
Certificate in Hyperbaric Medicine (United Kingdom)

Wound Care in Hyperbaric Medicine

Acute Wound – a wound that has progressed through the inflammatory phase and is entering the proliferative stage within 7 days of injury. Related terms: chronic wound, inflammatory phase, proliferative phase. In hyperbaric medicine the focus is on preventing transition to chronicity by ensuring adequate oxygen delivery. Practical application includes early HBOT to reduce edema and promote angiogenesis. Challenges involve timely identification and coordination with surgical teams.

Adjunctive Therapy – any treatment used in addition to the primary wound-care protocol to enhance healing. Related terms: hyperbaric oxygen therapy, negative-pressure wound therapy, debridement. Examples are the use of growth-factor dressings alongside HBOT. The challenge is selecting modalities that synergise rather than interfere, and managing increased cost and resource allocation.

Air Embolism – entry of air bubbles into the vascular system, potentially life-threatening during HBOT if chamber protocols are breached. Related terms: barotrauma, decompression illness, safety checklist. Prevention relies on strict chamber entry procedures. If it occurs, immediate recompression may be required, presenting a critical challenge for clinicians unfamiliar with emergency protocols.

Anaerobic Bacteria – microorganisms that thrive in low-oxygen environments, often colonising chronic wounds. Related terms: biofilm, clostridial infection, antimicrobial dressing. HBOT raises tissue oxygen tension, inhibiting anaerobic growth and enhancing leukocyte killing. The challenge is identifying anaerobic infection early, as standard cultures may miss deep-seated organisms.

Angiogenesis – formation of new capillary blood vessels from pre-existing vasculature, essential for wound repair. Related terms: vascular endothelial growth factor, hyperbaric oxygen therapy, granulation tissue. HBOT stimulates angiogenic factors, accelerating granulation. Clinicians must monitor for excessive granulation that may impede epithelialisation, a practical balance to achieve.

Antimicrobial Dressing – wound covering impregnated with agents such as silver, iodine, or honey to reduce microbial load. Related terms: bacterial load, biofilm, debridement. When used with HBOT, the increased oxygen can potentiate the antimicrobial effect. Challenges include dressing changes that may disrupt the hyperoxic environment and cost considerations.

Autologous Platelet-Rich Plasma (PRP) – concentration of a patient's own platelets applied to a wound to deliver growth factors. Related terms: growth factors, wound matrix, adjunctive therapy. PRP combined with HBOT can synergise by providing both biochemical and oxygenic stimuli. Practical difficulty lies in the preparation process and ensuring sterility.

Barotrauma – tissue injury caused by pressure differentials during compression or decompression in a hyperbaric chamber. Related terms: air embolism, sinus squeeze, ear barotrauma. In wound care patients, barotrauma may complicate treatment if facial sinuses are involved. Prevention includes gradual

compression rates and patient education, but individual susceptibility varies.

Baseline Assessment – comprehensive initial evaluation of a wound before initiating HBOT, documenting size, depth, exudate, and vascular status. Related terms: wound measurement, photographic documentation, perfusion assessment. Accurate baseline data allow objective monitoring of HBOT efficacy. Challenges include inter-observer variability and the need for specialised tools.

Bacterial Load – quantity of microorganisms present within a wound, expressed as colony-forming units per gram of tissue. Related terms: antimicrobial dressing, biofilm, culture. High bacterial load impedes healing; HBOT reduces anaerobic burden and improves antibiotic penetration. Determining the threshold for intervention remains debated among clinicians.

Biofilm – structured community of bacteria encased in a polymeric matrix that adheres to wound surfaces. Related terms: bacterial load, chronic wound, debridement. Biofilms resist antibiotics and host immunity. HBOT can disrupt biofilm architecture by increasing oxidative stress, yet complete eradication often requires mechanical debridement and adjunctive agents.

Chronic Wound – a wound that fails to progress through the normal phases of healing within 4 weeks, commonly associated with diabetes, venous insufficiency, or pressure injury. Related terms: acute wound, ischemia, hyperbaric oxygen therapy. HBOT is indicated when conventional therapy stalls, aiming to overcome hypoxia. Challenges include patient compliance, co-morbidities, and cost-effectiveness analysis.

