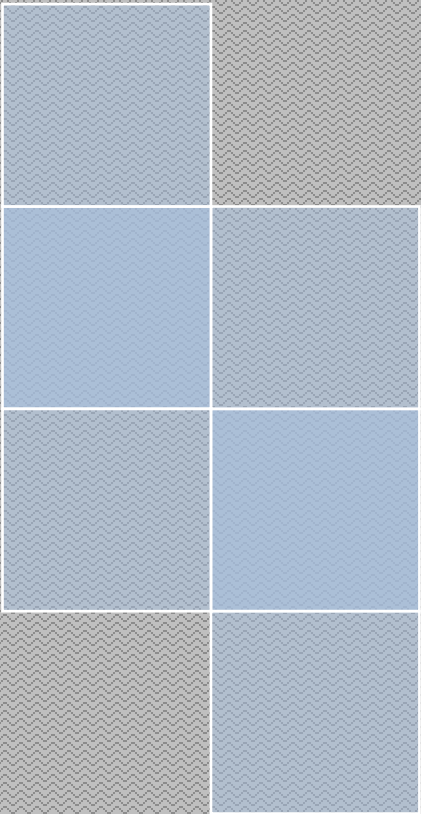


2018

Safety Manual/Monthly Safety Awareness Program



Fire Safety Plan

1. Purpose

To provide hyperbaric personnel a predetermined plan in the event of a fire in the hyperbaric area in order to reduce injury and/or catastrophic outcomes.

2. Policy

- 2.1. In the event of an emergency, the Hyperbaric Medicine Center personnel will be prepared to respond.
- 2.2. The Safety Director shall be designated by the Program Director / Manager or designee.

NOTE: NFPA 99 Health Care Facilities, 2012 Chapter 14 Pg 503

“14.3.1.3.2 A safety director shall be designated in charge of all hyperbaric equipment. The safety director shall work closely with facility management personnel and the hyperbaric physician(s) to establish procedures for safe operation and maintenance of the hyperbaric facility. He or she shall make necessary recommendations for departmental safety policies and procedures. The safety director shall have the authority to restrict or remove any potentially hazardous supply or equipment items from the chamber.”

- 2.3. Each plan shall be collaboratively developed with the hospital fire safety policy in conjunction with NFPA standards.
- 2.4. There will be no smoking or open flames in the hyperbaric area.
- 2.5. The area will be kept exceptionally clean and free of fire hazards according to the NGPA for Hyperbaric health care facilities.
- 2.6. The chamber itself will be kept exceptionally clean of lint and dust particles as these are hazardous when inside the chamber.
- 2.7. Each hyperbaric patient will be searched and questioned about possession of an ignition source before entering the chamber.
- 2.8. All items listed in the chamber safety policy will not be allowed in the chamber.

3. Scope

Applies to all Hyperbaric Medicine Center staff and patients.

4. Responsibility

It is the responsibility of the Safety Director for the center to implement and ensure that fire safety practices are followed within the department.

5. Procedure

5.1 The Program Director/Manager shall obtain the hospital fire safety plan.

5.2 A comprehensive plan will be developed and incorporated into the overall emergency plan for the center. It shall include the following at a minimum:

5.4.1 Signage locations

5.4.2 Extinguishing (sprinklers, smoke detectors, fire extinguishers, etc.) methods, equipment and location.

5.4.3 R.A.C.E. protocol or similar standard guideline for response in the event.

5.4.4 Emergency phone numbers-who to contact, when and where.

5.4.5 Oxygen leak testing-frequency and procedure.

5.4.6 Electrical equipment-location, preventive maintenance schedule

5.4.7 HBO requirements for fire prevention

5.4.8 Mock drill-frequency

5.4.9 General response to fire-code announcement, door and window handling

5.3 All SerenaGroup(c) Hyperbaric Medicine Centers personnel will be knowledgeable of the fire safety plan and be prepared to proactively prevent fire and in the case of a fire, extinguish it immediately.

5.4 Assure appropriate signage (readable from a distance of 5 feet) in the center prohibiting smoking.

5.4.1 Ensure patients, staff and visitors do not smoke or have any open flames within the center.

5.5 Ensure the patient has changed into 100% cotton or Cotton and Polyester blend clothing prior to the therapy. CLOTHING DISALLOWED IN THE CHAMBER
INCLUDE THE FOLLOWING:

5.5.1 Underwear (bra, panties, briefs)

5.5.2 Street clothes (even if tag states 100% cotton)

NOTE: These items are potential sources of ignition as well as a place for concealment of lighters or matches.

5.6 Ensure all linens are 100% cotton or cotton polyester blend. This includes pillow cases, blankets, and sheets.

5.7 Search all patients prior to initiation of every treatment to secure that no lighters or matches, jewelry etc. are being placed in the oxygen enriched environment. (Wedding bands may be taped if patient refuses to remove).

5.8 Cleanse or allow the patient to cleanse off the following petroleum based products:

- Make-up
- Hair spray
- Nail polish (unless 24 hours since applied)
- Perfume
- After shave lotion
- Oil-based creams/ointments (petroleum jelly), or cover wound or skin area with 100% cotton linen.

5.9 Allow only the items necessary for patient care during therapy such as:

- NG tubes (vented)
- External fixation devices covered with cotton towels
- Wound Dressings
- Soft contacts
- Foley catheters, auto vented
- Other drains or catheters, vented
- Monitoring leads and cables compatible with the chamber such as pass through lines for EKG or TCOM monitoring
- Intrinsically safe transducers

NOTE: Dressings of concern may be covered with a moist 100% cotton linen

NOTE: If patient has a post-op skin graft and physician does not want the dressing removed, cover existing dressing with 100% damp cotton towel. NEVER expose a wound covered with an ointment in the chamber.

5.10 Disallow the following items in the chamber:

- External pacemakers
- Halter monitors
- External TENS or similar product
- External insulin pump

5.11 Turn off the main oxygen supply to the chambers at the end of each day to ensure no leakage of oxygen into the room.

5.12 Sign off on the pretreatment checklist before every HBO therapy.

5.13 FIRE OUTSIDE OF CHAMBER AREA BUT INSIDE THE BUILDING

5.13.1 Follow hospital fire plan

5.14 FIRE IN THE HYPERBARIC UNIT BUT OUTSIDE OF THE CHAMBER

5.14.1 Pull fire alarm and activate hospital fire plan informing of location of the fire

5.14.2 Notify patients of need for rapid decompression.

5.14.3 “Emergency vent” the chambers and remove patients from chambers.

5.14.4 Turn off oxygen.

5.14.5 Assist in the evacuation of the area per hospital evacuation plan

5.15 FIRE INSIDE OF THE HYPERBARIC CHAMBER

5.15.1 Notify other staff members to pull fire alarm and activate hospital fire plan informing of location of the fire

5.15.2 “Emergency vent” the chambers and remove patients from chambers.

5.15.3 Have patient breathe from the air break mask during emergency ventilation.

5.15.4 Turn off oxygen.

5.15.5 Prepare to extinguish fire.

5.15.6 Assist in the evacuation of the area per hospital evacuation plan

Emergency Preparedness

1. Purpose

To establish an Emergency Preparedness plan specific for the hyperbaric center.

2. Policy

- 2.1. To provide optimal patient care and support in the event of an emergency such as fire, flood, hurricane, ice storm, earthquake, tornado, etc.
- 2.2. All staff will be oriented and updated to the emergency preparedness plan with safety as a primary focus
- 2.3. The Hyperbaric Medicine Center Emergency Preparedness plan compliments the hospital's plan; it does not supersede the hospital emergency preparedness plan.

3. Scope and Responsibility

Applies to all members of the Hyperbaric Medicine Center.

4. Procedure

- 4.1. Should it become necessary to remove patients from the chambers, the following actions should be taken:
 - 4.1.1. Explain to the patients why they are being decompressed.
 - 4.1.2. Decompress chambers at a normal rate. DO NOT EMERGENCY VENT THE CHAMBERS.
 - 4.1.3. Provide alternative care information to the patient on admission that instructs the patient on the plan for care in the event of a natural disaster.
 - 4.1.4. Once chambers are empty and all of the patients have exited the center, secure the chambers in the following manner:
 - 4.1.4.1. Close the doors on the chambers
 - 4.1.4.2. Switch off both the Oxygen and Air supply to the chambers at the wall source.
 - 4.1.4.3. Disconnect the transformer from the electrical outlet at the wall. This will interrupt the supply power to the battery charger.
 - 4.1.4.4. Cover the chambers with the cloth chamber cover.

