904 nm)[25]	~100 mW/cm² (for small/medium joints) *(up to 600 mW/cm² for large joints like shoulder)*[16]	~4 J per point (treat multiple spots; e.g. ~8–12 J total to cover a knee joint)[26]	~3×/week for 3–6 weeks (8–15 treatments typical); ~30–60 sec per point around the joint	When applied within recommended dose ranges, LLLT produces significant analgesic effects in chronic joint conditions. A review found ~30 mm VAS greater pain reduction in chronic knee/TMJ/neck joints with LLLT vs placebo (when using optimal dosing)[27]. Follow-up analyses noted that trials adhering to WALT dose guidelines saw consistently better pain relief outcomes[28].

Injury Type	Recommended Wavelength(s)	Power Density (mW/cm²)	Energy Dose (J/cm²)	Session Frequency & Duration	Application Notes / Outcomes
					Patients often report improved joint function and reduced stiffness after a course of LLLT, though results can vary with severity and technique.
Ligament Sprains (e.g. acute ankle sprain)	IR laser (904 nm GaAs superpulsed, or 820 nm diode)[29][30]	Low average irradiance (e.g. ~40 mW/cm² avg. with pulsed 25 W peak)[30]	~0.5–5 J/cm² per treatment area (doses in this range have been tested)[31]	Daily treatments for 1–2 weeks; in some studies, 2×/day in first 3 days post-injury for anti-inflammatory effect[32]. Usually combined with standard acute care (RICE).	Some evidence of expedited acute recovery: one study (47 athletes) showed that adding LLLT (820 nm, ~40 mW, pulsed) to RICE significantly reduced edema volume at 24–72 h post grade II ankle sprain vs RICE alone[32]. However, high-quality trials have found no significant improvement in pain or long-term function over placebo – in one RCT, neither low nor high dose 904 nm LLLT improved outcomes, and the placebo group even had slightly better early functional scores[33][34]. Thus, LLLT for sprains may aid inflammation reduction (swelling), but its impact on overall recovery is still inconclusive.
Soft Tissue Trauma (contusions, bruises, hematomas)	Red/NIR (e.g. 808–904 nm for deeper tissue penetration)[35]	~50–150 mW/cm² (moderate-high intensity)	~4–6 J/cm² per area (acute phase dosing)	Daily treatments during acute phase (first 3–5 days post-injury); brief irradiations (1–3 min) over injured area	LLLT can mitigate acute inflammatory reactions in soft-tissue injuries. Light at 800–900 nm has been shown to decrease edema formation and hemorrhage, reduce oxidative stress markers, and provide analgesia when applied soon after trauma[35]. Clinically, this can translate to quicker resolution of bruising and pain. Early photo biomodulation is considered a useful adjunct to standard care for minimizing tissue damage in contusions (with essentially no side-effects)[35].

Appendix C

Comparison of Laser Therapies for Onychomycosis (Fungal Nail Infections)

Note: All laser treatments for onychomycosis are intended to **increase clear nail growth** and reduce fungal burden, but reinfection remains possible[21]. Laser therapy is often used in conjunction with topical or oral antifungals for best results. Proper **eye protection and safety protocols** must be followed, especially with Class IV lasers, to prevent accidents. Always consult

device-specific manuals for detailed safety and contraindication information. Several laser modalities have been used to manage onychomycosis. The table below compares the main laser types employed in clinical practice, including their classification, examples of FDA/CE-cleared devices, required safety measures, and key contraindications[1][2].

