



Pulsed dye laser for port-wine stain and infantile hemangioma

Clinical Policy ID: CCP.1136

Recent review date: 9/2026

Next review date: 1/2028

Policy contains: Infantile hemangiomas, laser treatment; port-wine stains; propranolol.

Select Health of South Carolina has developed clinical policies to assist with making coverage determinations. Select Health of South Carolina's clinical policies are based on guidelines from established industry sources, such as the Centers for Medicare & Medicaid Services (CMS), state regulatory agencies, the American Medical Association (AMA), medical specialty professional societies, and peer-reviewed professional literature. These clinical policies along with other sources, such as plan benefits and state and federal laws and regulatory requirements, including any state- or plan-specific definition of "medically necessary," and the specific facts of the particular situation are considered, on a case by case basis, by Select Health of South Carolina when making coverage determinations. In the event of conflict between this clinical policy and plan benefits and/or state or federal laws and/or regulatory requirements, the plan benefits and/or state and federal laws and/or regulatory requirements shall control. Select Health of South Carolina's clinical policies are for informational purposes only and not intended as medical advice or to direct treatment. Physicians and other health care providers are solely responsible for the treatment decisions for their patients. Select Health of South Carolina's clinical policies are reflective of evidence-based medicine at the time of review. As medical science evolves, Select Health of South Carolina will update its clinical policies as necessary. Select Health of South Carolina's clinical policies are not guarantees of payment.

Coverage policy

Pulsed dye laser treatment for port-wine stains and infantile hemangiomas is clinically proven and, therefore, may be medically necessary for any of the following indications (Darrow, 2015; Krowchuk, 2019; Randel, 2016; Sabeti, 2021):

- Emergency therapy due to life-threatening complications.
- Urgent therapy of existing or imminent functional impairment, pain, or bleeding.
- Evaluation to identify structural anomalies potentially associated with the disorder.
- Elective treatment to reduce likelihood of long-term or permanent disfigurement.

Only pulsed dye laser therapy should be used for port-wine stains (Sabeti, 2021), and it should be used for infantile hemangiomas only in refractory cases (Darrow, 2015; Krowchuk, 2019). Propranolol should be used for systemic therapy for infantile hemangiomas, at 2 – 3 mg/kg daily, for at least six months to as many as 12 months (Krowchuk, 2019).

CCP.1136

Note: Depending on the extent of the port-wine stains, several laser treatments may be required, spaced at two- to three-month intervals.

Limitations

No limitations were identified during the writing of this policy.

Alternative covered services

- Adjuvant medications (e.g., propranolol).
- Photodynamic therapy.
- Surgical debulking and excision.
- Consultation with dermatologist.

Background

A port-wine stain (nevus flammeus) is a red or purple mark, often on the face. Port-wine stains represent the most common cutaneous vascular lesions and are commonly known as fire marks. They are caused by a localized area of abnormal blood vessels (capillaries). About three in 1,000 babies are born with port-wine stains (Nguyen, 2019). Most occur on the face, but any area of the skin can be affected. Although the vast majority of port-wine stains are present at birth, they can occasionally develop later on (Cunliffe, 2022b).

Port-wine stains arise from somatic activating variants in the guanine nucleotide-binding protein G(q) subunit alpha gene, most commonly the arginine-to-glutamine substitution at codon 183, together with related signaling networks. These variants drive endothelial dysfunction, aberrant vessel maturation, and progressive darkening and thickening of the lesion over the lifespan. This mosaic molecular basis helps explain the wide variation in treatment response and underlies current interest in imaging-guided parameter selection and pathway-targeted adjunctive therapy (Zhou, 2026).

A modest percentage of port-wine stains located over the eye and central forehead can be associated with glaucoma and/or complications in the brain resulting in seizures or developmental disabilities. This association of facial port-wine stains and glaucoma and/or seizures is called the Sturge-Weber Syndrome. The location and the extent of the port-wine stains on one extremity can lead to enlargement of the extremity relative to an unaffected limb (Klippel-Trenaunay-Weber Syndrome) (Cunliffe, 2022b).

Infantile hemangiomas are the most common benign childhood tumors. They are classified according to the International Society for the Study of Vascular Anomalies as distinct from more proliferative vascular malformations with implications for care management, as most infantile hemangiomas do not require imaging for diagnosis or aggressive treatment (Wildgruber, 2019). They typically develop within four to six weeks of birth, and approximately 20% are present at birth. Infantile hemangioma may present as a superficial nevus or as a deeply set lesion in the dermis and subcutis. While most lesions require no treatment, some can grow rapidly, bleed, or ulcerate. Segmental proliferative hemangiomas present the most challenges, as they occur at a younger age, can grow up to ten times larger, and are more likely to have associated congenital anomalies (Cunliff, 2022a).