Clostridial Myonecrosis – rapidly progressing necrotising infection caused by anaerobic *Clostridium* species, also known as gas gangrene. Related terms: anaerobic bacteria, hyperbaric oxygen therapy, surgical debridement. HBOT is a life-saving adjunct, inhibiting toxin production and enhancing tissue oxygenation. Early diagnosis is critical; delays increase mortality.

Collagen Synthesis – production of collagen fibers by fibroblasts, providing tensile strength to repairing tissue. Related terms: fibroblast activity, hyperbaric oxygen therapy, extracellular matrix. HBOT up-regulates pro-collagen genes, accelerating matrix formation. Over-production can lead to hypertrophic scarring, requiring careful monitoring.

Compression Therapy – application of graded pressure to a limb to improve venous return and reduce edema, essential in venous ulcer management. Related terms: venous insufficiency, ulcer classification, adjunctive therapy. When combined with HBOT, compression enhances perfusion, but improper pressure may compromise arterial inflow, especially in patients with peripheral arterial disease.

Decubitus Ulcer – pressure-induced injury to skin and underlying tissue, commonly occurring over bony prominences. Related terms: pressure injury, stage classification, off-loading. HBOT can be employed for stage III or IV ulcers refractory to standard care. Practical challenges include maintaining pressure relief while the patient undergoes repeated chamber sessions.

Decompression Sickness – illness caused by inert gas bubbles forming in tissues during rapid ascent from increased pressure, a risk for divers and HBOT patients. Related terms: barotrauma, nitrogen narcosis, safety protocol. Although unrelated to wound healing directly, awareness is crucial for patient safety during HBOT.

Treatment involves recompression, which may conflict with wound-care scheduling.

Dermal Graft – transplantation of split-thickness skin or dermal matrix to restore tissue continuity. Related terms: autograft, allograft, wound closure. Post-graft HBOT can improve graft take by enhancing neovascularisation. Challenges include timing of HBOT relative to graft placement and managing donor-site morbidity.

Diabetic Foot Ulcer (DFU) – chronic wound on the foot of a patient with diabetes, often neuropathic and ischemic. Related terms: peripheral neuropathy, peripheral arterial disease, off-loading. HBOT is indicated for DFUs with Wagner grade III or higher, aiming to reduce infection and promote granulation. Barriers include poor glycaemic control and patient adherence to off-loading devices.

Edema Management – strategies to reduce interstitial fluid accumulation that impedes oxygen diffusion. Related terms: compression therapy, lymphatic drainage, hyperbaric oxygen therapy. HBOT transiently decreases edema by vasoconstriction while maintaining oxygen delivery. Over-reliance on this effect without addressing underlying venous insufficiency may lead to recurrence.

Endothelial Progenitor Cells (EPCs) – circulating cells capable of differentiating into endothelial cells, contributing to neovascularisation. Related terms: angiogenesis, stem cells, hyperbaric oxygen therapy. HBOT has been shown to mobilise EPCs, enhancing vascular repair in chronic wounds. Quantifying EPC response remains a research challenge.

Extracellular Matrix (ECM) – complex network of proteins and glycosaminoglycans providing structural support for cells. Related terms: collagen synthesis, fibroblast activity, wound matrix. HBOT influences ECM remodelling by modulating matrix metalloproteinase activity. Excessive degradation can stall healing, requiring careful balance of enzymatic activity.

Fibroblast Activity – proliferation and function of fibroblasts that synthesise collagen, elastin, and ground substance. Related terms: collagen synthesis, granulation tissue, hyperbaric oxygen therapy. Hyperoxia stimulates fibroblast migration and gene expression. In fibrotic wounds, over-active fibroblasts may cause contracture, necessitating therapeutic modulation.

Granulation Tissue – pink, vascularised tissue that fills wound defects during the proliferative phase. Related terms: angiogenesis, fibroblast activity, hyperbaric oxygen therapy. HBOT accelerates granulation formation, reducing time to closure. Hypergranulation, however, can impede epithelial migration and may require debridement.

Growth Factors – signalling proteins such as PDGF, VEGF, and TGF- β that regulate cell proliferation, migration, and angiogenesis. Related terms: fibroblast activity, angiogenesis, PRP. HBOT up-regulates several growth factors, augmenting the healing cascade. Exogenous application must be timed to avoid redundancy and cost inefficiency.