2018 Safety Program Schedule

January – Acute CHF (fluid overload) in HBO

February – Static Electricity

March – Meeting “Medical Necessity” for DFU in HBO

April – Basic Monoplace Chamber Maintenance

May – Obtaining insurance approval for HBOT

June – Patient education and why it is important

July – Non Oxygen related seizures in HBO

August – Discussing Smoking and wound healing

September – Confinement Anxiety/Claustrophobia

October – Fire Safety on site (in Hospital)

November – Fire Safety off Site

December- Pneumothorax Under Pressure

December – Review of Gas Laws and how they apply

Call in Number : () Conference Number

(##)

January
Acute CHF (fluids over load) in HBO

Overview: Acute pulmonary edema associated with hyperbaric oxygen therapy is rare. Although others have commented about hyperbaric oxygen precipitating pulmonary edema, heart failure is generally not considered a risk factor in hyperbaric oxygen treatment. It has been suggested that acute pulmonary edema may be a complication of hyperbaric oxygen therapy.

Possible mechanisms for hyperbaric oxygen exposure causing pulmonary edema include the following: hyperbaric oxygen exposures cause an increase in systemic vascular resistance and a reduction in cardiac output both effects could contribute to pulmonary edema in a patient with compromised cardiac function. Increases in the pulmonary capillary wedge pressure occur with inhalation of high concentrations of normobaric oxygen in New York Heart Association class III or class IV heart failure patients (EF of 15 to 20%). We must assume that the partial pressures of oxygen that patients breathe during hyperbaric oxygen therapy might exaggerate increases in wedge pressure compared to breathing normobaric 100% oxygen, which could result in pulmonary edema. Oxygen radicals could damage the myocardium or interfere with myocyte calcium homeostasis. Also, oxygen radicals can consume endothelial-derived nitric oxide, which would decrease diastolic left ventricular (LV) distensibility. An imbalance in cardiac output between the right and left heart during hyperbaric oxygen therapy mediated by differential sympathetic tone could explain acute pulmonary edema if the right-sided cardiac output exceeded that of the left. However, Haque et measured sympathetic tone in muscles and found no change with inhalation of normobaric oxygen. Nevertheless, it is possible that cardiac sympathetic tone could be affected by hyperbaric oxygen, but not by 100% normobaric oxygen breathing. Hyperbaric oxygen therapy can cause pulmonary oxygen toxicity resulting in increased sympathetic tone leading to a decrease in LV compliance while increasing afterload, leading to pulmonary edema. However, pulmonary oxygen toxicity at the hyperbaric oxygen pressures and durations used clinically is not expected. It is unlikely that hyperbaric oxygen-associated pulmonary edema is caused by similar mechanisms as the development of high altitude toxicity.

Fluid overload could contribute to pulmonary edema associated with hyperbaric oxygen therapy. Death due to postoperative pulmonary edema

following excess fluid retention has been reported. Careful attention to fluid balance is imperative. Our cases occurred in outpatients who were functional. None of these patients had recent surgery or overt manifestations of heart failure. Nevertheless, if the hyperbaric service recommends hyperbaric oxygen therapy in patients with compromised LV function, careful attention to fluid balance during their course of therapy is advised.

Acute pulmonary edema is not expected in patients treated with hyperbaric oxygen therapy, yet pulmonary edema may occur in certain patients with heart failure. Most patients treated with hyperbaric oxygen have hypoxic wounds, which often occur in patients with ischemic cardiovascular disease who may be at risk for acute pulmonary edema during hyperbaric oxygen therapy. Unfortunately, we cannot identify in whom or when acute pulmonary edema may develop. Caution is recommended in treating heart failure patients with hyperbaric oxygen.

- Symptoms similar to those of chronic heart failure, but more severe and start or worsen suddenly
- Sudden fluid buildup
- Rapid or irregular heartbeat (palpitations)
- Sudden, severe shortness of breath and coughing up pink, foamy mucus
- Chest pain, if your heart failure is caused by a heart attack

Procedure:

- Chronic CHF and dialysis patients most at risk.
- These patients should be weighed before treatment, if 25% over dry wt. do not treat.
- May not present for 30 – 40 minutes after treatment, find ways to keep patients in center for at least 30 minutes after treatment is complete.
- Dialysis patients should receive HBOT after their dialysis treatment, always before.
- If dialysis is missed HBOT treatment should be held.
- Not believed to be linked to number of treatments.
- Chronic CHF and dialysis patients should be treated at lower pressure, 2 ATA as opposed to 2.4-5 ATA, and compressed and decompressed over 15 minutes.

Reference: 1 Abel FL, McNamee JE, Cone DL, et al. Effects of hyperbaric oxygen on ventricular performance, pulmonary blood volume, and systemic and pulmonary vascular resistance. *Undersea Hyperb Med* 2000; 27:67–70

2 Riddick MF. Sternal wound infections, dehiscence, and sternal osteomyelitis: the role of hyperbaric oxygen therapy. In: Kindwall EP, Whelan HT, eds. *Hyperbaric medicine practice*. 2nd ed. Flagstaff, AZ: Best Publishing, 1999; 617– 618

3 Side effects. In: Hampson NB, ed. Hyperbaric oxygen therapy: 1999 committee report. Kensington, MD: Undersea and Hyperbaric Medical Society, 1999; 73–75

4 Whalen RE, Saltzman HA, Holloway DH Jr, et al. Cardiovascular and blood gas responses to hyperbaric oxygenation. *Am J Cardiol* 1965; 15:638–646

5 Haque WA, Boehmer J, Clemson BS, et al. Hemodynamic effects of supplemental oxygen administration in congestive heart failure. *J Am Coll Cardiol* 1996; 27:353–357

6 Pulmonary Edema Associated With Hyperbaric Oxygen Therapy, Lindell K. Weaver and Sue Churchill *Chest* 2001;120;1407-1409 DOI 10.1378/chest.120.4.1407

Date: _____

Name: _____

Post-Test
Acute CHF (fluids over load) in HBO

1. Acute CHF is a common side effect of HBOT
(circle) True False
2. Dialyzed patients should be _____ before treatment, if ___% over dry wt.
do not treat.
3. When treating a patient for radiation injury who is on a diuretic and has told he
has not taken it for the past 10 days you should:

A: Tell him he should take all meds as directed, and treat at 2.0?
B: Make a note in the chart and treat at 2.4?
C: Consult with the Physician who will decide if he is safe to treat?
4. All patients with Chronic Kidney disease should not receive HBOT.

(circle) True False
5. The purpose of a chest X-ray is to determine if the patient is likely to develop
acute CHF: (circle) True False
6. BONUS: Name 5 Symptoms of acute CHF (fluid overload)

February Static Electricity/Grounding

Overview: When oxygen concentration increases in an atmosphere, the risk of fire increases. Sparks caused by discharges of static electricity have been implicated as ignition sources in fires and explosions. To prevent fires in any environment the 3 legs of the fire triangle must be considered, fuel, ignition source and oxygen. Fire prevention in hyperbaric environments focuses on reducing the amount of available fuel and eliminating the source ignition. The majority of fires in Hyperbarics have been caused by the introduction of an ignition source (hand warmers, cigarette lighters, etc.) Static electricity is a routine part of our lives. We have all experienced a snap or pop of static when you reach for a doorknob, particularly after walking across a carpeted floor. In certain situations a static discharge can lead to disaster. Electrons accumulate on the surfaces of objects (including our body) and can result in significant voltage potentials under certain conditions. These voltages usually flow unnoticed from object to object through conductive pathways. To reduce the potential for sparks, static charges must have conductive pathways to flow through and these are called grounds. Ground examples are: conductive footwear, cables, chains or elevated relative humidity levels (>40-50%) can provide an appropriate path to ground in order to dissipate the accumulated charge. There are specific grounding requirements for Hyperbaric Chambers and occupants defined in the National Fire Prevention Agency Manual (NFPA) Chapter 19, NFPA 99 or Chapter 20, NFPA 02. Requirements state that a grounding system must provide a high impedance conductive pathway in contact with the patient's skin. Grounding straps used in hyperbaric chambers are usually attached to the patient's wrist or to an adhesive ECG monitoring pad. The Hyperbaric environment poses an increased fire hazard primarily due to elevated oxygen concentration. It would be extremely rare to see the discharge of more than a single spark especially if the patient was properly grounded.

Procedure: Daily inspection of your hyperbaric chamber includes the inspection of the grounding wire attached at the rear of your chamber. All patients are required to wear a grounding wrist band or ECG patch before entering the chamber. Grounding Areas: chamber (cable is attached to grounding plate upon daily inspection) patient (wrist band or ECG patch attached) gurney (chain at bottom of gurney making contact with the floor). To safely treat patients in an increased oxygen environment we must pay close attention to static control by increasing relative humidity and providing adequate conductive pathways as listed above.