Genetic mechanisms underlying infantile hemangiomas have been implicated in certain multi-organ birth defect syndromes. These syndromes include the acronyms PHACE (*P*osterior fossa brain malformations, *s*egmental facial *H*emangiomas, *A*rterial anomalies, *C*ardiac defects, *E*ye anomalies, and *s*ternal clefting or supraumbilical raphe) and LUMBAR (*L*ower body hemangiomas, *U*rogenital anomalies, *M*yelopathy, *B*one deformities, *A*norectal malformations/*A*rterial anomalies, and *R*enal anomalies) (Siegel, 2018).

A distant subset of infantile hemangioma consists of multiple small lesions varying in size from a few millimeters to one to two centimeters. This form of infantile hemangioma (so-called multiple neonatal hemangiomatosis) has a higher risk of visceral involvement, particularly in the liver and gastrointestinal tract; however, the prognosis for the skin lesions is usually good, as they often involute by two years of age (Wildgruber, 2019).

Pulsed dye lasers target oxyhemoglobin and deoxyhemoglobin. They penetrate up to two millimeters of skin with a duration of just milliseconds. The procedure is delivered in outpatient settings, over multiple sessions, with or without anesthesia. The U.S. Food and Drug Administration has cleared certain laser devices for marketing through the 510(k) process for specific dermatologic indications, including treatment of port-wine stains and infantile hemangiomas (Food and Drug Administration, 2023a, 2024). The flashlamp-pulsed dye laser emits a yellow light wave length of 595 to 600 nanometers, which allows deeper penetration than the original 577 nanometer models introduced in the 1980s (Brightman, 2015).

The U.S. Food and Drug Administration 510(k) record for the Candela Vbeam family (Vbeam Prima and Vbeam Perfecta; K230990; decision date June 1, 2023) identifies the devices as Class II powered laser surgical instruments (product code GEX; 21 CFR 878.4810). The 510(k) summary states that the clearance expanded the 595 nanometer indications to include pediatric treatment of cutaneous capillary malformations, also known as port-wine stains, infantile hemangiomas, and congenital hemangiomas (Food and Drug Administration, 2023a).

The US Food and Drug Administration describe medical lasers as medical devices that use precisely focused light to treat or remove tissue. The agency's general safety information identifies potential risks of laser surgery, including incomplete treatment, pain, infection, bleeding, scarring, and skin-color changes, and notes that laser surgery uses non-ionizing radiation. These general safety points supplement, but do not replace, the condition-specific clinical evidence summarized below (Food and Drug Administration, 2023b).

Findings

The evidence base for pulsed dye laser treatment consists of multiple clinical practice guidelines from the American Academy of Pediatrics (Darrow, 2015; Krowchuk, 2019; Randel, 2016), Japanese national clinical practice guidelines for vascular anomalies (Kinoshita, 2026), and dermatological consensus statements (Sabeti, 2021), supported by extensive systematic reviews and meta-analyses encompassing over 10,000 participants (Hashemi, 2025). For port-wine stains, systematic reviews demonstrate clearance rates ranging from 21% achieving 75 to 100% clearance (van Raath, 2019) to 89% achieving good to excellent clearance in more recent studies (Hashemi, 2025), with permanent adverse effects occurring in less than 1% of participants (Hashemi, 2025; Shi, 2023). The evidence confirms pulsed dye laser as the gold standard treatment for port-wine stains, though hemoporphin-mediated photodynamic therapy achieved greater clearance than the 595 nanometer pulsed dye laser in a network meta-analysis of randomized trials and in a retrospective comparison of 1,129 participants; hemoporphin is not approved by the United States Food and Drug Administration and remains investigational in this country (Ding, 2025; Nguyen L, 2025; Zhou, 2026).

Somatic variants in the guanine nucleotide-binding protein G(q) subunit alpha gene and related pathways underlie port-wine stains, and quantitative vascular imaging such as dynamic optical coherence tomography is being investigated to guide parameter selection and to measure response, but neither is yet established in routine care (Zhou, 2026). For infantile hemangiomas, the evidence supports propranolol as first-line systemic therapy (Jangid, 2024; Kinoshita, 2026; Krowchuk, 2019), with pulsed dye laser demonstrating 80 to 90% response rates (Jangid, 2024) and particular effectiveness for superficial lesions and refractory cases (Chaple Gil, 2025). Combination therapy with beta-blockers and pulsed dye laser shows superior outcomes to monotherapy for uncomplicated lesions (Chaple Gil, 2025; Chen, 2020), with shorter treatment duration and lower recurrence

rates; for ulcerated lesions, however, the addition of laser to beta-blocker therapy has not been shown to shorten healing time, and the evidence remains inconclusive (Kinoshita, 2026; Lee, 2026). Early intervention improves outcomes for both conditions (Hashemi, 2025; Okuda, 2026; Sabeti, 2021), though optimal treatment protocols remain undetermined and must be individualized based on factors including lesion characteristics, morphological subtype, peak lesion size, participant age, and skin type (Okuda, 2026).