Hyperbaric Oxygen Therapy (HBOT) – medical use of 100 % oxygen at pressures > 1 ATA to increase dissolved oxygen in plasma. Related terms: oxygen tension, barotrauma, wound healing. In wound care it improves hypoxic tissue, combats anaerobes, and stimulates angiogenesis. Practical challenges include

patient selection, contraindications such as untreated pneumothorax, and logistical scheduling.

Ischemia – inadequate blood supply to tissue, leading to oxygen deficiency. Related terms: peripheral arterial disease, hypoxia, reperfusion injury. HBOT temporarily overcomes ischemic deficits by delivering oxygen independent of perfusion. Long-term resolution requires revascularisation; HBOT alone cannot replace arterial flow.

Langer's Lines – natural orientation of collagen fibers in the skin, influencing scar direction. Related terms: incision planning, wound tension, scar management. When planning surgical debridement or graft placement, aligning incisions with Langer's lines reduces tension. HBOT can improve scar quality but does not alter line orientation.

Latent Infection – presence of microorganisms that are not actively causing clinical signs but may proliferate under hypoxic conditions. Related terms: bacterial load, biofilm, culture. HBOT can suppress latent anaerobes, preventing flare-ups. Detecting latent infection requires advanced diagnostics, posing a challenge for routine practice.

Leukocyte Function – ability of neutrophils and macrophages to migrate, phagocytose, and kill pathogens. Related terms: oxidative burst, hyperbaric oxygen therapy, immune modulation. Hyperoxia enhances the oxidative burst, improving bacterial clearance. Immunocompromised patients may still have impaired response despite HBOT.

Medical-Grade Oxygen – purified oxygen meeting regulatory standards for therapeutic use. Related terms: hyperbaric chamber, safety protocol, oxygen toxicity. Ensuring supply integrity is essential; contaminants can provoke adverse reactions. Monitoring for oxygen toxicity, especially in prolonged HBOT courses, is a safety imperative.

Microvascular Perfusion – flow of blood through the smallest vessels, crucial for nutrient and oxygen delivery. Related terms: capillary density, laser Doppler, hyperbaric oxygen therapy. HBOT increases the diffusion gradient, enhancing perfusion even when microvascular flow is compromised. Assessment tools are often unavailable in routine clinics, limiting objective measurement.

Negative-Pressure Wound Therapy (NPWT) – application of sub-atmospheric pressure to a wound via a sealed dressing and pump. Related terms: granulation tissue, adjunctive therapy, wound exudate. NPWT can be combined with HBOT to synergise fluid removal and oxygen delivery. Coordination of dressing changes with chamber sessions requires meticulous planning.

Neuropathic Ulcer – wound resulting from loss of protective sensation, commonly in diabetic feet. Related terms: peripheral neuropathy, off-loading, diabetic foot ulcer. Lack of pain leads to delayed presentation; HBOT aids healing once identified. Preventative education remains the primary challenge.

Oxygen Toxicity – cellular damage caused by excessive oxygen exposure, manifesting as pulmonary or central nervous system effects. Related terms: hyperbaric oxygen therapy, seizure risk, treatment protocol. Monitoring cumulative oxygen dose and limiting session length mitigates risk. Clinicians must balance therapeutic benefit against toxicity thresholds.

Oxygen Tension – partial pressure of oxygen within tissue, expressed in mm Hg. Related terms: hyperoxia, diffusion gradient, wound hypoxia. HBOT raises tissue oxygen tension from 200 mm Hg, facilitating cellular processes. Accurate measurement is invasive, thus indirect clinical indicators are often used.

Off-Loading – redistribution of pressure away from a wound site, essential for plantar ulcer management. Related terms: total contact cast, pressure relief, diabetic foot ulcer. Off-loading devices must be compatible with HBOT chamber entry; bulky casts may limit patient access, requiring custom solutions.

Peri-Wound Skin – intact skin surrounding a wound, acting as a barrier to infection. Related terms: maceration, moisture balance, wound edge. Maintaining peri-wound integrity during HBOT sessions involves careful positioning to avoid moisture accumulation from chamber humidity.

Peripheral Arterial Disease (PAD) – atherosclerotic narrowing of limb arteries reducing blood flow. Related terms: ischemia, ankle-brachial index, revascularisation. HBOT may be adjunctive in PAD-related wounds but cannot substitute for surgical revascularisation. Determining candidacy requires vascular imaging.