References: NFPA 99, Chapter 19 Section 2.7.4, 3.1.5.3, NFPA 03, Chapter 20 Section 20.2.7.4, 20.3.1.5.3.2, Wilbur T. Workman, Hyperbaric Facility Safety: A Practical Guide, Chapter 3, pp 523-53

Date: _____

Name: _____

Post-Test
Static Electricity/Grounding

1. A static spark does not generate enough charge to be dangerous in an oxygen enriched environment. (circle) True False
2. Give two examples grounding used in the HBO department _____ and _____.
3. To decrease static electricity you may need lower your humidity in the chamber room. (circle) True False
4. This _____ grounding area is inspected prior to treating your first patient of the day.
5. The _____ Manual gives you specific grounding requirements.
6. If your patient is grounded it is extremely rare to have a static spark. (circle) True False
7. The human body is capable of producing significant voltage potential under the certain conditions. (circle) True False
8. The majority of fires in HBO chambers have been caused by _____ source.
9. The 3 legs of the fire triangle are: _____, _____ and _____.
10. When the concentration of oxygen is increased so does the risk of fire. (circle) True False

March
Meeting Medical Necessity for a DFU for HBOT

Overview:

Medical necessity is a United States legal doctrine, related to activities which may be justified as reasonable, necessary, and/or appropriate, based on evidence-based clinical standards of care.

In order to meet Medical necessity we must meet all elements listed the LCD for the procedure we wish to provide. Each HBO indications has deferent elements of medical necessity. The Following is a compleat plan, provided by our colleague Matt Schweyer, it is a well constructed providers note that contains all elements of Medical Necessary.

Patient is a Type I/Type II Diabetic and he/she has a Wagner Grade 3/4/5 ulcer of the _____, as proven by (MRI/bone scan/x-ray/ Abscess/ gangrene/ etc). The patient has had 30 days of standard wound care without measurable signs of healing. Maintenance of clean, moist wound bed of granulation has been performed with serial debridements on (dates) and applying (dressings). Proper offloading has been provided by (offloading device). Debridement of infected bone has been performed on (date). Vascular assessment including (Spell out all testing done and results, TCOM, ultrasound, CT angio, ABI) and no revascularization is required and/or revascularization has been provided by Dr. _____ on (date) and optimized and/or patients is not a candidate for revascularization. Pre-albumin and Albumin levels are within normal ranges (or skin turgor, multi-vitamins, Ensure, etc) indicating that the patient's nutritional status is optimized. Recent Hemoglobin A1C is _____. Glucose levels controlled/being followed by _____ and any changes/modifications to insulin/medications will be followed by this physician. Patient has been treated and/or is being treated with _____ to resolve any infection. Patient education regarding smoking cessation was provided (if smoker).

Review of Systems: physician to dictate full review of systems here

Review of Contraindications: The relative contraindications for hyperbaric oxygen therapy have been reviewed and the patient risk vs benefit considered regarding the following:

Untreated pneumothorax, history of spontaneous pneumothorax.
Any history of the following medications: Bleomycin, Doxyrubicin (Adriamycin), Disulfiram (Antabuse), Cis-Platinum and Mafenide Acetate (Sulfamylon).

Upper respiratory infections and chronic sinusitis.

Retinal surgery in the preceding 6 weeks with use of intraocular gas.

Seizure disorders

Patient receiving anti-convulsing medications should have drug levels addressed prior to initial treatment and as determined by the physician during the course of HBO therapy. Benzodiazepines (Diazepam or Lorazepam) may be administered to reduce the risk of oxygen seizures.

Emphysema with CO2 retention.

High fever >100.

Pregnancy

Medications: Steroids as they may decrease the threshold for oxygen seizures; Narcotics may lead to decreased respiratory drive and Phenergan predisposes to oxygen toxicity (utilize different antiemetic).

The potential risks associated with treatment were reviewed with the patient including but not limited to: fire, barotrauma, seizure and confinement anxiety as well as visual changes. Patient acknowledges risk, benefits and common complications and acknowledges by signing informed consent. Patient wishes to proceed with hyperbaric oxygen treatment.

Plan:

Patient is candidate for hyperbaric oxygen therapy for the diabetic ulcer of the _____.

Treatment will consist of 2.0-2.5 ATA for 90-120 minutes once a day as an adjunct to the appropriate standard of care.

Procedure:

By utilizing the following form when reviewing a chart for HBOT you can assure that the provider has met all elements of medical necessity:

DIABETIC ULCER PATHWAY WORKSHEET
HBOT REFERRAL

Diabetic: Type I Type II

Wagner Stage: (must be stage III or higher) _____

Vascular Studies (check all that are appropriate)

Tcpo2 Date _____

Doppler Date _____

Non invasive arterial studies Date _____

Arteriogram Date _____

Other _____ Date _____

Lower extremity by-pass surgery Y N

If yes Location / Surgeon /Date _____

Not a candidate for by-pass

Surgical debridement Y N

Procedure(s) _____ Date: _____

_____ Date _____

Wound Care (check all that apply)

30 days of documented wound management

Maintenance (dressing change)

Type(s) _____

Debridement of devitalized tissue

Off Loading (if appropriate)

Measurable signs of healing Y N

Wound size at start of wound care (LxWxD) _____ Date _____

Present wound size (LxWxD) _____ Date _____

Change in amount of exudate Increase decrease no change

Change in amount of devitalized tissue Increase decrease no change

Antibiotic therapy Y N

Name: _____ P.O. / I.V. Date _____

Duration: _____

Glucose Controlled Hgbic Date: _____ Results: _____ N.A.

Optimized nutrition Dietary consult Y N N/A Date _____ Supplements prescribed

Appropriate candidate for HBOT Y N

Completed by: _____ Date _____

References: CMS pub 100.3, manual section number 20.29 2016 NCD Hyperbaric oxygen Therapy, Novitas WC LCD (L32125) 11-9-2017, Matt Schweyer "Diabetic lower extremities ulcer HBO H&P.

Date: _____

Name: _____

Post-Test
Meeting Medical Necessity for a DFU for HBOT

1. Diabetic Foot wounds are always staged?
(circle) True False

1. If the patient has a bounding pedal pulse there is no need for any vascular study's?
(circle) True False

2. The Patient who is a documented diabetic who you have been treating for a Wagner II ulcer on his left foot, just arrived at your center they have a new Wagner III foot ulcer on there right foot. Can you put them in HBO immediately? (Circle) Y. N. If no why not?

3. Your Patient has received 31 treatments in the Hyperbaric Chamber for his DFU Wagner III the wound has made progress toward healing, it would be medically necessary to order another 30 treatments? (circle) True False

4. Vascular assessment testing can be done utilizing, _____, _____, _____, or _____.

5. Are Diabetic foot ulcers ever downgraded (until fully closed) ? (Circle) Y. N.

6. Bonus: What are the elements of a Wagner Grade III Diabetic foot Ulcer?

April
Basic Monoplace Chamber Maintenance

Overview:

NFPA 99 states that before each run, each chamber operator must acknowledge, in writing, in an appropriate log, the purpose of the run or test, duties of all personal involved, and a statement that he or she is satisfied with the condition of all equipment. NFPA also requires that a routine maintenance program one that document all repairs.

Daily Maintenance Requirements (ensure On/off is in off position)

1. Perform a thorough inspection of acrylics, looking for evidence of cracks, scratches, nicks, crazing or discoloration.
2. Inspect the chamber door and door locking mechanism for ease of operation and positive locking.
3. Inspect door cam, clean and lightly apply HALOCARBON grease as needed.
4. Inspect door seal for dirt, cracks, cuts, or any obvious damage. Lub with unscented talc (lightly) as needed.
5. Inspect chamber for cleanliness, clean as needed.
6. Inspect ground wire from chamber to wall, tighten connections as needed.
7. Inspect all chamber control and communications knobs for tightness to stem, tighten as needed.
8. Check for proper operation of communication panel.
9. Inspect chamber O₂ supply and exhaust lines(hoses), no kinks and in tack, replace as needed. NOTE Never tighten connections with gas in line!
10. Inspect all gauges for cracks and that all pointers are at zero (except Line Pressure gauge)replace if needed.
11. Check Line Pressure gauge and wall panel to insure that pressure is between 40-80 psi.

Weekly Maintenance Requirements (with Chamber unoccupied)

Turn System on, set rate to Maximum rate, set Pressure to 3 psi vent at min.