Guidelines

A consensus statement from dermatological experts in the United States recommends pulsed dye laser as the standard treatment for port-wine stains regardless of lesion size, location, or color. Laser treatment is safe for people of all ages when performed by experienced physicians to minimize the psychosocial impact and to diminish nodularity and potential tissue hypertrophy. Treatment efficacy is higher in participants with lighter skin types. In participants with skin of color (for example, Fitzpatrick skin types V and VI), higher rates of side effects, mainly dyspigmentation and atrophic scarring, may be observed, but moderate energy densities, less pulse overlap, and increased cooling may minimize these risks. Starting treatment at an earlier age may achieve better outcomes, and the use of general anesthesia in young participants should be considered on a case-by-case basis (Sabeti, 2021).

An American Academy of Pediatrics guideline notes that since 2008, propranolol has been used to treat infantile hemangioma. The guideline recommends the drug, with cardiovascular monitoring every hour for two hours, with repeat monitoring for any dose increase over five milligrams per kilogram. If propranolol cannot be used or is ineffective, corticosteroids (usually daily oral prednisone or prednisolone) can be an alternative therapy. Laser therapy may be useful in treating early lesions (Randel, 2016).

A 2015 report from the American Academy of Pediatrics provided updates on the pathogenesis, treatment, and clinical associations of infantile hemangiomas, including the use of pulsed dye laser for refractory cases (Darrow, 2015).

The most recent American Academy of Pediatrics guideline on infantile hemangiomas declares that pulsed dye laser is safe and effective, and evidence has demonstrated that pulsed dye is more effective than other laser therapies, although acknowledging there is controversy over using the technique in infants. The guideline also recommends using propranolol for systemic treatment of infantile hemangiomas (Krowchuk, 2019).

The Japanese clinical practice guidelines for vascular tumors, vascular malformations, lymphatic malformations, and lymphangiomatosis, prepared in 2022 and published in English in 2026, address laser therapy through formal clinical questions with graded recommendations. Dye laser is identified as first-line therapy for capillary malformations; treatment is likely to be more effective on the face and neck than at other sites and more likely to cause pigmentary complications on the limbs (strength of recommendation 2, evidence C). Initiation of laser therapy before one year of age is recommended as an option (strength of recommendation 2, evidence D), and lesions may darken again with time after treatment (strength of recommendation 2, evidence C). Lasers other than the dye laser, including the alexandrite laser and the neodymium-doped yttrium aluminum garnet laser for thickened lesions, are not first-line but may be tried in cases resistant to dye laser (strength of recommendation 2, evidence D). For infantile hemangioma, oral propranolol administered under careful monitoring is the first choice (strength of recommendation 1, evidence A), preferably started within six months of birth and stopped by 12 to 15 months of age. For ulcerated lesions, oral propranolol is recommended (strength of recommendation 1, evidence B), whereas laser therapy performed by an expert may be effective in some cases but the evidence is considered insufficient at present (strength of recommendation 2, evidence D) (Kinoshita, 2026).

Systematic Reviews and Meta-Analyses

Port-wine stains - Efficacy and outcomes

A review of 65 studies (n = 6,207) revealed that just 21% of participants with port-wine stains treated with pulsed dye laser achieved 75% to 100% clearance. The authors observed no improvement in outcomes over the past three decades despite technological improvements and changes in participant selection, indicating the need for further research of novel therapies (van Raath, 2019).

A systematic review examining 33 journal articles (n = 7,725 total participants, including 2,033 with port-wine birthmarks) demonstrated that good, excellent, or complete clearance was achieved in 17 of 19 studies (89%) for port-wine birthmarks, confirming pulsed dye laser as the gold standard treatment with particular benefit when initiated early in childhood (Hashemi, 2025).

Protocol changes such as varying interval time between pulsed dye laser treatments appears to have no effect on participant outcomes (Snast, 2021). Newer generations of pulsed dye laser, such as large spot pulsed dye laser, may offer improved effectiveness and efficiency but require higher quality studies to confirm improvement in outcomes (Sodha, 2023).

Port-wine stains - Comparative effectiveness

A systematic review and network meta-analysis identified 27 randomized controlled trials, of which 12 contributed to the quantitative network covering 1,033 observations across 19 treatment approaches. Hemoporphin-mediated photodynamic therapy was significantly more effective than the 595-nanometer pulsed dye laser (mean difference 0.97; 95% confidence interval 0.64 to 1.31), though it carried the highest risk of long-term adverse events. Pulsed dye laser remained superior to photodynamic therapy alone (mean difference negative 1.49), no treatment (negative 1.37), intense pulsed light (negative 1.13), and diode laser (negative 1.02). The 755-nanometer alexandrite laser and the combination of 595 nanometer pulsed dye laser with the 1064 nanometer neodymium-doped yttrium aluminum garnet laser also carried a high risk of adverse events. Most included trials had unclear risk of bias owing to incomplete reporting, and rates of treatment discontinuation for adverse events did not differ significantly among modalities (Nguyen L, 2025).

