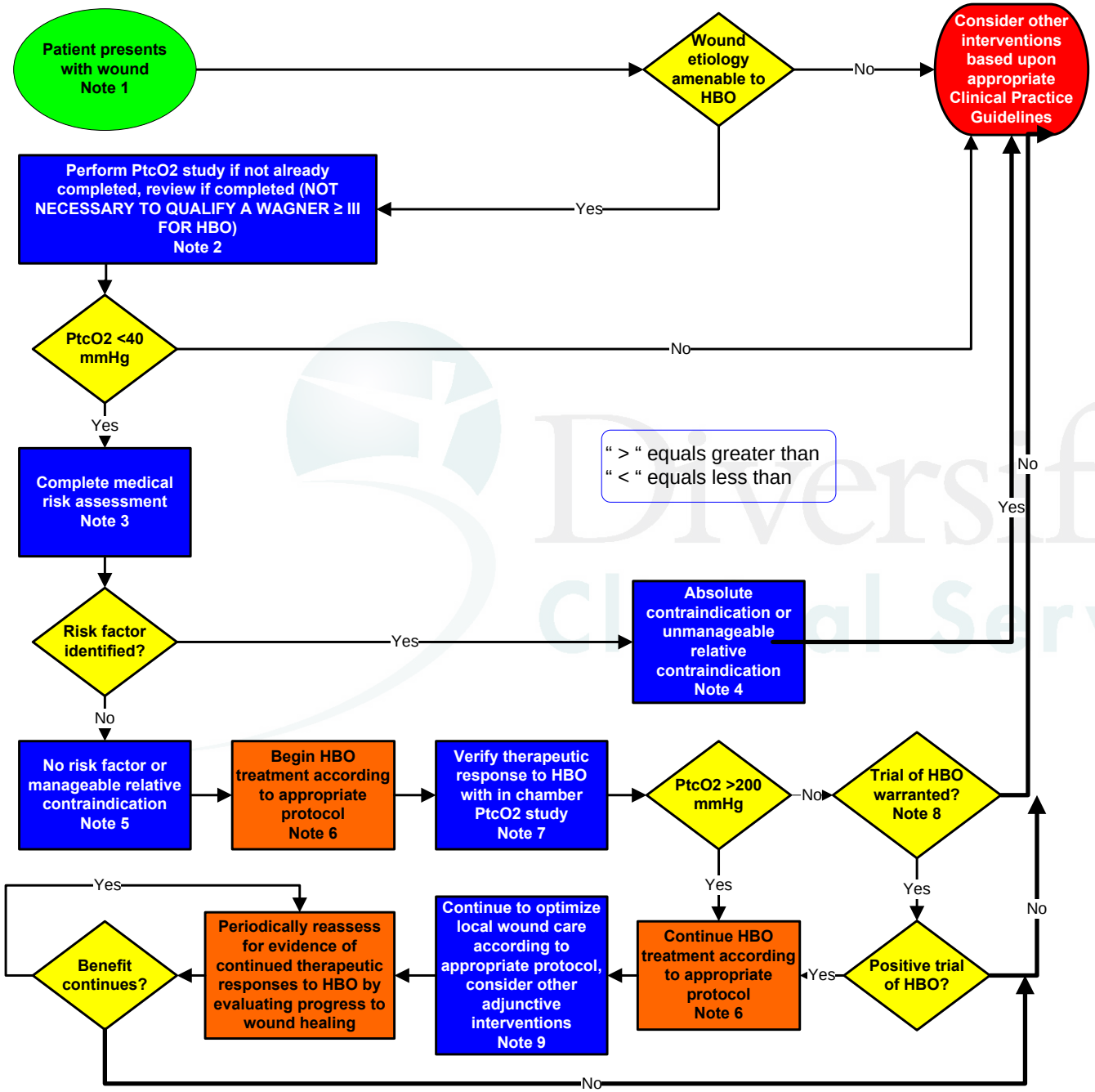
DCS CPG: **H01.02 SELECTING PATIENTS FOR HYPERBARIC OXYGEN TREATMENT**



Note 1: Decision to consider HBO as adjunctive treatment comes as a part of the overall assessment of the problem wound patient and wound and is also discussed in each of the applicable Clinical Practice Guidelines.