1. Check that locking pin engagement, door cannot be opened.
2. Set Pressure to 30 psi. Allow chamber to pressurize and level out to 30 psi. (3 ATA)

- Turn system off and press and hold “emergency decompression” button, (exhaust bypass).
- Time how long it takes to reach .5 psi. If more then 2 minuets;
 - Remove and clean Chamber exhaust filter.
 - Repeat steps 1&2 if still more then 2 minuets replace filter.
- 3. Remove and clean Chamber exhaust filter. At foot end of chamber (inside) remove the (2) black thumb screws holding the exhaust cover plate in place, set aside, loosen and remove the exhaust filter, using a wire brush and mild soapy water clean filter. Reinstall filter, only hand tighten only.
- 4. Using a calibrated ohmmeter check resistance between chamber and wall, your reading should be zero, if not check ground wire, and all connections if no brakes replace wire.
- 5. Using calibrated ohm meter check resistance between medal on wrist band and ‘banana’ jack should read between 1.001 and .9999 if not in range replace.

Annual Maintenance Requirements

- WILL BE PERFORMED BY QUALIFIED, FACTORY TRAINED AND CERTIFIED PERSONS ONLY
 - INSPECT ALL COMPONENTS, Compete leak testing, calibrate chamber, clean/replace all control filters, check tie-rod torque, disassemble and clean regulators as needed, replace control stems as needed. Test and replace back up communication battery.

Procedure: Preform all Maintenance as above, including chamber cleaning, and document on proper forms. Place all forms into appropriate chamber log.

Reference: Sechrist pp. 1.2, 2.6, 4.4, Sigma 44 to 62 pp. 14, 18, Sigma Plus pp.17, ETC BARA-Med chamber manual chapter 7 page 8.

Date: _____

Name: _____

Post Test
Basic Monoplace Chamber Maintenance

1. At 3 ATA a monoplace chamber is required to emergency decompress within 3 minutes or 1 ATA per minute.
(circle) True False

2. Joe has preformed his daily Maintance and noted that he has a large area of at the acrylic that appears to discolored upon further inspection he determines that it is in the center of the acrylic, not on the suffice neither on inside or outside of the chamber and decides that this must be crazing. Joe's best course of action is:
 - a. Make a note in the log, and continue to treat his first patient.
 - b. Take a marker and outline the area so that he can monitor it, note in log and continue to treat first patient.
 - c. Place a cover over the area, so that patients won't be disturbed and continue to treat his first patient
 - d. Turn the gas off, place an out of service sign on the chamber, contact the Nation Safety Director and reschedule your patients.

3. The exhaust filter on a Perry chamber should be tightened with a large wrench to 35 psi.
(circle) True False

4. The chamber is equipped with a battery back-up that must be changed monthly?
(circle) True False

5. When tightening gas line connections it is important to be sure the gas is turned on so that you can hear if it is leaking or not? (circle) True False

6. Bonus: Describe the process used to full inspection of the Acrylic.

May
Obtaining insurance approval for HBOT

Overview: Health insurance companies use the prior authorization or pre-approval process to verify that a certain drug, procedure, or service is medically necessary BEFORE it is done (or the prescription is filled). This is extremely important for you to know, especially people being treated in hyperbaric. If the service is done before the insurance plan approves it, your patient could be responsible for full cost, with the insurer paying nothing.

Submitting a Request Prior authorization should be requested as soon as the HBO therapy treatment is scheduled. Treatment should not be delayed due to a pending prior authorization decision. An affirmed decision in cases that are considered emergent may be retroactively applied to services based on the earliest date noted on documentation that supports medical necessity (you can find all elements of medical necessity can be found I your LCD even for non cms),(you should ask in these cases) or the start date requested on the prior authorization request – whichever is later. Claims, however, should not be submitted until the prior authorization decision has been received as it will contain the tracking number that must be placed on the claim. Submitters are encouraged to use a form specifically designed for prior authorization requests. The form assists submitters with making sure that you have all information needed so that all requests can be completed on the first contact.

Submitters should include the following data elements in a PA request package:

Beneficiary Information:

Beneficiary Name, Beneficiary insurance Number, Beneficiary Date of Birth, and Beneficiary Gender.

Ordering Physician/Practitioner Information:

Physician/Practitioner Name, Physician/Practitioner National Provider Identifier (NPI), and Physician/Practitioner Address

Facility Information:

Facility Name, Facility National Provider Identifier (NPI), and Facility Address

Requestor Information:

Contact Name, and Telephone Number

Other Information:

Number of treatments requested, Number of units per treatment requested, HCPCS Code (G0277 for facility charge, 99813 Physician oversight), Submission Date, Start Date of the 12 month period, Indicate if the request is an initial or resubmission review, Indicate if the request is expedited and the reason why, State, and Diagnosis Codes.

Additional Required Documentation:

Documentation from the medical record to support the medical necessity of HBO treatment, and Any other relevant document as deemed necessary by the insurance company to process the prior authorization. Please see the insurance company's website for additional information.

Pre approval will not guarantee payment you may need to provide more information at time of or after billing.

Procedure:

Design a form that incorporates all needed information and have it available before you call the insurance. Keep a log of the 'Special needs' of the different companies. When calling KEEP a complete record of who you talked to, what was said, time and date, follow up at least 2 times per week. If you are unsuccessful request a peer to peer phone call with their Medical Director and the ordering Physician. NOTE not all commercial insurers cover the same indications as CMS, and some will cover non-CMS indications so you should always check.

References:

None.

Date: _____

Name: _____

Post-Test
Obtaining insurance approval for HBOT

1. You called the insurance to obtain PA for your patient, you are denied, after a complete review of the medical you find that you have met all elements of Medical Necessity. Your next step is:
 - A. Nothing you are done.
 - B. Turn it over to your Program Manager, this is as far as you can go.
 - C. File an appeal with the carrier, if still unsuccessful request a Peer to Peer call.
 - D. Call back as if it your first, talking to a new agent will sometimes work.

2. Name the patient information you will need before you call the insurance company: _____

_____.

3. Once you receive approval you can then do as many treatments as you like? (circle)
True False

4. Once you have received a approval you will receive a tracking number, what will be your best action for this number :
 - a. Write it on your notes and pass it them on?
 - b. Use this number on everything you submit for billing?
 - c. Nothing this is the responsibility of the billing department?
 - d. Ask the hospital to use it as their MRN?

5. The elements of medical necessity can be found in your LCD, how ever you only need to meet most of them? (circle) True False
6. Bonus: Name the elements of medical necessity for Soft tissue radiation?

June
Patient education and why it is important

Overview:

Patients and health consumers nowadays fall into two extremes. There's the information junkie, armed with a bunch of articles and studies found online, not to mention the well-meaning advice they get from friends and relatives about their medical condition. But who's to say if the self-diagnosis they did online was correct? Was the source of their information even reliable?

Then there's the little informed, possibly, devil-may-care patient with zero information —and possibly zero interest —about his/her health and medical records. Until something happens.

Despite the difference between patients, it's clear that patient education should be viewed as an important part of providing quality health care.

After all, there's more to patient education than understanding the prescription, or cause of an illness.

Educating patients can help them manage diseases, or prevent them from occurring in the first place. For instance, by informing a rather unhealthy family about the drastic repercussions of processed and sugary foods, you can help save them from obesity.

Inform them how difficult it is to live obese, and the host of medical problems they'll have to deal with once there. Many patients report that they would've tried harder to maintain a healthy weight, if they were fully aware its unwanted effects.

Researchers from Ohio found that one to two physical therapy sessions before a total hip or knee replacement reduced the need for postoperative care by 29% after reviewing 4,733 Medicare cases.

Of course, people assumed that the cause for improvement is the physical therapy sessions. But two sessions isn't enough to trigger that much improvement. The reason for the development was that the physical therapy sessions helped surgery patients understand the procedure and recovery process before going under the knife.

The therapy sessions helped them feel in control of the situation, instead of feeling scared and vulnerable.

What happens if a patient doesn't follow their prescription? For the common cold, they're just not going to get better anytime soon. But what if a patient has a chronic condition that requires rigid maintenance, such as hypertension or diabetes?

Patients with illnesses requiring multiple medications, lifestyle modifications, and constant monitoring (i.e. blood pressure, glucose level), need more help on the education front.

In most cases, it's not enough to explain all this verbally. The healthcare provider will need to provide educational aids, such as pamphlets and online resources, to ensure compliance and help them accept the diagnosis.

A Gallup study showed the relation between patient preparedness before a surgery and patient satisfaction with the results. When a patient 'strongly agreed' about knowing what to expect after surgery, 72% are more likely to be satisfied with the surgery results.

The study also shows that reports of problems or complications following an operation dropped to 8% if the patient knew what to expect

Procedure:

Document all teaching.

The following is some information you should share with your patients, remembering that is our opportunity to help them prevent a reoccurrence of their ulcer.

HBOT Frequently Asked Questions

What is Hyperbaric Oxygen Therapy?