For treating hypertrophic or resistant port-wine stains, a network meta-analysis of eight comparative studies (comprising 308 difficult-to-treat port-wine stains) found intense pulsed light (odds ratio 11.81, 95% confidence interval 2.15 to 64.89) and 585 nanometer long-pulsed dye laser (odds ratio 9.95, 95% confidence interval 1.75 to 56.62) were likely more effective than 585 nanometer short pulsed dye laser in further clearing lesions by more than 25%. The evidence was rated as having low certainty in the findings (Jamjanya, 2023).

A single-center retrospective analysis compared 850 participants with port-wine stains treated with the 595 nanometer pulsed dye laser and 279 participants treated with hemoporphin-mediated photodynamic therapy over a ten-year period. Cumulative cure, defined as at least 75% clearance, significant response, and overall response rates were 22.2%, 54.1%, and 88.9% with photodynamic therapy versus 9.7%, 31.3%, and 68.9% with pulsed dye laser, respectively (all P = 0.001). Long-term hyperpigmentation and hypopigmentation were more frequent after pulsed dye laser (14.0% and 7.3%, respectively) than after photodynamic therapy (9.0% and 3.9%), and no serious adverse effects occurred in either group. The study was retrospective and non-randomized, and it was conducted in a Chinese population in which hemoporphin is licensed; hemoporphin is not approved by the United States Food and Drug Administration, which limits applicability to practice in this country (Ding, 2025).

Port-wine stains - Safety profile

Shi's systematic review and meta-analysis identified several acute and long-term complications associated with pulsed dye laser. The pooled complication rates were purpura (98.3%), edema (97.6%), crusting (21.5%), blistering (8.7%), hyperpigmentation (12.8%), hypopigmentation (0.9%), and scarring (0.2%). Long-term

permanent complications occur infrequently, suggesting the importance of protective measures after treatment in preventing scar formation (Shi, 2023).

An analysis of 2,033 participants with port-wine birthmarks demonstrated excellent safety with only 16 participants (0.8%) reporting permanent adverse effects including scarring, keloids, or permanent pigmentation change, with no cases of blindness or serious injury reported (Hashemi, 2025).

Pain is a common side effect after laser therapy for dermatological procedures for conditions such as port-wine stains. A review of 32 randomized and nonrandomized controlled studies showed that noninvasive techniques, including pulsed dye laser, resulted in less pain than placebo, and topical anesthesia had better outcomes than skin cooling (Greveling, 2017).

Port-wine stains - Special populations

Eckembrecher (2023) summarized nine observational studies (n = 241) on pulsed dye laser for treating port-wine stains in participants with Fitzpatrick skin type IV–VI. While preliminary evidence suggests pulsed dye laser can be effective in participants with darker skin color, larger studies with diverse populations are needed to inform clinical practice, including use of adjunct treatments to mitigate adverse effects.

Port-wine stains - Emerging and investigational approaches

A 2026 evidence synthesis integrating mechanistic and clinical literature reaffirmed the 595 nanometer pulsed dye laser as the global first-line modality for port-wine stains while emphasizing that response is heterogeneous and often incomplete, particularly in thick or nodular lesions. Somatic activating variants in the guanine nucleotide-binding protein G(q) subunit alpha gene and downstream mitogen-activated protein kinase and phosphoinositide 3-kinase signaling drive lesion progression, providing a rationale for pathway-targeted adjunctive agents such as mitogen-activated protein kinase kinase inhibitors and inhibitors of the mechanistic target of rapamycin, none of which is yet supported by adequate clinical trial evidence. Hemoporphin-mediated photodynamic therapy achieved high efficacy in selected phenotypes but with a distinct adverse-event profile. Quantitative imaging techniques, principally dynamic optical coherence tomography, can noninvasively measure vessel depth and caliber and may support phenotype-guided parameter selection and objective assessment of response; these approaches remain investigational and are not established components of care (Zhou, 2026).

Infantile hemangioma - Efficacy and outcomes

A systematic review of 198 articles examining management of infantile hemangiomas confirmed that propranolol remains the first-line systemic treatment, with other beta-blockers such as nadolol, timolol, atenolol, acebutolol, and captopril showing comparable results to propranolol. Pulsed dye laser demonstrated response rates of 80–90% in numerous studies, with the authors concluding that a conventional combination of beta-blockers with laser therapy might represent first-line treatment to arrest growth of infantile hemangiomas (Jangid, 2024).