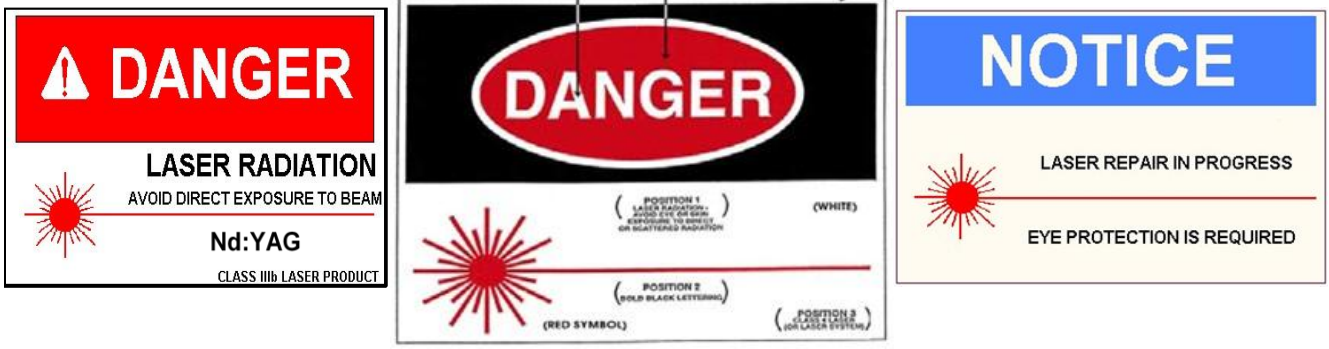
Laser Type	Laser Class & Wavelength	Regulated Devices (FDA/CE-Cleared Examples)	PPE and Safety Requirements	Contraindications
Nd:YAG Laser (1064 nm)	Class IV (high-power); 1064 nm (near-infrared)[3][4] Deep tissue penetration (targets nail bed)	Multiple FDA-cleared 1064 nm Nd:YAG systems (since 2010): e.g. **PinPointe™ FootLaser** (NuvoLase), **Cutera GenesisPlus™**, **Sciton JOULE ClearSense™**, **Candela GentleMax™**, etc.[5]	**Class IV** laser precautions: all present must wear **1064 nm protective eyewear** (invisible beam)[3]; avoid direct beam exposure to eyes/skin (burn hazard). Non-ablative (no plume), but a **warming sensation** may be felt during treatment[6].	**Not advised in**: Pregnancy (safety unproven)[7]; patients with **peripheral neuropathy or poor circulation** (risk of burns, impaired healing)[8]; **active nail bed infections or trauma** (wait until resolved)[9]. Use caution in immunocompromised patients (response may be reduced)[10].
Diode Lasers (810–980 nm)	Class IV (high-power); typically 810–980 nm (near-IR spectrum)[11] Often used in dual wavelengths (e.g. 870/930 nm)	**Noveon®** dual-wavelength laser (870/930 nm diode) and **HyperBlue 1530** multiuse diode laser are examples of cleared systems[2][12]. Others include various 810 nm or 980 nm podiatry diode lasers (FDA product code GEX).	**Class IV** safety as above: require appropriate **protective goggles** for 810–980 nm; no reflective objects or jewelry during use. These lasers emit heat to kill fungus[13], so use **skin cooling or pulsed modes** to prevent burns. **No significant plume** unless used at high settings or to ablate.	**Similar to Nd:YAG** – avoid in **pregnant** patients[7]; use caution in **diabetic neuropathy or vascular insufficiency** (reduced pain sensation and healing)[8]. Ensure nail bed has no open wounds or severe inflammation. If using in combination with photosensitizing drugs (e.g. for photodynamic therapy), follow specific contraindications of that protocol.
CO_2 Lasers (10,600 nm)	Class IV (surgical laser); 10,600 nm (far-infrared) – strongly absorbed by water, **ablative** action on nail[14]	Certain fractional **CO_2 laser systems** (originally for skin surgery) have FDA clearance for temporary clear nail increase[15][14]. *Examples:* medical CO_2 lasers used in podiatry/dermatology (e.g. Lumenis Ultrapulse® CO_2) to drill microchannels or thin the nail plate for antifungal treatment.	**Class IV / ablative** laser precautions: **protective eyewear** for 10.6 µm (typically polycarbonate shields) for everyone in the room. Use a **smoke evacuator and high-filtration mask** – ablating nail can release fungal spore-laden plume[16]. Operate in a controlled area (laser warning signage); avoid flammable materials (alcohol prep must dry fully).	**Contraindicated in patients with poor wound healing** or **severe peripheral vascular disease** (ablative laser creates tissue injury that may not heal well)[8]. **Not for use on pregnant** patients (no studies). Avoid treating nails with **active bacterial infection** or cellulitis until resolved (to prevent spreading via plume). Use caution if patient has very thin nails or minimal nail plate (to avoid excessive bed injury).
Lunula Laser (405 + 635 nm)	Class II laser device; dual-wavelength low-level laser (non-thermal phototherapy) – 405 nm	**Erchonia LunulaLaser®** – first and only **non-thermal** "cold" laser cleared by FDA for onychomycosis (uses 405/635 nm simultaneously)[17].	**Low-level laser (Class II)** – **minimal PPE** needed. Device includes safety glasses, but risk of eye injury is low (visible low-power beams)[19]. **No heat or burning** –	**No known significant contraindications** – the Lunula is very safe (no reported side effects)[6]. Standard precautions apply: it is generally recommended to avoid elective laser therapy during **pregnancy**

Laser Type	Laser Class & Wavelength	Regulated Devices (FDA/CE-Cleared Examples)	PPE and Safety Requirements	Contraindications
	(violet) + 635 nm (red)[3]	CE-marked in EU (Class 2a medical device)[18]. No other laser in this category (unique LLLT device for nails).	completely painless[3]. No smoke/plume generated (no tissue ablation). Can be operated unattended once properly set up[20].	due to lack of research[7]. Patients with **photosensitivity** disorders or on photosensitizing medications should use caution (405 nm is within visible spectrum).

Appendix D

SAMPLE ANSI Z535 COMPLIANT LASER SAFETY SIGNS

Laser warning signs



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