Hyperbaric oxygen therapy (HBOT) is a medical treatment which enhances the body's natural healing process by inhalation of 100% oxygen in a total body chamber, where atmospheric pressure is increased and controlled. It is used for a wide variety of treatments usually as a part of an overall medical care plan.

How long are the treatments?

You will be placed in one of our chambers for a period of 120 minutes each day. This does not include the time you need to arrive at the facility, change into appropriate clothing and upon completion of your treatment change back into your clothing. A typical Hyperbaric treatment will take two and a half hours from arrival to departure.

How many treatments are required?

The number of treatments and duration of each treatment will be determined by the physician. This is based on your diagnosis and your response to treatment. Typical patients require 30-40 visits daily Monday through Friday with the exception of holidays and weekends.

Is Hyperbaric Oxygen Therapy safe?

Yes. Hyperbaric Oxygen Therapy is prescribed by a physician and you are always under

medical supervision while in our chamber. You are monitored by a specially trained Hyperbaric Technologist who is in the treatment room at all times and a specially trained hyperbaric physician is always available.

Are there any side effects?

The most common side effect is barotrauma to the ears and sinuses caused by the change in pressure. To minimize this risk patients learn techniques to promote adequate clearing of the ears during compression or in cases when patients have problems with pressure equalization, tubes may be inserted into the ears. In most cases patient may experience 'popping and or cracking ' at night after there first 2-3 treatments, this will subside and is nothing to be concerned with. Occasionally some patients may experience changes in their vision during their treatment period. These changes are usually minor and temporary. A rare side effect is oxygen toxicity which is caused by administration of too much oxygen.

How should patients prepare for their hyperbaric treatments?

Patients should arrive for their treatments 15 minutes prior to their scheduled treatment time. Only clean cotton clothing provided by the center is allowed into the hyperbaric chamber. No cosmetics, perfumes, hair products, deodorants, wigs, under clothing, eyeglass's or jewelry are allowed into the chamber. Patients are also advised not to drink carbonated beverages or alcohol for four hours prior to their treatment. Additionally, patients should give up smoking and nicotine products while receiving hyperbaric treatments as they interfere with the body's ability to transport oxygen. Patents with diabetes get hypoglycemia (low blood sugar) when their bodies don't have enough sugar to use as energy. Each person may have different symptoms. Please help to recognize yours as your blood glucose can drop by an unpredictable amount during your treatment. We will check your glucose level before and after each treatment. We will not treat you if it is below 120, however a high level will delay wound healing, so we will work with you to help control you blood glucose levels.

Diabetes and Diet

A diabetes diet simply means eating the healthiest foods in moderate amounts and sticking to regular mealtimes.

A diabetes diet is a healthy-eating plan that's naturally rich in nutrients and low in fat and calories. Key elements are fruits, vegetables and whole grains. In fact, a diabetes diet is the best eating plan for most everyone.

Purpose

If you have diabetes, your doctor will likely recommend that you see a dietitian to help you develop a healthy eating plan. The plan helps you control your blood sugar (glucose), manage your weight and control risk factors for heart disease, such as high blood pressure and high blood fats.

When you eat excess calories and fat, your body responds by creating an undesirable rise in blood glucose. If blood glucose isn't kept in check, it can lead to serious problems, such as a dangerously high blood glucose level (hyperglycemia) and long-term complications, such as nerve, kidney and heart damage.

You can help keep your blood glucose level in a safe range by making healthy food choices and tracking your eating habits.

For most people with type 2 diabetes, weight loss also can make it easier to control blood glucose and offers a host of other health benefits. If you need to lose weight, a diabetes diet provides a well-organized, nutritious way to reach your goal safely.

Diet details

A diabetes diet is based on eating three meals a day at regular times. This helps your body better use the insulin it produces or gets through a medication.

A registered dietitian can help you put together a diet based on your health goals, tastes and lifestyle. He or she can also talk with you about how to improve your eating habits, for example, by choosing portion sizes that suit the needs for your size and level of activity.

Recommended foods

Make your calories count with these nutritious foods:

- Healthy carbohydrates. During digestion, sugars (simple carbohydrates) and starches (complex carbohydrates) break down into blood glucose. Focus on the healthiest carbohydrates, such as fruits, vegetables, whole grains, legumes (beans, peas and lentils) and low-fat dairy products.
- Fiber-rich foods. Dietary fiber includes all parts of plant foods that your body can't digest or absorb. Fiber moderates how your body digests and helps control blood sugar levels. Foods high in fiber include vegetables, fruits, nuts, legumes (beans, peas and lentils), whole-wheat flour and wheat bran.
- Heart-healthy fish. Eat heart-healthy fish at least twice a week. Fish can be a good alternative to high-fat meats. For example, cod, tuna and halibut have less total fat, saturated fat and cholesterol than do meat and poultry. Fish such as salmon, mackerel, tuna, sardines and bluefish are rich in omega-3 fatty acids, which promote heart health by lowering blood fats called triglycerides.

Avoid fried fish and fish with high levels of mercury, such as tilefish, swordfish and king mackerel.

- "Good" fats. Foods containing monounsaturated and polyunsaturated fats can help lower your cholesterol levels. These include avocados, almonds, pecans, walnuts, olives, and canola, olive and peanut oils. But don't overdo it, as all fats are high in calories.

Foods to avoid

Diabetes increases your risk of heart disease and stroke by accelerating the development of clogged and hardened arteries. Foods containing the following can work against your goal of a heart-healthy diet.

- Saturated fats. High-fat dairy products and animal proteins such as beef, hot dogs, sausage and bacon contain saturated fats.
- Trans fats. These types of fats are found in processed snacks, baked goods, shortening and stick margarines. Avoid these items.
- Cholesterol. Sources of cholesterol include high-fat dairy products and high-fat animal proteins, egg yolks, liver, and other organ meats. Aim for no more than 200 milligrams (mg) of cholesterol a day.
- Sodium. Aim for less than 2,300 mg of sodium a day. However, if you also have hypertension, you should aim for less than 1,500 mg of sodium a day.

Putting it all together: Creating a plan

A few different approaches to creating a diabetes diet are available to help you keep your blood glucose level within a normal range. With a dietitian's help, you may find one or a combination of the following methods works for you:

- The plate method. The American Diabetes Association offers a simple seven-step method of meal planning. In essence, it focuses on eating more vegetables. When preparing your plate, fill one-half of it with nonstarchy vegetables, such as spinach, carrots and tomatoes. Fill one-quarter with a protein, such as tuna or lean pork. Fill the last quarter with a whole-grain item or starchy food. Add a serving of fruit or dairy and a drink of water or unsweetened tea or coffee.
- Counting carbohydrates. Because carbohydrates break down into glucose, they have the greatest impact on your blood glucose level. To help control your blood sugar, eat about the same amount of carbohydrates each day, at regular intervals, especially if you take diabetes medications or insulin.

A dietitian can teach you how to measure food portions and become an educated reader of food labels, paying special attention to serving size and carbohydrate content. If you're taking insulin, he or she can teach you how to count the amount of carbohydrates in each meal or snack and adjust your insulin dose accordingly.

- The exchange lists system. A dietitian may recommend using food exchange lists to help you plan meals and snacks. The lists are organized by categories, such as carbohydrates, protein sources and fats.

One serving in a category is called a "choice." A food choice has about the same amount of carbohydrates, protein, fat and calories — and the same effect on your blood glucose — as a serving of every other food in that same category. So, for example, you could

choose to eat half of a large ear of corn or 1/3 cup of cooked pasta for one starch choice.

- Glycemic index. Some people who have diabetes use the glycemic index to select foods, especially carbohydrates. This method ranks carbohydrate-containing foods based on their effect on blood glucose levels. Talk with your dietitian about whether this method might work for you.

A sample menu

When planning meals, take into account your size and activity level. The following menu is tailored for someone who needs 1,200 to 1,600 calories a day.

- Breakfast. Whole-wheat bread (1 medium slice) with 2 teaspoons jelly, 1/2 cup shredded wheat cereal with a cup of 1 percent low-fat milk, a piece of fruit, coffee
- Lunch. Cheese and veggie pita, medium apple with 2 tablespoons almond butter, water
- Dinner. Salmon, 1 1/2 teaspoons vegetable oil, small baked potato, 1/2 cup carrots, side salad (1 1/2 cups spinach, 1/2 of a tomato, 1/4 cup chopped bell pepper, 2 teaspoons olive oil, 1 1/2 teaspoons red wine vinegar), unsweetened iced tea
- Snack. 2 1/2 cups popcorn or an orange with 1/2 cup 1 percent low-fat cottage cheese

Results

Embracing your healthy-eating plan is the best way to keep your blood glucose level under control and prevent diabetes complications. And if you need to lose weight, you can tailor it to your specific goals.