An analysis of 5,692 participants with hemangiomas demonstrated that good, excellent, or complete clearance was achieved in seven of seven studies (100%) for infantile hemangiomas, with only 11 participants (0.2%) reporting permanent adverse effects including scarring, keloids, or permanent pigmentation change, with no cases of blindness or serious injury reported (Hashemi, 2025).

A systematic review and network meta-analysis of 30 randomized trials assessing treatment for infantile hemangioma found laser with topical beta blockers had the greatest efficiency, and long-pulsed dye laser was the most effective. A higher dose and a longer treatment duration of oral propranolol achieved a higher success rate and increased side effects, while pulse dye laser with propranolol had the lowest incidence of adverse reactions (Fei, 2020).

Infantile hemangioma - Comparative effectiveness

A systematic review evaluating 20 studies (n = 2,856 participants) across various laser modalities found that 595 nanometer pulsed dye laser demonstrated high efficacy for superficial infantile hemangiomas with improvement rates up to 85%, while the 1064 nanometer neodymium-doped yttrium aluminum garnet laser was more effective for deeper lesions, achieving up to 87.57% regression. Combination therapies, particularly pulsed dye laser with propranolol or timolol, yielded superior outcomes compared to monotherapy, with higher regression rates, shorter treatment duration, and lower recurrence rates, while adverse effects were generally mild and infrequent across all laser modalities (Chaple Gil, 2025).

A Cochrane review of 28 studies (n = 1,728) found that compared with placebo, oral propranolol (3 milligrams per kilograms daily) for infantile hemangiomas probably improves clinician-assessed clearance with no difference in rates of serious adverse events, including no instances of bradycardia or hypotension. In two trials of children with superficial early hemangiomas in the pre-proliferative or early proliferative growth phase (n = 143); there were no differences in clearance outcomes, aesthetic appearance, or requirements for surgical correction when comparing pulsed dye laser to wait-and-see, although fewer adverse events were reported in the wait-and-see group (Novoa, 2019).

An Agency for Healthcare Quality and Research review of 148 studies of infantile hemangioma outcomes indicated that longer-pulse pulsed dye laser was generally more effective than observation (Chinnadurai, 2016b). This finding was consistent with a review of 29 studies, which also concluded that pulsed dye laser worked better than other laser therapies (Chinnadurai, 2016a). Reported side effects of laser treatment include purpura, swelling, blisters, hypopigmentation, bleeding, infection, and atrophic or hypertrophic scarring. Limitations of the evidence include small sample size, lack of comparative studies, and protocol variations. Nonetheless, laser treatment can be considered if there is a contraindication to systemic treatment (Chinnadurai, 2016a, 2016b).

Combination therapy

A meta-analysis analyzed efficacy of combined therapy with adrenergic beta-antagonist and lasers for infantile hemangiomas. Combined therapy with oral propranolol and lasers was superior to propranolol or lasers alone (both $P < .00001$). Combined therapy with topical timolol and lasers was superior to topical timolol ($P < .00001$) or lasers ($P = .007$) alone. Authors observed no differences in adverse effects (Chen, 2020).

A systematic review evaluating pulsed dye laser combined with sirolimus for treatment of capillary malformations analyzed nine studies (n = 58 participants). While five studies showed improvement in measured post-treatment parameters including shortened treatment time and less frequent dosing, three studies utilizing colourimetric analysis found no statistically significant differences between pulsed dye laser monotherapy and combination therapy with sirolimus. Seven studies reporting subjective clearance by photographic evaluation demonstrated statistically significant improvement, though considerable heterogeneity among studies requires larger studies with standardized protocols to establish conclusive safety and efficacy guidelines (Tan, 2024).

A systematic review and meta-analysis of nine studies examined whether adding laser therapy to beta-blocker treatment shortens healing of ulcerated infantile hemangiomas; three studies provided quantitative healing times. Combination beta-blocker and laser therapy suggested faster healing, but the pooled result did not reach statistical significance. Most included studies addressed ulcerated lesions only incidentally and lacked a beta-blocker monotherapy comparator. The authors concluded that laser may be a useful adjunct in appropriately selected cases but that current evidence is insufficient to establish a benefit for ulceration specifically (Lee, 2026).

Cohort Studies

A multicenter retrospective cohort study examined 117 children with nonulcerated infantile hemangioma treated with pulsed dye laser. In the 99 (84.6%) participants who had late intervention (≥ 12 months of life), there was a mean 85% overall improvement compared to baseline (range 18% to 100%) measured by visual

analog scale, mostly in erythema or telangiectasias, with a low incidence of adverse effects (6.1%) (Shah, 2023).