Note 2: Refer to the detailed PtcO2 testing procedure and interpretation guidelines in the Interpreting PtcO2 Testing Guideline W03.02

Note 3: Complete medical risk assessment for hyperbaric oxygen treatment as outlined in the separate Clinical Practice Guideline Assessing the Medical Risk for and Managing the Complications of Hyperbaric Oxygen Treatment Guideline (H03.01).

Note 4: In the event that an absolute contraindication exists, or a relative contraindication is present that cannot be sufficiently optimized to provide an acceptable risk benefit ratio for adjunctive hyperbaric oxygen treatment, hyperbaric oxygen treatment should be with held and other options considered as recommended in the appropriate Clinical Practice Guideline.

Note 5: There are no absolute contraindications and/or relative contraindications or risk factors have been identified and management and risk reduction optimized.

Note 6: Refer to the specific Clinical Practice Guideline for each wound etiology for which hyperbaric oxygen treatment is warranted for specific treatment profiles, duration of treatment recommendations, and other notes and precautions (H01.02).

Note 7: A PtcO2 value during 100% oxygen breathing at treatment depth that is > 200 mmHg is considered to be predictive of a reasonable probability of achieving a therapeutic response to hyperbaric oxygen treatment.

Note 8: In patients whose initial in chamber PtcO2 value is <200 mmHg an for whom there is no alternative option for support of distal limb salvage, a limited trial of hyperbaric oxygen treatment may be administered. The trial is the completion of 5 consecutive hyperbaric oxygen treatments with a second in chamber PtcO2 measurement made on the fifth treatment. If the PtcO2 value reaches > 200 mmHg, the trial is considered successful and the patient continues treatment according to the prescribed Clinical Practice Guideline. If the PtcO2 measurement is < 200 mmHg and there is no clinical indication of improvement in the wound as evidenced by decreased ischemic rubor, decreased inflammation or improved control of local infection, new granulation tissue, improvement in the condition of the wound margins, the trial is considered a failure and additional PtcO2 measurements at 1 ATA with air breathing are completed to determine an amputation level likely to heal (with or without hyperbaric oxygen treatment support). If the PtcO2 measurement is < 200 mmHg but has increased from the initial treatment measurement and there is evidence of improvement in the wound as evidenced by decreased ischemic rubor, decreased inflammation or improved control of local infection, new granulation tissue, improvement in the condition of the wound margins, the trial is considered a partial success and may be extended for an additional five treatments at which time the PtcO2 study is repeated as assessed as before. Failure to reach the > 200 mmHg threshold in the diabetic foot ulcer patient by the 10th treatment is indicative of a very high probability of ultimate treatment failure.

Note 9: Wound assessment and care should continue throughout the period of adjunctive hyperbaric oxygen treatment with consideration given as appropriate to the application of other complimentary treatment modalities as presented in the specific wound category Clinical Practice Guideline.