Pressure Injury Classification – staging system (I-IV) describing depth and tissue loss of pressure-related wounds. Related terms: decubitus ulcer, stage, tissue viability. HBOT is generally reserved for stage III/IV injuries unresponsive to standard care. Accurate staging guides therapy intensity and duration.

Re-Epithelialisation – migration of keratinocytes across the wound surface to restore the epidermal barrier. Related terms: wound edge, growth factors, hyperbaric oxygen therapy. HBOT accelerates re-epithelialisation by improving oxygen-dependent cellular metabolism. Over-rapid migration may lead to fragile epithelium; monitoring is essential.

Re-Oxygenation – restoration of adequate oxygen levels after a hypoxic episode. Related terms: reperfusion, hyperbaric oxygen therapy, oxidative stress. Controlled re-oxygenation via HBOT reduces reperfusion injury by modulating reactive oxygen species. Timing is critical; premature hyperoxia may exacerbate oxidative damage.

Revascularisation – surgical or endovascular restoration of arterial blood flow to an ischemic limb. Related terms: peripheral arterial disease, bypass graft, angioplasty. Successful revascularisation often precedes HBOT to maximise oxygen delivery. In patients unsuitable for surgery, HBOT serves as a bridge therapy, though outcomes are less predictable.

Rehabilitation Protocol – structured plan incorporating mobility, nutrition, and wound-care education post-HBOT. Related terms: multidisciplinary team, functional outcome, patient compliance. Integration of physiotherapy ensures that gains in tissue oxygenation translate into functional recovery. Coordination across services poses logistical challenges.

Remote Ischemic Pre-Conditioning – brief cycles of limb ischemia applied to stimulate protective pathways before HBOT. Related terms: ischemic tolerance, conditioning, hyperbaric oxygen therapy. Early studies suggest synergistic improvement in wound perfusion, yet standardised protocols are lacking, limiting widespread adoption.

Scar Contracture – tightening of scar tissue that restricts movement or distorts anatomy. Related terms: fibroblast activity, collagen synthesis, physiotherapy. While HBOT reduces scar hypertrophy, it does not fully prevent contracture. Early mobilisation and splinting remain essential adjuncts.

Septicemia – systemic infection resulting from bacterial invasion of the bloodstream, a possible complication of chronic wounds. Related terms: bacterial load, systemic antibiotics, hyperbaric oxygen therapy. HBOT can improve antibiotic efficacy and host immunity, but must be initiated promptly to avoid progression. Monitoring for signs of sepsis during therapy is mandatory.

Skin Graft Take – successful adherence and integration of a graft onto a wound bed. Related terms: dermal graft, hyperbaric oxygen therapy, wound bed preparation. HBOT administered within 24 hours post-graft improves neovascularisation, enhancing take rates. Graft failure may still occur due to shear forces or infection, requiring vigilant postoperative care.

Split-Thickness Skin Graft (STSG) – graft comprising epidermis and a portion of dermis, commonly used for large wounds. Related terms: donor site, graft take, hyperbaric oxygen therapy. HBOT supports STSG survival by reducing hypoxia at the graft-recipient interface. Donor-site pain may be exacerbated by chamber pressure, necessitating analgesic strategies.

Staged Debridement – sequential removal of necrotic tissue over multiple sessions to minimise blood loss and allow reassessment. Related terms: surgical debridement, enzymatic debridement, hyperbaric oxygen therapy. Combining staged debridement with HBOT can progressively improve tissue oxygenation, preparing the wound for closure. Scheduling constraints and patient tolerance are practical concerns.

Standardised Wound Measurement – use of calibrated tools (e.g., planimetry, digital imaging) to quantify wound dimensions. Related terms: baseline assessment, photographic documentation, outcome tracking. Consistent measurement enables objective evaluation of HBOT efficacy. Training staff and ensuring inter-rater reliability are ongoing challenges.

Systemic Antibiotic Therapy – oral or intravenous agents targeting wound-associated pathogens. Related terms: bacterial load, antimicrobial dressing, hyperbaric oxygen therapy. HBOT enhances antibiotic penetration by increasing tissue oxygen levels, particularly for anaerobes. Overuse may lead to resistance; stewardship protocols must be integrated.