A single-center retrospective study of 92 participants with 107 infantile hemangioma lesions treated with pulsed dye laser, with oral propranolol added for 24 lesions, found that earlier initiation of laser therapy was strongly associated with an earlier peak in lesion size ($r = 0.80$, $P < 0.0001$). Among 87 lesions evaluable at follow-up, 48.3% had no residual skin change, 27.6% had mild change, 11.5% had moderate change, and 12.6% had severe change. Nodular lesions showed significantly more severe residual change than superficial lesions ($P < 0.0001$), and a peak lesion size of 3 square centimeters or greater independently predicted severe residual change (odds ratio 21.6; 95% confidence interval 2.93 to 358; $P = 0.0090$). Prematurity and low birth weight were not risk factors when laser therapy was initiated early, and the severity of residual change did not differ between laser monotherapy and laser combined with propranolol ($P = 0.477$). The authors support early risk stratification by morphological subtype and lesion size, with timely consideration of systemic therapy in high-risk cases (Okuda, 2026).

In 2026, we reorganized the findings section by evidence type rather than chronologically and incorporated five new systematic reviews (Chaple Gil, 2025; Hashemi, 2025; Jangid, 2024; Nguyen L, 2025; Tan, 2024). No policy changes were warranted. In 2026, we added one national clinical practice guideline (Kinoshita, 2026), one systematic review and meta-analysis of ulcerated infantile hemangioma (Lee, 2026), two retrospective cohorts (Ding, 2025; Okuda, 2026), and one mechanistic and imaging-focused evidence synthesis (Zhou, 2026). We also recorded the June 2023 premarket notification clearance of the 595 nanometer pulsed dye laser for the pediatric population. No policy changes were warranted.

References

On August 17, 2026, we searched PubMed and the databases of the Cochrane Library, the U.K. National Health Services Centre for Reviews and Dissemination, the Agency for Healthcare Research and Quality, and the Centers for Medicare & Medicaid Services. Search terms were (“port wine stain (MeSH),” “hemangioma (MeSH),” “dye laser, pulsed (MeSH),” “port wine stain,” “propranolol,” “infantile hemangioma,” and “laser treatment.” We included the best available evidence according to established evidence hierarchies (typically systematic reviews, meta-analyses, and full economic analyses, where available) and professional guidelines based on such evidence and clinical expertise.

Brightman LA, Geronemus RG, Redy KK. Laser treatment of port-wine stains. *Clin Cosmet Investig Dermatol*. 2015;8:27-33. Doi: 10.2147/CCID.S53118.

Chaple Gil A, Caviedes R, Díaz L, Von Marttens A, Sotomayor C, Basualdo J, Beltrán V, Jorquera G, Bersezio C, Angel P, Cabello Ibacache R, Fernández E. Comparative evaluation of laser therapy for infantile hemangiomas: a systematic review of clinical outcomes and treatment considerations. *Photodiagnosis Photodyn Ther*. 2025;53:104637. Doi:10.1016/j.pdpdt.2025.104637.

Chen X, Guo Y, Wang P, et al. Efficacy and safety of adrenergic beta-antagonist combined with lasers in the treatment of infantile hemangiomas: A meta-analysis. *Pediatr Surg Int*. 2020;36(10):1135-1147. Doi: 10.1007/s00383-020-04711-2.

Chinnadurai S, Sathe NA, Surawicz T. Laser treatment of infantile hemangioma: A systematic review. *Lasers Surg Med*. 2016;48(3):221-233. Doi: 10.1002/lsm.22455.(a)

Chinnadurai S, Snyder K, Sathe N, et al (eds.). Diagnosis and management of infantile hemangioma. Rockville (MD): Agency for Healthcare Research and Quality (US); 2016 Jan. Report No.: 16-EHC002-EF. *AHRQ Comparative Effectiveness Reviews No. 18*. <https://www.ncbi.nlm.nih.gov/books/NBK344065/>. Published 2016.(b)

Cunliffe T. Infantile haemangiomas (including strawberry naevi). Primary Care Dermatology Society. <https://www.pcds.org.uk/clinical-guidance/strawberry-naevus>. Last updated June 15, 2022. (a)

Cunliffe T. Port-wine stain (syn. naevus flammeus). Primary Care Dermatology Society. <http://www.pcds.org.uk/clinical-guidance/port-wine-stain-syn.-naevus-flammeus#history>. Last updated June 15, 2022. (b)

Darrow DH, Greene AK, Mancini AJ, Nopper AJ, Section on Dermatology, Section on Otolaryngology-Head and Neck Surgery, and Section on Plastic Surgery. Diagnosis and management of infantile hemangioma. *Pediatrics*. 2015;136(4):e1060-1104. Doi: 10.1542/peds.2015-2485.