Aside from managing your diabetes, a diabetes diet offers other benefits, too. Because a diabetes diet recommends generous amounts of fruits, vegetables and fiber, following it is likely to reduce your risk of cardiovascular diseases and certain types of cancer. And consuming low-fat dairy products can reduce your risk of low bone mass in the future.

Risks

If you have diabetes, it's important that you partner with your doctor and dietitian to create an eating plan that works for you. Use healthy foods, portion control and scheduling to manage your blood glucose level. If you stray from your prescribed diet, you run the risk of fluctuating blood sugar levels and more-serious complications.

What is a Diabetic Foot Ulcer?

A diabetic foot ulcer is an open sore or wound that occurs in approximately 15 percent of patients with diabetes and is commonly located on the bottom of the foot. Of those who develop a foot ulcer, 6 percent will be hospitalized due to infection or other ulcer-related complication.

Diabetes is the leading cause of non-traumatic lower extremity amputations in the United States, and approximately 14-24 percent of patients with diabetes who develop a foot ulcer

will require an amputation. Foot ulceration precedes 85 percent of diabetes-related amputations. Research has shown, however, that development of a foot ulcer is preventable.

Causes

Anyone who has diabetes can develop a foot ulcer. Native Americans, African Americans, Hispanics, and older men are more likely to develop ulcers. People who use insulin are at higher risk of developing a foot ulcer, as are patients with diabetes-related kidney, eye, and heart disease. Being overweight and using alcohol and tobacco also play a role in the development of foot ulcers.

Ulcers form due to a combination of factors, such as lack of feeling in the foot, poor circulation, foot deformities, irritation (such as friction or pressure), and trauma, as well as duration of diabetes. Patients who have diabetes for many years can develop neuropathy, a reduced or complete lack of ability to feel pain in the feet due to nerve damage caused by elevated blood glucose levels over time. The nerve damage often can occur without pain, and one may not even be aware of the problem. Your podiatrist can test feet for neuropathy with a simple, painless tool called a monofilament.

Vascular disease can complicate a foot ulcer, reducing the body's ability to heal and increasing the risk for an infection. Elevations in blood glucose can reduce the body's ability to fight off a potential infection and also slow healing.

Prevention

The best way to treat a diabetic foot ulcer is to prevent its development in the first place. Recommended guidelines include seeing a podiatrist on a regular basis. Your podiatrist can determine if you are at high risk for developing a foot ulcer and implement strategies for prevention.

You are at high risk if you have or do the following:

- Neuropathy
- Poor circulation
- A foot deformity (e.g., bunion, hammer toe)
- Wear inappropriate shoes
- Uncontrolled blood sugar
- History of a previous foot ulceration

Reducing additional risk factors, such as smoking, drinking alcohol, high cholesterol, and elevated blood glucose, are important in prevention and treatment of a diabetic foot ulcer. Wearing the appropriate shoes and socks will go a long way in reducing risks. Your podiatrist can provide guidance in selecting the proper shoes.

Learning how to check your feet is crucial so that you can find a potential problem as early as possible. Inspect your feet every day—especially the sole and between the toes—for cuts, bruises, cracks, blisters, redness, ulcers, and any sign of abnormality. Each time you visit a health-care provider, remove your shoes and socks so your feet can be examined. Any problems that are discovered should be reported to your podiatrist as soon as possible; no matter how simple they may seem to you.

The key to successful wound healing is regular medical care to ensure the following “gold standard” of care:

- Lowering blood sugar
- Appropriate debridement of wounds
- Treating any infection
- Reducing friction and pressure
- Restoring adequate blood flow

Reference:

Clinical Procedures in Emergency Medicine, 3rd Edition, Ed Roberts & Hedges, W.B. Saunders. Hyperbaric Medicine Practices, 2nd Edition 1995, Eric P. Kindwall, M.D. , UCAOA Corporate Support Partners (CSP) program. Thank you to Patient Direct, a Diamond CSP., <https://www.mayoclinic.org/diseases-conditions/diabetes/in-depth/diabetes-diet/art-20044295?pg=1>, <http://www.apma.org/Learn/FootHealth.cfm?ItemNumber=981>.

Date: _____

Name: _____

Post Test
Patient education and why it is important

1. Educating patients can help them _____ diseases, or _____ them from occurring in the first place
2. A Gallup study showed that patient preparedness before a surgery resulted higher patient satisfaction scores. (circle) True False
3. Diabetes increases your risk of heart disease and stroke by accelerating the development of clogged and hardened arteries.
(circle) True False
4. Your Patient asks you to suggest a healthy meal for her your best reply is:
 - a. Hot Dogs, French fries and a soda?
 - b. Fried chicken, rice and beans?
 - c. Salmon, 1 1/2 teaspoons vegetable oil, small baked potato, 1/2 cup carrots, side salad?
 - d. Fast food such as a Big Mac and fries?
5. Patients with Neuropathy:
 - a. Have difficulty performing task as they are mentally challenged?
 - b. Have a lost of sensation in the lower extremities, often resulting in their ulcer?
 - c. No blood flow to there feet?
6. Bonus: Foot ulceration precedes ____ percent of diabetes-related amputations.

July
Non Oxygen related seizures in HBO

Introduction:

A recent study of 80,000 HBO treatments showed that Only 2 oxygen seizures were documented, yielding an incidence of 2.4 per 100,000 patient-treatments. Both cases occurred in a monoplace chamber pressurized to 2.4 ATA with two 5-min air breaks. As you can see the incidents of O2 seizures is extremely low.

Most seizures in HBO are the result of conditions that only manifest under Hyperbaric condition, in other words hyperbaric act to lower the seizure threshold. Such things as fevers, medications, changes in blood chemistry, and brain tumors can cause seizures under Hyperbaric conditions. These incidents are extremely rare as well however many can be prevented. Patients who have a fever over 100F should be treated with an antipyretic. Patients who have recently began new drug that has Seizures as a side effect may cause a seizure such as Chantix a popular stop smoking drug when reaching its therapeutic level has been known to cause a seizure. Low Magnesium or potassium and other minerals may cause seizures. Another common cause of seizures is Hyper and Hypoglycemia.

In conclusion although HBO is generally well tolerated, there exists a risk of seizure in all patients that may be increased in patients with predisposing factors including: fever, hypothermia, prior seizure, or brain injury.

Procedure:

Before initiating the first treatment a complete review of all meds should be performed paying close attention to new drugs. Follow Policies and Procedures concerning fever and blood glucose in HBOT.

Should your patient experience a seizure a full work up must be performed before the patient can return for treatment. If it is determined to be oxygen seizure (Oxygen toxicity is a diagnosis of excursion) patient should only be treated at 2.0ata with air breaks

Reference: Seizure incidence in 80,000 patient treatments with hyperbaric oxygen. Yildiz S1, Aktas S, Cimsit M, Ay H, Toğrol E., Seizure During Hyperbaric Oxygen Therapy for Carbon Monoxide Toxicity: A Case Series and Five-year experience Robert W.SandersMD, DMT***Kenneth D.KatzMD*§JoeSuyamaMD*JawaidAkhtarMD*§Kevin S.O'TooleMD*DiannCorlIRN*Regan N.LadenburgerMD*

Date: _____

Name: _____

Post Test
Non Oxygen related seizures in HBO

1. A patient that is experiencing a seizure should be emergency vented out of the chamber. (circle) True False
2. _____ to the lungs may occur during emergency ventilation.
3. Patients can be removed from the chamber in 30 seconds or less. (circle) True False
4. The emergency vent button may be depressed _____ to avoid trauma to the lungs.
5. Under what condition would you use the Emergency Vent?
_____.
6. Name (3) conditions that may result in as seizure: _____,
_____, _____
7. What is the hall mark of a o2 seizure? _____. _____.
8. AS HBO lowers the seizure thus-hold if no pre existing conditions or present you can assume it is an O2 seizure and continue to treat the patient?
9. Bonus: Explain the process by which a tension pneumothorax results in Hyperbaric:

August

Discussing Smoking and wound healing

Introduction:

As each of you know, each day that we have a patient in our chamber room we have a unique opportunity to provide important information concerning their wound. It is our duty to provide with accurate and timely information that may not be obvious to all. One area that may fall into this category would be the link between wound healing and smoking. The following material can provide you with talking points to share with you smoking patients.

(From **Advanced Tissue** Website)

Smoking is often admonished by healthcare professionals for its ability to cause serious diseases, but puffing on a cigarette does more than just increase your risk for developing cancer and emphysema – it can also decelerate your body's natural **wound healing** process. According to the American Orthopedic Foot & Ankle Society, smokers face a steeper uphill battle than their non-smoking counterparts when it comes to recovering from injuries or surgeries, a process that can already be arduous depending on the severity of the wound. Read on to discover three key ways a smoking habit can get in the way of a successful medical recovery.