Thermal Imaging – infrared assessment of skin temperature to infer perfusion status. Related terms: microvascular perfusion, wound assessment, hyperbaric oxygen therapy. Post-HBOT temperature elevation may indicate improved blood flow. Limited resolution and equipment cost restrict routine use.

Topical Oxygen Therapy (TOT) – application of oxygen directly to the wound surface via a sealed dressing. Related terms: hyperbaric oxygen therapy, wound hypoxia, dressing technology. TOT is less invasive but delivers lower oxygen concentrations compared with HBOT. It may serve as a bridge for patients unable to access a chamber; comparative efficacy data remain limited.

Traction-Induced Pressure Ulcer – ulcer developing under devices that exert continuous force, such as skeletal traction pins. Related terms: pressure injury, off-loading, wound prevention. Early identification and

pressure redistribution are key; HBOT may be considered if the ulcer progresses despite corrective measures.

Vascular Endothelial Growth Factor (VEGF) – potent angiogenic cytokine stimulating new blood-vessel formation. Related terms: angiogenesis, growth factors, hyperbaric oxygen therapy. HBOT up-regulates VEGF expression, accelerating granulation. Excessive VEGF can lead to leaky vessels; clinical monitoring for edema is advised.

Venous Insufficiency – failure of venous valves leading to retrograde blood flow and edema. Related terms: chronic wound, compression therapy, ulcer classification. Compression remains first-line; HBOT is reserved for refractory ulceration. Patient adherence to compression garments is a major hurdle.

Wound Bed Preparation (WBP) – systematic approach to optimise the wound environment before definitive closure. Related terms: debridement, infection control, moisture balance. WBP includes debridement, infection management, and bioburden reduction, creating a suitable platform for HBOT. Inadequate preparation diminishes HBOT benefits.

Wound Edge Necrosis – death of tissue at the periphery of a wound, impeding closure. Related terms: debridement, perfusion, hyperbaric oxygen therapy. Early HBOT can reverse marginal ischemia, but persistent edge necrosis may require surgical excision. Monitoring edge colour and temperature guides intervention timing.

Wound Exudate Management – control of fluid output to maintain a moist yet non-macroscopic environment. Related terms: dressing selection, moisture balance, infection risk. Excess exudate can dilute oxygen concentration; absorptive dressings combined with HBOT prevent maceration. Over-absorption may desiccate tissue, slowing healing.

Wound Healing Cascade – sequential phases of haemostasis, inflammation, proliferation, and remodeling. Related terms: chronic wound, hyperbaric oxygen therapy, growth factors. HBOT primarily influences the proliferative phase by enhancing oxygen-dependent cellular activities. Understanding where a patient's wound resides within the cascade informs appropriate HBOT timing.

Wound Infection Grading – classification (e.g., Clean, Contaminated, Infected, Septic) guiding treatment intensity. Related terms: bacterial load, systemic antibiotics, hyperbaric oxygen therapy. HBOT is most effective in the Infected grade, where oxygen augments host defence. Accurate grading requires clinical judgement and sometimes microbiological confirmation.

Wound Matrix – scaffold composed of collagen, elastin, and glycosaminoglycans supporting cell migration. Related terms: extracellular matrix, debridement, growth factors. Application of bioengineered matrices alongside HBOT can synergise, providing both structural support and enhanced oxygenation. Cost and availability may limit use in some settings.

Wound Monitoring Protocol – scheduled assessments documenting size, depth, exudate, and pain. Related terms: baseline assessment, outcome tracking, standardized measurement. Integration of HBOT session logs into the monitoring protocol allows correlation of oxygen exposure with healing metrics. Data entry burden

and consistency are practical challenges.

Wound Pressure Redistribution – techniques (e.g., cushions, positioning) to alleviate focal stress on vulnerable tissue. Related terms: off-loading, pressure injury, support surfaces. Even during HBOT, patients must be positioned to avoid pressure points, especially in prolonged sessions. Failure to redistribute pressure may negate HBOT benefits by re-inducing ischemia.

Wound Re-Evaluation – critical review after each HBOT course to decide continuation or modification of therapy. Related terms: outcome tracking, wound monitoring protocol, treatment plan. Objective criteria include >20% reduction in area or improvement in granulation. Subjective factors such as pain relief also inform decisions. Inconsistent re-evaluation can lead to overtreatment.