Ding Y, Jin C, Liang X, Chen J, Liu S. Comparison of the effects of hemoporphin-mediated photodynamic and Vbeam pulsed dye laser in the treatment of port-wine stains: a retrospective analysis. *Eur J Med Res*. 2025;30(1):533. Doi: 10.1186/s40001-025-02820-z.

Eckembrecher FJ, Eckembrecher DG, Camacho I, Shah H, Jaalouk D, Nouri K. A review of treatment of port-wine stains with pulsed dye laser in Fitzpatrick skin type IV-VI. *Arch Dermatol Res*. 2023;315(9):2505-2511. Doi: 10.1007/s00403-023-02640-3.

Fei Q, Lin Y, Chen X, et al. Treatments for infantile hemangioma: A systematic review and network meta-analysis. *EClinicalMedicine*. 2020;26:100506. Doi: 10.1016/j.eclinm.2020.100506.

Greveling K, Prens EP, Liu L, van Doorn MBA. Non-invasive anaesthetic methods for dermatological laser procedures: A systematic review. *J Eur Acad Dermatol Venereol*. 2017;31(7):1096-1110. Doi: 10.1111/jdv.14130.

Hashemi DA, Tao J, Wang JV, Geronemus RG. The 595-nm wavelength pulsed dye laser for pediatric port-wine birthmarks and infantile hemangiomas: a systematic review. *Lasers Surg Med*. 2025;57(1):27-36. Doi: 10.1002/lsm.23864.

Jamjanya S, Vejjabhinanta V, Tanasombatkul K, Phinyo P. Comparative effectiveness among available treatments in difficult-to-treat port-wine stains (PWS): A network meta-analysis of observational evidence. *J Dermatolog Treat*. 2023;34(1):2231582. Doi: 10.1080/09546634.2023.2231582.

Jangid SD, Madke B, Bhatt D, Singh AL. A systematic review on management of infantile hemangiomas: how far we have reached in this past decade. *Indian J Paediatr Dermatol*. 2024;25(3):188-194. Doi:10.4103/ijpd.ijpd_65_24.

Kinoshita Y, Ishikawa K, Akita S, et al. Japanese clinical practice guidelines for vascular tumors, vascular malformations, lymphatic malformations, and lymphangiomatosis 2022. *Jpn J Radiol*. 2026;44(5):745-855. Doi: 10.1007/s11604-025-01932-0.

Krowchuk DP, Frieden IJ, Mancini AJ, et al, Subcommittee on the Management of Infantile Hemangiomas. Clinical practice guideline for the management of infantile hemangioma. *Pediatrics*. 2019;143(1):e20183475. Doi: 10.1542/peds.2018-3475.

Lee D, Bueth M, Sui J, Stein AB, Heskett K, Eichenfield DZ. Multimodal management of ulcerated infantile hemangioma with beta blockers and laser therapy – a systematic review and meta-analysis. *Pediatr Dermatol*. 2026;43(5):879-883. Doi: 10.1111/pde.70227.