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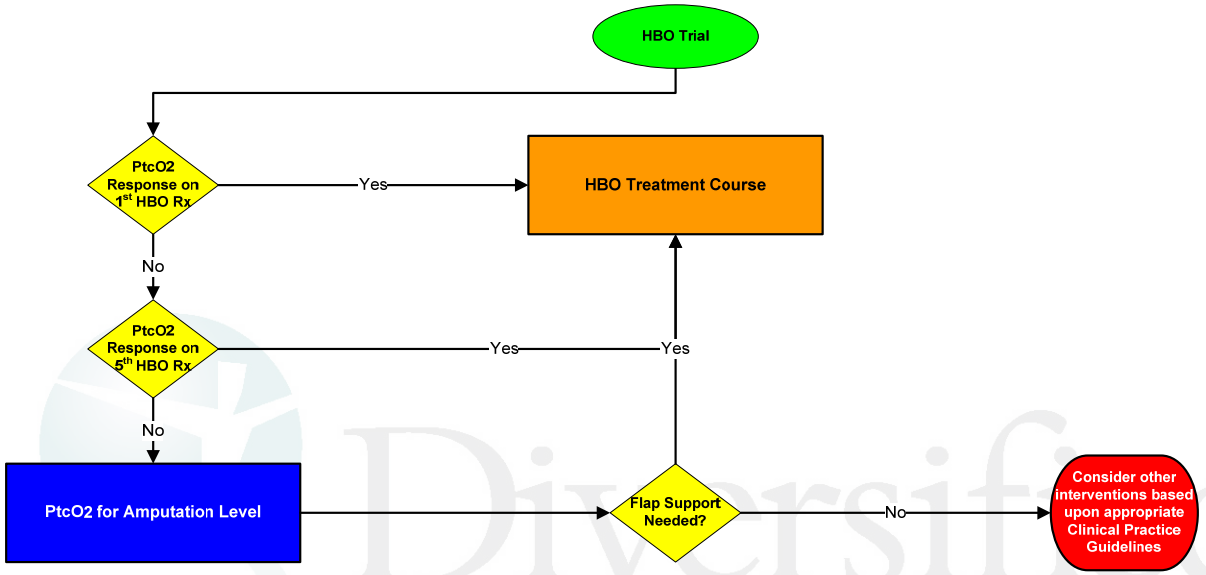
ENTRY CRITERIA:	HYPERBARIC KEY THERAPEUTIC OBJECTIVES:	CONTRAINDICATIONS: ABSOLUTE/RELATIVE:
☐ Air or gas embolism ☐ Carbon monoxide poisoning and/or cyanide poisoning ☐ Decompression sickness ☐ Exceptional blood loss anemia ☐ Acute ischemic soft tissue injury with at least partial restoration or preservation of perfusion ☐ Wound with progressive infection or malperfusion with local hypoxia as a complicating factor	☐ Mechanical effects (bubble size reduction) ☐ Treatment of hypoxia ☐ Bacteriostatic/cidal effects ☐ Treatment of poisoning	**Absolute Contraindications to Hyperbaric Therapy** ☐ Untreated pneumothorax ☐ Concomitant administration of doxorubicin, cisplatin, other chemotherapeutic (esp antiangiogenic) agents ☐ Bleomycin administration within 12 months (caution re pulmonary oxygen toxicity if > 12 months) ☐ Pregnancy in non-life threatening circumstances ☐ Terminal patient with irreversible disease **Relative Contraindications to Hyperbaric Therapy** ☐ Upper respiratory infections ☐ Chronic sinusitis ☐ History of reconstructive ear surgery ☐ Auditory impairment ☐ Visual impairment ☐ Cognitive impairment ☐ Uncontrolled high fever ☐ Congenital spherocytosis ☐ Sickle cell anemia ☐ History of optic neuritis (may be associated with increased risk of recurrence but only limited case report experience) ☐ History of seizure disorder ☐ Congestive heart failure ☐ Pacemaker or AICD ☐ Uncontrolled bronchospasm ☐ History of previous thoracic surgery ☐ Non-communicating air trapping lesions on x-ray or CT scan ☐ History of spontaneous pneumothorax ☐ Emphysema with CO2 retention ☐ Pregnancy in life threatening circumstances ☐ Concomitant administration of medications that lower threshold for CNS oxygen toxicity *Impact and management vary with specific indication for hyperbaric oxygen treatment and are detailed in the specific clinical practice guidelines.*

Documentation in the medical record should support the medical necessity for hyperbaric oxygen treatment. **See DCS H02.01-H02.XX, H03.01-XX, and H04.01-H04.XX** for specific recommendations for documentation for each indication for HBO. In all cases documentation must include an initial assessment that includes a medical history detailing the condition requiring HBO and an appropriate physical examination that addresses the indication for treatment and the assessment of potential relative or absolute contraindications for HBO treatment. The medical record should also include specific orders for treatment including the treatment pressure, duration of oxygen breathing, number, interval, and duration of air breaks if provided, monitoring required before, during, of following HBO treatment, and number of treatments prescribed. All patients should be periodically evaluated during treatment with appropriate documentation defining the response to treatment and noting any complications that have occurred and any interventions applied.

PATIENT SELECTION PROCESS	NOTES	NURSING INTERVENTION
Complete a full evaluation identifying all potentially reversible causes of non-healing. **Optimize local wound care, surgical and antibiotic management.**		
1. Identify Key Therapeutic Objective for hyperbaric oxygen treatment.	☐ Mechanical effects (bubble size reduction) ☐ Treatment of hypoxia ☐ Bacteriostatic effects ☐ Treatment of poisoning	• Obtain patient history • Complete patient assessment
2. Identify an appropriate diagnostic indication (UHMS Oxygen Therapy Committee Report, 2007) **and select a treatment table according to H01.02 Treatment Profile Decisions…Selecting the Right Table.**		• Obtain patient history • Complete patient assessment
2. Where appropriate, demonstrate periwound hypoxia prior to hyperbaric oxygen treatment.	• **Periwound oxygen tensions** measured using transcutaneous PO_2 (PtcO2) monitor using **multiple** leads both adjacent to wound and reflecting regional arterial blood flow distribution. • Normal PtcO2 values anywhere on the leg should be greater than50 mmHg • Baseline measurements with patient supine on 1ATA air provide an initial **indication for adjunctive hyperbaric oxygen treatment:** **PtcO2 less than 30 mmHg in non-diabetics** **PtcO2 less than 40 mmHg in diabetics** • **Provocative testing** with limbs elevated and/or dependent on 1ATA air, Bacharach, et al (1992) and Hauser, et al (1984, 1993) as a screening tool to identify occult PVD, assess impact of edema, may increase the sensitivity of recognition of clinically significant periwound hypoxia. • **Oxygen challenge** to assess potential for response to adjunctive hyperbaric oxygen treatment, Harward, et al (1985) greater than 300 mmHg is an excellent response, a normal exam greater than 200 mmHg is a good response 100-200 mmHg is an adequate response, non limb threatening ischemia 51-99 mmHg demonstrates significant ischemia, a borderline response in terms of hyperbaric response potential, probably deserves a **trial** of hyperbaric exposure 0-50 mmHg demonstrates high grade ischemia/hypoxia	• Obtain PtcO2 • Patient/caregiver education related to PtcO2 procedure

PATIENT SELECTION PROCESS	NOTES	NURSING INTERVENTION
3. Complete evaluation for safety and appropriateness of adjunctive hyperbaric oxygen treatment. Minimum elective evaluation of patients undergoing hyperbaric oxygen treatment • Examination by hyperbaric physician • Assess ability to equalize middle ear pressure • Screening chest xray • CBC, HA1C/glucose in diabetics, other lab as indicated • Presence of prostheses including contact lenses Emergency/critical care patient evaluation • As for the elective patient plus, ABCD (Airway, Breathing, Cardiovascular Stability, Drugs) issues Some screening tests may have to be eliminated in the interests of time • How stable/unstable is my patient? • What are the risk/benefit considerations for this specific patient? **Patients requiring critical care during hyperbaric oxygen treatment should be treated at facilities with the capability for continuous monitoring, ventilatory support if indicated, and adequate backup medical specialty support.** **Refer to DCS CPG: H03.01A, H03.01B, and H03.01C for guidelines on preventing and managing complications of hyperbaric oxygen treatment.**	• **Absolute contraindications excluded** Untreated pneumothorax Concomitant administration of doxorubicin, cisplatin, other chemotherapeutic (esp antiangiogenic) agents Bleomycin administration within 12 months (caution re pulmonary oxygen toxicity if > 12 months) Pregnancy in non-life threatening circumstances Terminal patient with irreversible disease • **Relative contraindications optimized** Upper respiratory infections Chronic sinusitis History of reconstructive ear surgery Auditory impairment Visual impairment Cognitive impairment Uncontrolled high fever Congenital spherocytosis Sickle cell anemia History of optic neuritis (may be associated with increased risk of recurrence but only limited case report experience) History of seizure disorder Congestive heart failure Pacemaker, AICD Uncontrolled bronchospasm History of previous thoracic surgery Non-communicating air trapping lesions on x-ray or CT scan History of spontaneous pneumothorax Emphysema with CO2 retention Pregnancy in life threatening circumstances Concomitant administration of medications that lower threshold for CNS oxygen toxicity • **Is the treatment worse than the disease?**	• Coordinate radiological examination • Review history for contraindications • Review medications for contraindications • Patient/caregiver education related to absolute and relative contraindications
4. Where possible and appropriate, demonstrate therapeutic PtcO2 values during treatment.	• Generally, a PtcO2 of at least 200 mmHg achieved at depth no later than the er of the second oxygen breathing period if multiple air breaks are given or by 45 minutes with a single air break or without air breaks is considered to be a minima response in the non diabetic patient with a PtcO2 of at least 400 mmHg necessa in diabetic patients. The higher the PtcO2 value achieved in the chamber during treatment, the more likely a therapeutic response is to be achieved. • Failure to reach a therapeutic value on the first or second treatment is an indication to initiate the trial of treatment protocol defined below.	• Obtain in-chamber PtcO2 during first or second HBO treatment
5. Protocol for trial of hyperbaric oxygen treatment when the response to 1 ATA 100% oxygen challenge is felt to be inadequate (see H01.02)	A trial of HBO may be attempted with PtcO2 measurements made during the first or second and fifth treatment. Failure to achieve therapeutic PtcO2 values by the fifth treatment or failure to show significant clinical improvement should lead to termination of HBO treatment. The trial can be extended for five additional treatments if the patient shows either clinical or PtcO2 evidence of improvement, but should in most cases not be extended beyond 10 treatments.	• Perform in-chamber PtcO2



PATIENT SELECTION PROCESS	NOTES	NURSING INTERVENTION
6. Frequently reassess the response to treatment and/or evidence of continued requirement for treatment.		• Complete patient assessment
What if revascularization or edema control best addresses the primary non healing pathophysiology?	• Repeat the transcutaneous PO_2 study to demonstrate persistent periwound hypoxia **post** revascularization or edema control. • **Adjunctive hyperbaric oxygen treatment may be initiated prior to revascularization or during edema control in severely hypoxic, infected, life or limb threatening wounds.**	• Coordinate consultative care

GUIDELINES FOR ADJUSTMENT OR TERMINATION OF ADJUNCTIVE HYPERBARIC OXYGEN TREATMENT	
Decisions to adjust or terminate adjunctive hyperbaric oxygen treatment at this time are based largely on clinical judgment. Our data concerning when wounded tissue has reached an optimum or maximum response and is thus capable of continuing to healing without further support is limited. In the absence of purely objective data to support decision making, the following suggestions are made to provide some guidance in this process.	
QUESTIONS FOR CONSIDERATION	**NOTES**
• Is the patient intolerant of treatment or have other medical conditions limited the application of an effective treatment protocol?	• Severe oxygen toxicity, unmanageable confinement anxiety, intercurrent medical illness precluding or taking precedence over hyperbaric oxygen treatment
• Is the wound failing to respond to adjunctive hyperbaric oxygen treatment after a reasonable trial of treatment?	• Was initial in chamber PtcO2 below threshold for effectiveness for lower extremity diabetic ulcers? If so, refer to **Trial of HBO Protocol.** Is infection persisting in the wound? Is there no or an inadequate granulation response in the wound?
• Is the original indication for which adjunctive hyperbaric oxygen treatment was initiated no longer present?	• Has infection been adequately controlled or resolved? Is there a healthy, well perfused granulating tissue base in the wound (see below)? In the case of a non wound indication for hyperbaric oxygen treatment, have objective findings of deficit been resolved or has the response to treatment plateaued?
• Have transcutaneous PO2 values in the skin reasonably adjacent to the wound risen to a level above the selection criteria for the particular patient?	• Although this is a controversial point, it is reasonable to consider discontinuing hyperbaric oxygen treatment if objective findings of periwound skin hypoxia are not longer present: **$PtcO_2$ > 30 mmHg in non-diabetics** **$PtcO_2$ > 40 mmHg in diabetics** However, these values are guidelines only and must not be considered either in selection or in termination decisions in isolation without regard to the condition and response of the wound.
• Has the wound healing response plateaued?	• Has no further wound improvement been observed in 5 consecutive treatment days? If so, consider termination of hyperbaric oxygen treatment for reevaluation of the wound and application of other treatment modalities.