1. Smoking prevents wounds from receiving enough oxygen

Few elements are as crucial to the healing process as oxygen. After being inhaled, oxygen travels through the blood stream to the wound, where it becomes essential in the biological battle to fight infection, regenerate tissue and return to health.

Smoking, however, holds the body back from being able to win this battle. The chemicals found in cigarettes – and cigarette smoke – can cause respiratory and cardiovascular problems, both of which can reduce the amount of oxygen that tissue is able to receive, explained the National Health Service. Cigarettes also cause users to inhale carbon monoxide, which connects to red blood cells and prevents adequate amounts of oxygen from passing through the bloodstream.

2. Smoking raises blood sugar levels

Heightened blood sugar levels have numerous medical consequences, one of which is a deceleration of the wound healing process. According to Wound Care Centers, high blood sugar, which can be caused by smoking, creates arterial stiffness and narrows the blood vessels.

An elevated blood sugar level can also make red blood cells cluster together. Cell clumps are often unable to pass through capillaries, which can result in a lack of sufficient blood flow to **healing wounds**.

3. Smoking can cause patients to experience increased pain

Wound healing can be achy for anyone, but normal pain levels can be greatly exacerbated in patients with smoking habits. The American Orthopedic Foot & Ankle Society noted that cigarette-related chemicals have been shown to negatively impact the way bodies understand “pain signals.” Smoking can also aggravate inflammation, which can boost pain and add to the difficulties of the healing process.

Advanced Tissue is the nation's leader in [specialized wound-care supplies](#), delivering to both homes and long-term care facilities. © 2017 Advanced Tissue

Effects of smoking on cost and duration of hyperbaric oxygen therapy for diabetic patients with non-healing wounds.

Abstract

During this study to determine the effects of smoking on diabetic patients undergoing hyperbaric oxygen therapy (HBO2T) for nonhealing wounds, one physician visited five hyperbaric facilities and reviewed records on 1,006 patients who had received HBO2T for diabetic wounds. Smoking history was documented on 469 patients, while 180 patients had complete information on number of HBO2Ts, outcome, age, duration of diabetes, transcutaneous oxygen baseline in air at ambient conditions, Wagner score of the worst wound, smoking history, and intensity of treatment. These factors were statistically significant predictors of treatment outcome using multiple regression modeling. No difference was found between smokers with less than 10 pack years of cumulative history and nonsmokers. After that point there was a significant increase in the number of HBO2Ts needed to produce at least some healing in smokers vs. patients who had never smoked. The average patient with a greater than 10 pack-year smoking history* who benefited from treatment was estimated to need between 8 and 14 more HBO2Ts. This translates into an added treatment cost of \$4,000 to \$7,000 for the average patient who has smoked, and an estimated \$22-37 million annually for the United States.

Procedure:

Discuss the effects of smoking and wound healing with your patients.
Document your discussions in the teaching record portion of his/her chart.

This discussion should not be judgmental, but rather educational and factual, avoid such things as remarking on smell, remember you may be giving them information no one has given them before. Your goal should to help support them toward quitting. The attach study preformed by *Otto GH¹, Buyukcakir C, Fife CE*, should help when discussing the real life effects on HBO as well as the advantages of quitting

References: <https://www.advancedtissue.com/smoking-negatively-impacts-wound-healing/>,

Effects of smoking on cost and duration of hyperbaric oxygen therapy for diabetic patients with non-healing wounds. *Otto GH¹, Buyukcakir C, Fife CE*.

*It is calculated by multiplying the number of packs of cigarettes smoked per day by the number of years the person has smoked. For example, 1 pack-year is equal to smoking 20 cigarettes (1 pack) per day for 1 year, or 40 cigarettes per day for half a year, and so on.

Date: _____

Name: _____

Post Test
Discussing Smoking and wound healing

1. Smoking has no effect on wound, this is just a myth the doctor tells to get people to stop smoking. (circle) True False
2. One study shows that there is little difference if the patient has only been smoking ___ pack per day for less then ___ years, what should we counsel our patient about this? _____.
3. When patients are being treated in the Hyperbaric Chamber they receive so much oxygen that it overcomes the effects of smoking. (circle) True False
4. How will smoking effect a diabetics blood sugar ? _____, will this effect wound healing? _____ -
5. How will effect pain levels? _____, Why? _____ >
6. Bonus: Please propose some ways you could approach your Patients about smoking?

Discussion: Should we treat smokers with HBOT?

September
Confinement Anxiety/Claustrophobia

- Overview:** All patients prior to their first treatment should be assessed for possible confinement anxiety or claustrophobia. To prevent or decrease the effects of confinement anxiety use pre-medication or distraction (TV, movies). Assure the patient that there will be someone present at all times. Reinforce that if the patient wants out of the chamber they will be taken out.
- Signs/Symptoms:** Clenching of fists, flushed face, profuse diaphoresis, and defensive attitude, urgency to empty bladder, feeling of being smothered or suffocated, sudden complaint of pain or discomfort, complaint of nausea or diarrhea.
- Procedure:** On your initial assessment if patient states that they suffer from claustrophobia you may want to order an anxiolytic drug. This medication can be given 30 minutes prior to treatment. Some patients may not realize they are claustrophobic until they go into the chamber. Should the patient request to come out of the chamber this must be done immediately. Pre-medication can be ordered prior to their next treatment.
- References:** Hyperbaric Nursing, Larson-Lohr pp. 137-138, 141-142, Hyperbaric Medicine Practice, Kindwall, pp.54

Date: _____

Name: _____

Post-Test
Confinement Anxiety/Claustrophobia

1. Name three symptoms that your patient may exhibit if they are showing signs of confinement anxiety. _____, _____ and _____.
2. Pre-treatment assessment will help identify patients that may suffer from claustrophobia. (circle) True False
3. _____ may be given prior to the treatment if the patient needs it.
4. If the patient states they want out of the chamber try to keep the patient in so they can complete their treatment. (circle) True False
5. Assure the patient that you are always present in the room should they need anything. (circle) True Fals

October
Fire Safety/On Site (in hospital)

Overview: The flammability of materials will increase as the partial pressure of oxygen increases to the point where normally non-combustible materials may become flammable or combustible. Materials, generally not considered fuel sources, will burn vigorously in an oxygen-enriched environment (23.5%) such as:

- Human tissue, body hair, oils and fats
- Loose cotton garments
- Oil-based products, facial cream, body oils, hair spray, etc.

Before the patient's treatment, a safety check needs to be completed and documented in the chart. The safety checklist states that the Hyperbaric Technologist or Nurse treating the patient has gone through a checklist of safety procedures.

◇ FIRE OUTSIDE THE HYPERBARIC UNIT, BUT INSIDE THE BUILDING

- Follow hospital fire plan

◇ FIRE IN THE HYPERBARIC UNIT, BUT OUTSIDE THE CHAMBER

PROCEDURE:

Office Staff or Designee

- Pull fire alarm and call _____ informing them of location of the fire
- Assist in the evacuation of the area per hospital evacuation plan

Nursing Staff

- Evacuate the area per hospital evacuation plan

Director

- Report to the Hyperbaric Unit and stand by to turn off main oxygen as soon as emergency decompression is complete
- After turning off oxygen assist in the evacuation of the Hyperbaric Unit per hospital evacuation plan

Nurse Manager

- Report to the Hyperbaric Unit and prepare to extinguish the fire
- Assist the Hyperbaric Technologist in the emergency decompression of the patient using the emergency vent button (Sechrist) or bypass/exhaust button (Perry)
- Remove patient from the chamber and follow hospital evacuation plan

Hyperbaric Technologist

- Decompress all chambers as quickly and safely as possible using the emergency vent button (Sechrist) or bypass/exhaust button (Perry)
- Notify personnel who is standing by to turn off main oxygen valve
- Remove patients from the chamber and follow hospital evacuation plan

◇ FIRE INSIDE THE HYPERBARIC CHAMBER ON SITE

PROCEDURE:

Office Staff or Designee

- Pull fire alarm and call _____ informing them of location of fire
- Assist in the evacuation of the area

Nursing Staff

- Evacuate the area per hospital evacuation plan

Director

- Report to the Hyperbaric Unit and stand by to turn off main oxygen as soon as emergency decompression is complete
- After turning off the oxygen assist in the evacuation of the Hyperbaric Unit per hospital evacuation plan

Nurse Manager

- Report to the Hyperbaric Unit and place the fire extinguisher next to the chamber on fire
- Assist the Hyperbaric Technologist in the emergency decompression of the patient in the unaffected chambers, emergency vent button (Sechrist) or bypass/exhaust button (Perry)
- Remove patients from the chambers and follow hospital evacuation plan

Hyperbaric Technologist

- Have patient breathe off the air mask and emergency decompress the chamber, emergency vent button (Sechrist) or bypass/exhaust button (Perry)
- Notify personnel standing by to turn off the main oxygen valve
- Prepare to extinguish the fire before removing the patient from the chamber and evacuate the building per hospital evacuation plan

◇ STAFF READINESS FOR FIRE SAFETY MANAGEMENT

PROCEDURE:

All Staff will participate in the hospital's fire drills per the hospital's policy.