- Nguyen V, Hochman M, Mihm MC, Nelson JS, Tan W. The pathogenesis of port wine stain Sturge Weber Syndrome: Complex interactions between genetic alterations and aberrant MAPK and PI3K activation. *Int J Mol Sci*. 2019;20(9):2243. Doi: 10.3390/ijms20092243.
- Nguyen L, Sorbe C, Schoen G, Schneider SW, Herberger K. Laser and light-based treatments for port-wine birthmarks – a systematic review and network meta-analysis. *J Dtsch Dermatol Ges*. 2025;23(3):293-301. Doi: 10.1111/ddg.15612.
- Novoa M, Baselga E, Beltran S, et al. Interventions for infantile haemangiomas of the skin: Abridged Cochrane systematic review and GRADE assessments. *Br J Dermatol*. 2019;180(3):527-533. Doi: 10.1111/bjd.17407.
- Okuda K, Nakamura M, Nakamura R, Takagi S, Morita A. Early intervention effects and risk factors for residual skin changes in infantile hemangiomas. *J Dermatol*. 2026 Jul 30. Doi: 10.1111/1346-8138.70388.
- Randel A. American Academy of Pediatrics releases report on infantile hemangioma. *Am Fam Physician*. 2016;93(6):526-527. <https://www.aafp.org/pubs/afp/issues/2016/0315/p526.html>.
- Sabeti S, Ball KL, Burkhart C, et al. Consensus statement for the management and treatment of port-wine birthmarks in Sturge-Weber Syndrome. *JAMA Dermatol*. 2021;157(1):98-104. Doi: 10.1001/jamadermatol.2020.4226.
- Shah SD, Mathes EF, Baselga E, et al. Multicenter retrospective review of pulsed dye laser in nonulcerated infantile hemangioma. *Pediatr Dermatol*. 2023;40(1):28-34. Doi: 10.1111/pde.15132.
- Shi MD, Yang K, Li SB, Zhao Q, Huo R, Fu C. Complication rates and safety of pulsed dye laser treatment for port-wine stain: A systematic review and meta-analysis. *Lasers Med Sci*. 2023;39(1):16. Doi: 10.1007/s10103-023-03961-5.
- Siegel DH. PHACE syndrome: Infantile hemangiomas associated with multiple congenital anomalies: Clues to the cause. *Am J Med Genet C Semin Med Genet*. 2018;178(4):407-413. Doi: 10.1002/ajmg.c.31659.
- Snast I, Lapidoth M, Kaftory R, et al. Does interval time between pulsed dye laser treatments for port-wine stains influence outcome? A systematic review and meta-analysis. *Lasers Med Sci*. 2021;36(9):1909-1916. Doi: 10.1007/s10103-021-03264-7.
- Sodha P, Wang JV, Aboul-Fettouh N, et al. Largest comparative analysis: Novel large spot size 595 nm, high-energy, pulsed dye laser reduces number of treatments for improvement of adult and pediatric port wine birthmarks. *Lasers Surg Med*. 2023;55(8):741-747. Doi: 10.1002/lsm.23693.
- Tan IJ, Truong TM, Pathak GN, et al. Evaluating the clinical efficacy of pulsed dye laser with sirolimus for treatment of capillary malformations: a systematic review. *Skin Health Dis*. 2024 Jan;4(1):e333. Doi: 10.1002/ski2.333.
- U.S. Food and Drug Administration. 510(k) premarket notification K230990: Candela Vbeam family of pulsed dye lasers (Vbeam Prima, Vbeam Perfecta). Silver Spring (MD): United States Food and Drug Administration; decision date June 1, 2023. <https://www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfpmn/pmn.cfm?ID=K230990>. 510(k) summary: https://www.accessdata.fda.gov/cdrh_docs/pdf23/K230990.pdf. (2023a)
- U.S. Food and Drug Administration (2023b). Medical lasers. Silver Spring (MD): United States Food and Drug Administration; updated August 3, 2023. <https://www.fda.gov/radiation-emitting-products/surgical-and-therapeutic-products/medical-lasers>.

U.S. Food and Drug Administration (2024). Premarket notification 510(k). Silver Spring (MD): United States Food and Drug Administration; updated August 22, 2024. <https://www.fda.gov/medical-devices/premarket-submissions-selecting-and-preparing-correct-submission/premarket-notification-510k>.

Van Raath MI, Chohan S, Wolkerstorfer A, van der Horst CMAM, Storm G, Heger M. Port wine stain treatment outcomes have not improved over the past three decades. *J Eur Acad Dermatol Venereol*. 2019;33(7):1369-1377. Doi: 10.1111/jdv.15599.

Wildgruber M, Sadick M, Müller-Wille R, Wohlgemuth WA. Vascular tumors in infants and adolescents. *Insights Imaging*. 2019;10(1):30. Doi: 10.1186/s13244-019-0718-6.

Zhou J, Hua L, Gan L, Wang Y. Port-wine stains: molecular drivers, translational models, and emerging theragnostic directions. *Lasers Med Sci*. 2026;41(1):158. Doi: 10.1007/s10103-026-04957-7.

Policy updates

- 9/2014: initial review date and clinical policy effective date: 1/2015
- 9/2015: Policy references updated.
- 9/2016: Policy references updated.
- 9/2017: Policy references updated.
- 9/2018: Policy references updated.
- 9/2019: Policy references updated. Policy ID changed to CCP.1136.
- 9/2020: Policy references updated. Title changed.
- 9/2021: Policy references updated.
- 9/2022: Policy references updated. Title changed.
- 9/2023: Policy references updated.
- 9/2024: Policy references updated.
- 9/2025: Policy references updated.
- 9/2026: Policy references updated.

Related codes

Below are the most commonly submitted codes for the service(s)/item(s) subject to this policy CCP.1136 This is not an exhaustive list of codes. Providers are expected to consult the appropriate coding manuals and bill accordingly.

Code	Code description
17106	Destruction of cutaneous vascular proliferative lesions (for example, laser technique); less than 10 square centimeters
17107	Destruction of cutaneous vascular proliferative lesions (for example, laser technique); 10.0 to 50.0 square centimeters
17108	Destruction of cutaneous vascular proliferative lesions (for example, laser technique); over 50.0 square centimeters

Code	Code description
17999	Unlisted procedure, skin, mucous membrane and subcutaneous tissue
96999	Unlisted special dermatological service or procedure
00300	Anesthesia for all procedures on the integumentary system, muscles and nerves of head, neck, and posterior trunk, not otherwise specified
00400	Anesthesia for procedures on the integumentary system on the extremities, anterior trunk and perineum; not otherwise specified
J8499	Prescription drug, oral, non chemotherapeutic, not otherwise specified