1. In order to ensure proper management of the hyperbaric patient's therapy, the hyperbaric unit will be notified in advance of a fire drill.
2. The hyperbaric unit will conduct quarterly department fire drills as part of the Center's safety preparedness.

References: Wilbur T. Workman, Hyperbaric Facility Safety pp. 670-671, Francois Burman, Risk Assessment Guide pp.1.7-1.8
Written documentation from Sechrist and Perry Manufacturer regarding sequence main oxygen cut off valve

Date: _____

Name: _____

Post – Test
Fire Safety/Onsite in Hospital

1. What percentage is considered an oxygen-enriched environment. _____?
2. The flammability of materials decreases as the partial pressure of oxygen increases. (circle) True False
3. List three items that generally are not fuel sources _____, _____ and _____.
4. Normal non-combustible materials may become flammable or combustible when the partial pressure of oxygen increases. (circle) True False
5. 100% cotton is non-flammable in an oxygen-enriched environment. (circle) True False

November
Fire Safety/Off Site

Overview: The flammability of materials increases as the partial pressure of oxygen increases to the point where normally non-combustible materials may become flammable or combustible. Materials generally not considered fuel sources will burn vigorously in an oxygen-enriched environment (23.5%) such as:

- Human tissue, body hair, oils and fats
- Loose cotton garments
- Oil-based products, facial cream, body oils, hair spray, etc.

Before the patient's treatment, a safety check needs to be completed and documented in the chart. The safety checklist states that the Hyperbaric Technologist or Nurse treating the patient has gone through a checklist of safety procedures.

◇ FIRE OUTSIDE THE HYPERBARIC UNIT, BUT INSIDE THE BUILDING

- Follow hospital fire plan

◇ FIRE IN THE HYPERBARIC UNIT, BUT OUTSIDE THE CHAMBER

PROCEDURE:

Office Staff or Designee

- Call "911" informing the emergency operator of the exact location of the fire
- Pull fire alarm
- Assist in the evacuation of the area per hospital evacuation plan

Nursing Staff

- Evacuate the area per hospital evacuation plan

Director

- Report to Hyperbaric Unit and stand by to turn off main oxygen as soon as emergency decompression is complete
- After turning off the oxygen assist in the evacuation of the Hyperbaric Unit per hospital evacuation plan

Nurse Manager

- Report to the Hyperbaric Unit and prepare to extinguish the fire
- Assist the Hyperbaric Technologist in the emergency decompression of the patients, emergency vent button (Sechrist) or bypass/exhaust button (Perry)
- Remove patients from the chamber and follow hospital evacuation plan

Hyperbaric Technologist

- Decompress all chambers as quickly and safely as possible using the emergency vent button (Sechrist) or bypass/exhaust button (Perry)
- Notify personnel standing by to turn off main oxygen valve
- Remove patients from the chamber and follow hospital evacuation

PROCEDURE:

Office Staff or Designee

- Call “911” informing the emergency operator of the exact location of the fire
- Pull fire alarm
- Assist in the evacuation of the area per hospital evacuation plan

Nursing Staff

- Evacuate area per hospital evacuation plan

Director

- Report to the Hyperbaric Unit and stand by to turn off main oxygen as soon as emergency decompression is complete
- After turning off the oxygen assist in the evacuation of the Hyperbaric Unit per hospital evacuation plan

Nurse Manager

- Report to the Hyperbaric Unit place fire extinguisher next to the chamber on fire
- Assist the Hyperbaric Technologist in the emergency decompression of the patients in the unaffected chambers, emergency vent button (Sechrist) or bypass/exhaust button (Perry)
- Remove patients from the chambers and follow hospital evacuation plan

Hyperbaric Technologist

- Have patient breathe off the air mask and emergency decompress the chamber, emergency vent button (Sechrist) or bypass/exhaust button (Perry)
- Notify personnel standing by to turn off the main oxygen valve
- Prepare to extinguish the fire before removing the patient from the chamber and evacuate the building per hospital evacuation plan

◇ STAFF READINESS FOR FIRE SAFETY MANAGEMENT

PROCEDURE:

All Staff will participate in the hospital’s fire drills per the hospital’s policy.

1. In order to ensure proper management of the hyperbaric patient's therapy, the hyperbaric unit will be notified in advance of a fire drill.
2. The hyperbaric unit will conduct quarterly department fire drills as part of the Center's safety preparedness.

References: Wilbur T. Workman, Hyperbaric Facility Safety pp. 670-671, Francois Burman, Risk Assessment Guide pp.1.7-1.8
Written documentation from Sechrist and Perry Manufacturer regarding sequence main oxygen cut off valve.

Date: _____

Name: _____

Post – Test
Fire Safety/Offsite

6. What percentage is considered an oxygen-enriched environment. _____?
7. The flammability of materials decreases as the partial pressure of oxygen increases.
(circle) True False
8. List three items that generally are not fuel sources _____, _____
and _____.
9. Normal non-combustible materials may become flammable or combustible when the
partial pressure of oxygen increases. (circle) True False
10. 100% cotton is non-flammable in an oxygen-enriched environment.
(circle) True False

December
Pneumothorax Under Pressure

Overview: A pneumothorax in the chamber is extremely serious. Symptoms suggesting pneumothorax include sudden shortness of breath, stabbing chest pain, tracheal shift, asymmetric chest movement, and increased respiratory distress during decompression. If a pneumothorax is suspected, a 14-16 gauge needle should be readily available prior to decompression. Upon exiting the chamber, additional findings may be present on physical exam. These include asymmetric breath sounds, hypotension and tachycardia. Perform an immediate needle decompression if the patient appears to have a “tension” pneumothorax as evidenced by significant tachycardia, hypotension, or respiratory distress. Decompression is performed by inserting a 14 or 16 gauge needle over the top of the 2nd rib at the midclavicular line.

Procedure: If patient exhibits any of the above symptoms, do the following:

- Stop decompression
- Notify Hyperbaric Physician
- If it is determined that the patient does have a tension pneumothorax, gather your equipment and staff to immediately insert a 14-16 gauge needle upon opening the chamber door
- Once physician has arrived, bring patient up at a rate of 5 psig or as ordered by the physician
- Following this initial stabilization, make arrangements for appropriate transfer and further management

Reference: Clinical Procedures in Emergency Medicine, 3rd Edition, Ed Roberts & Hedges, W.B. Saunders. Hyperbaric Medicine Practices, 2nd Edition 1995, Eric P. Kindwall, M.D. pp. 291-292

Date: _____

Name: _____

Post Test
Pneumothorax in chamber

7. Patients may experience the following symptoms during decompression _____ and _____.
8. During the decompression the pneumothorax expands. (circle) True False
9. A patient suffering a pneumothorax in the Hyperbaric Chamber is not serious. (circle) True False
10. The patient may exhibit signs of cyanosis in the chamber. (circle) True False
11. Patients with any kind of pulmonary lesions on x-ray should have a _____ descent rate.

Insert your chambers yearly
Service / Maintenance Report(s) Here

(See attached sample)

QUARTERLY QUALITY ASSURANCE OF EMERGENCY PROCEDURES

REQUIREMENTS: One Fire Safety Drill each quarter, at least one of which includes a timed egress. Choose one of the other three topics each quarter.

TOPICS	DATE	MET	NOT MET	COMMENTS
Fire Safety				
Cardiac/Respiratory Arrest				
Pneumothorax Under Pressure				
Seizures in the Hyperbaric Chamber				

SAFETY DIRECTOR _____ MEDICAL DIRECTOR _____

DEPARTMENT OF HYPERBARIC MEDICINE

II. HYPERBARIC ADVERSE EVENTS

ADVERSE EVENTS

1. Ear Squeeze
2. Sinus Squeeze
3. Oxygen Toxicity – CNS & Pulmonary
4. Nausea / Vomiting
5. Pneumothorax

ADVERSE EVENTS

6. Air Embolism
7. Seizure – Oxygen Related, Diabetic Related , Other
8. Confinement Anxiety
9. Diabetic Reaction
10. Other – Please Specify

MONTH: _____

Medical Record #	Adverse Events	Intervention	Comments

SAFETY DIRECTOR _____ MEDICAL DIRECTOR _____

Notes:
