SerenaGroup

Building the Nation's Leading Wound Care Team

2024 SerenaGroup Hyperbaric Safety & Education Manual

SerenaGroup Monthly Awareness Program

Section One: The Fire Safety Plan

1. Purpose

A Fire Safety plan provides hyperbaric personnel with an emergency plan in the event of a fire in the hyperbaric area. A predetermined plan is expected to reduce injury and potentially catastrophic outcomes. Hyperbaric centers must develop their own fire safety plan. This document will guide the development of the plan.

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.

NFPA 99 Health Care Facilities, 2018 edition, (page 118):

"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/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. The plan is a collaborative effort developed between SerenaGroup® and hospital representatives responsible for fire safety in accordance with NFPA standards.
2.4. There will be no smoking or open flames in the hyperbaric area.
2.5. The area will be kept meticulously clean and free of fire hazards in accordance with the National Fire Protection Association (NFPA) guidelines for Hyperbaric health care facilities.
2.6. The chamber(s) must be kept free of lint and dust particles. These are hazardous when inside the chamber during operation.
2.7. Each hyperbaric patient will be searched and questioned about possession of an ignition source before entering the chamber.
2.8. Items listed as unsafe in the chamber safety policy manual, are NOT allowed in the chamber.

3. Scope

This manual applies to all Hyperbaric Medicine Center staff, overseeing physicians, and patients.

4. Responsibility

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

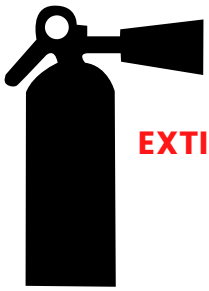
5. Elements of the Fire Safety Plan

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 at a minimum:
5.2.1. Identification of signage locations
5.2.2. Extinguishing (sprinklers, smoke detectors, fire extinguishers, etc.) methods, equipment and location
5.2.3 The Rescue, Alarm, Contain, Extinguish (RACE) protocol:

RESCUE = **Assist anyone who is in immediate danger.**

ALARM = **Activate the nearest fire alarm. Immediately after activating the alarm, go to the nearest phone and call 911. Let the operator know there is a fire and give the exact location.**

CONTAIN = **Attempt to contain the fire by closing all doors and windows in the area where the fire is located. If smoke is observed coming from underneath any of the doors that were closed, dampen towels and place them at the door base.**



EXTINGUISH = **Try to extinguish the fire. Retrieve the nearest fire extinguisher and use it on the fire. Note: if the fire is out of control, do not attempt to extinguish it. Close the door immediately!**

5.2.4. Emergency phone numbers: who to contact, when and where
5.2.5. Oxygen leak testing-frequency and procedure
5.2.6. Electrical equipment-location, preventive maintenance schedule
5.2.7. Specific fire prevention requirements for hyperbaric suite
5.2.8. Mock Drill-frequency
5.2.9. General response to fire-code announcement door and window handling

5.3. All SerenaGroup® personnel and hospital employees working in the hyperbaric suite will be knowledgeable of the fire safety plan. They will be fully prepared to prevent a fire or in the case of a fire, extinguish it immediately.
5.4. Assure appropriate signage in the center prohibiting smoking (readable from a distance of 5 feet).
5.5. Ensure patients, staff and visitors do not smoke. There should never be an open flame within the center.
5.6. Ensure the patient has changed into 100% cotton clothing prior to the therapy.
5.7. Ensure all linens are 100% cotton. This includes pillowcases, blankets, and sheets.
5.8. No clothing is permitted in the chamber except that provided by the hyperbaric staff in accordance with safety policies and procedures. This includes but is not limited to undergarments even if they are 100% cotton, street clothes, hospital gowns, and scrubs.
5.9. All patients are searched prior to every hyperbaric treatment for prohibited items.
5.10. Patients must remove any petroleum-based products including but not limited to make-up, hair spray, nail polish, perfume, after shave lotion, oil-based creams or ointments with a petroleum base.
5.11. Allow only items necessary for patient care during therapy such as nasogastric tubes, external fixation devices, wound dressings, soft contact lenses, Foley catheters, vented drains, monitoring leads and cables for cardiac monitoring as long as they have been tested for hyperbaric safety.
5.12. Cover dressings with 100% cotton linens. If patient has a post-op skin graft and physician does not want the dressing removed, cover existing dressing with 100% damp cotton towel. Do not expose a wound covered with an ointment in the chamber.
5.13. Devices with a power source are not permitted in the chamber such as external pacemakers, holter monitors, external TENS units or insulin pumps.

5.14. Turn off the main oxygen supply to the chambers at the end of operations each day to prevent oxygen leakage into the hyperbaric suite.
5.15. According to policy, analyze the oxygen concentration in the room around the gaskets of the chamber and various sites in the room to ensure no leakage of oxygen is occurring.
5.16. Complete and sign the pretreatment checklist before every Hyperbaric treatment.

6. Action depending on the location of the fire

6.1. Fire inside the building housing the hyperbaric unit.
6.1.1. In the case of a fire inside the building but outside of the chamber area follow the hospital fire plan.
6.1.2. Only remove patients from the chamber or chamber room if the fire threatens the suite.
6.2. Fire in the hyperbaric unit but outside of the chamber(s)
6.2.1. Pull the fire alarm and activate hospital fire plan informing fire station of the fire location.
6.2.2. If chamber is directly threatened, inform the patients in the hyperbaric chamber that rapid emergency decompression is necessary and they should try to stay calm, breath normal and do not hold their breath.
6.2.3. Follow the procedure to emergency vent the chamber(s) (see SerenaGroup® Policy 401. Emergency Procedures for Monoplace Chamber).
6.2.4. Remove the patients from the chamber(s).
6.2.5. Turn off the oxygen supply located outside chamber room.
6.2.6. Assist in the evacuation of the area per hospital evacuation plan.

6.3. Fire inside the a Monoplace Hyperbaric Chamber
6.3.1. A fire inside a monoplace hyperbaric chamber pressurized with 100% oxygen during operation is a fatal event. The patient inside the chamber in which a fire has occurred has no chance of survival; therefore, no attempt to save this patient by emergency decompression is warranted.
6.3.2. Pull the fire alarm.
6.3.3. Immediately follow the procedure to emergency vent the unaffected chamber(s).

6.3.4. When assistance arrives have them activate the hospital fire plan informing fire fighting personnel of location of the fire.
6.3.5. Inform the patient that emergency decompression is required.
6.3.6. Have the patient breathe from the air break mask during emergency decompression.
6.3.7. Evacuate the patient(s).
6.3.8. Turn off oxygen supply to the chamber(s).

Section Two: Emergency Preparedness

1. Purpose

The purpose of this section is to establish an Emergency Preparedness plan specific to the hyperbaric center.

2. Policy

2.1. To provide optimal patient care and support in the event of an emergency or natural disaster such as a flood, hurricane, ice storm, earthquake, or tornado.
2.2. Patients are informed of alternative care options in the case of a disaster that may impact the hyperbaric center.
2.3. Hyperbaric unit sand supporting staff will receive education on emergency preparedness plan to promote safety during a disaster.
2.4. The Hyperbaric Medicine Center Emergency Preparedness plan compliments the hospital's plan; it does not supersede the hospital emergency preparedness.

3. Scope and Responsibility

This policy applies to all members of the Hyperbaric Medicine staff, physicians and patients.

4. Procedure

4.1. In the case of a disaster, it may become necessary to remove patients from the hyperbaric chambers. The following steps should be taken:
4.1.1. Explain to the patients why the reason for ending the treatment early.
4.1.2. Decompress chambers at a normal rate. **DO NOT EMERGENCY VENT THE CHAMBERS.**

4.1.3. Once the chambers are empty and all the patients have exited the center, secure the chambers in the following manner:

4.1.3.1. Close the doors on the chambers.

4.1.3.2. Switch off both the Oxygen and Air supply to the chambers at the wall source.

4.1.3.3. Disconnect the transformer from the electrical outlet at the wall interrupting the power supply to the battery charger.

4.1.3.4. Cover the chambers with the cloth chamber cover.

Section Three: 2024 Monthly Safety Program Schedule

January - UHMS, CMS, and Insurance Medical Policies

February – Outpatient, Inpatient, and Off-label

March – Barotrauma

April – Medical Necessity

May – Clinical and Non-Clinical Emergencies and Preparedness

June – Seizures

July – What Can and Cannot Go into the chamber?

August – To Dive or NOT to Dive?

September – Clean Chambers are Safe Chambers

October – Physiology of HBOT for Each Indication and When to Consider Continuation

November – Diabetes Management for the Hyperbaric Patient

December – Patient Education and Compliance

January – UHMS, CMS, and Insurance Medical Policies

Abbreviations:
UHMS- Undersea Hyperbaric Medical Society
CMS- Centers for Medicare & Medicaid Services

UHMS Approved Indications

- 01. Air or Gas Embolism
- 02a. Carbon Monoxide Poisoning
- 02b. Carbon Monoxide Poisoning Complicated by Cyanide Poisoning
- 03. Clostridial Myositis and Myonecrosis (Gas Gangrene)
- 04. Crush Injury, Compartment Syndrome, and Other Acute Traumatic Ischemias
- 05. Decompression Sickness
- 06a. Arterial Inefficiencies: Central Retinal Artery Occlusion
- 06b. Arterial Inefficiencies: Enhancement of Healing in Selected Problem Wounds
- 07. Severe Anemia
- 08. Intracranial Abscess
- 09. Necrotizing Soft Tissue Infections
- 10. Osteomyelitis (Refractory)
- 11. Delayed Radiation Injury (Soft Tissue and Bony Necrosis)
- 12. Compromised Grafts and Flaps
- 13. Acute Thermal Burn Injury
- 14. Idiopathic Sudden Sensorineural Hearing Loss

CMS Approved Indications

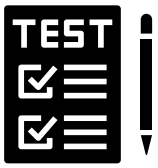
- Acute Carbon Monoxide Intoxication
- Decompression Illness
- Gas Embolism
- Gas Gangrene
- Acute Traumatic Peripheral Ischemia
- Crush Injuries and Suturing of Severed Limbs
- Progressive Necrotizing Infections (Necrotizing Fasciitis)
- Acute Peripheral Arterial Insufficiency
- Preparation and Preservation of Compromised Skin Grafts
- Chronic Refractory Osteomyelitis
- Osteoradionecrosis
- Soft Tissue Radionecrosis
- Cyanide Poisoning
- Actinomycosis
- Diabetic Wounds of the Lower Extremities

Many insurances dictate either the CMS or UHMS approved indications in their medical policy. However, they may add or subtract indications. This is why it is crucial that we consult the medical policy for patients to ensure we follow their medical policy. Often times we will receive calls that are not a common indication for hyperbaric. A good rule of thumb is to obtain their insurance details and review their medical policy to confirm their candidacy for hyperbaric oxygen therapy. It's also important to remember that just because it's listed on the medical policy, it does not mean there aren't still elements of medical necessity that need to be met or that the indication is appropriate in the outpatient setting.

How do you check an insurance medical policy? Finding a medical policy is not difficult. Often the back of the insurance card will have a website where you can find this information. If not, a simple google search of the insurance plan followed by the key phrase "medical policy" should lead you to their page where you can then search for "hyperbaric." If you cannot find a posted medical policy online, you may be able to use the associated insurance portal or call the provider line for that insurance and provide the ICD 10 codes to have an agent reference their policy.

Sources:

- HBO Indications - Undersea & Hyperbaric Medical Society (uhms.org)
- NCD - Hyperbaric Oxygen Therapy (20.29) (cms.gov)



Name: _____

Date: _____

Post-Test: UHMS, CMS, and Insurance Medical Policies

1. Idiopathic Sudden Sensorineural Loss is an approved indication. (True or False? Explain below.)

_____

_____

2. All approved indications by CMS are able to be treated in an outpatient setting. (True or False?)

February – Outpatient, Inpatient, and Off-Label

Overview:
Outpatient hyperbaric oxygen therapy centers, hospitals with inpatient hyperbaric oxygen capabilities, and off-label hyperbaric centers can and will treat different conditions.

Outpatient Hyperbaric:
Conditions that we most commonly treat in outpatient settings include chronic, non-life-threatening conditions. These are usually insurance approved indications in patients that are stable enough to not require hospital inpatient care. These indications include:

- diabetic ulcers
- chronic refractory osteomyelitis
- delayed radiation injury
- compromised flap/graft
- idiopathic sudden sensorineural hearing loss

Inpatient Hyperbaric:
Hyperbaric departments that are used or able to be used for the use of acute conditions for admitted patients are what we refer to as inpatient hyperbaric. These patients are suffering from significant, life-threatening conditions that without emergency care and/or emergency hyperbaric they are at risk of death. These patients may or may not be conscious. Treatments may be longer 90 minutes, deeper than 2.4 ATA, and more than once a day in some instances. These indications include:

- acute carbon monoxide poisoning
- decompression sickness
- gas embolism
- gas gangrene
- acute ischemia/arterial insufficiency
- crush injury/compartment syndrome
- progressive necrotizing infections
- cyanide poisoning

Off-Label Hyperbaric:
Clinics that offer off-label hyperbaric are usually self-pay as insurance does not usually cover any conditions that are considered experimental. Off-label centers are usually free-standing centers and use hyperbaric for a wide variety of reasons ranging from cancer to anti-aging. Some of these conditions that have been deemed experimental for hyperbaric may include:

- chronic pain syndrome
- autism
- lyme disease
- cancer
- surgical wounds
- autoimmune disease
- multiple sclerosis
- post-traumatic stress disorder
- traumatic brain injury
- and many more

Clinics may offer hyperbaric in more than one of the three categories discussed above. For instance, a freestanding clinic may offer outpatient and off-label hyperbaric, or a hospital unit might offer inpatient and outpatient hyperbaric. As a hyperbaric technician, it's best to know what your local area has to offer!

Sources:

- HBO Indications - Undersea & Hyperbaric Medical Society (uhms.org)
- NCD - Hyperbaric Oxygen Therapy (20.29) (cms.gov)

Name: _____

Date: _____

Post-Test: Outpatient, Inpatient, and Off-Label

1. Which indication is an outpatient indication?
   a. arterial insufficiency
   b. compromised flap
   c. crush injury

2. Which categories will undoubtedly take insurance?

_____

3. A center can only accept one (outpatient, inpatient or off-label).
   True or False

March – Barotrauma

Overview:

Middle ear barotrauma is the most common complication of hyperbaric therapy. During compression clearing the ears, auto inflation, equalizes the pressure between the middle ear and the pressure in the chamber. Recall from Boyle's Law that as pressure is increased, air-filled spaces will decrease in volume. Auto inflation maneuvers open the eustachian tubes in the nasopharynx permitting communication between the middle ear space and the atmosphere. A patient that cannot equalize the pressure between the middle ear and the chamber by using an auto inflation maneuver or yawning, swallowing, or taking a drink, may experience severe pain and potentially damage the tympanic membrane. Middle ear damage is called barotrauma. The underlying causes of barotrauma include an inability to auto inflate, artificial airways and damage to the eustachian tubes.

Techniques for Equalizing:

1. Valsalva Manuever – pinch your nostrils and blow through your nose.
2. Tonybee Manuever – With your nostrils pinched, swallow. This will pull open your Eustachian tubes while the movement of the tongue with your nose closed, compresses air against them.
3. Lowry Technique – While closing your nostrils, blow and swallow at the same time.
4. Edmonds Technique – While tensing the soft palate and throat muscles, push the jaw forward and down.
5. Frenzal Maneuver – Close your nostrils and close the back of your throat as if straining to lift weight. Then make the sound of the letter "K" forcing the back of your tongue upward, compressing air against the opening of the Eustachian tubes.
6. Voluntary Tubal Opening – Tense the muscles of the soft palate and throat while pushing the jaw forward and down, as if starting to yawn. These muscles pull the Eustachian tubes down.

Procedure:

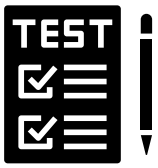
If the patient experiences mild to moderate pain during compression, stop the pressurization and decrease the pressure until the patient no longer experiences pain. Advise the patient not to auto inflate while the chamber is decompressing. Once a stable pressure has been reached, have the patient perform several auto inflation maneuvers. Once the patient and technician are satisfied, pressurization can recommence. If patient experiences severe pain

that is not relieved by stopping the pressurization or decompressing, remove patient from the chamber and notify the Hyperbaric Physician. It is reasonable to attempt to compress a patient up to three times. If the patient experiences pain on the third attempt at compression the treatment is aborted. Remember the adage “three strikes and you’re out.”

Ear Exam:
The classification system used to grade the appearance of the tympanic membrane following HBOT is called the Teed Scale. It is named for Wallace Teed, a United States Navy Submarine Medical Officer during World War II, who first described middle ear barotrauma related to changes in pressure.
https://www.ncbi.nlm.nih.gov/books/NBK499851/

- TEED 0 – Symptoms, such as pain or stuffiness, with no physical findings
- TEED 1 - Erythema or injection around the handle of the malleus, congestion around the umbo
- TEED 2 – Erythema, injection, or congestion of the entire tympanic membrane
- TEED 3 - Hemorrhage into the tympanic membrane appearing as bright red patches
- TEED 4 - Deep blue/black appearance of the tympanic membrane due to blood filling the middle ear with the possibility of rupture present.
- TEED 5 - Perforated ear drum

References:
Eric P. Kindwall, Hyperbaric Medicine Practice, Chapter 4 pp. 51 Larson-Lohr, Norvell, Hyperbaric Nursing, pp. 87,127,140 :
https://www.ncbi.nlm.nih.gov/books/NBK499851/



Name: _____

Date: _____

Post-Test: Baratrauma

1.What is the most common complication of hyperbaric oxygen therapy?

_____

2.Patients should be instructed not to try to equalize during what phase?

_____

3.Hemorrhage in the tympanic membrane is classified as a TEED 3.
True or False

4.How many times is considered reasonable to attempt to compress a patient during a single dive?

_____

5.Boyle's Law: as pressure is increased, air-filled spaces will _____ in volume.

Extra Credit Question: Have you ever put an inflated glove into the chamber during a test cycle? What occurs?

_____

April - Medical Necessity

Overview:
Medical necessity is how we reference the requirements that are unique to each condition that help us to qualify a patient for hyperbaric. Medical necessity was created to dictate when certain treatments are appropriate. SerenaGroup makes this easy with the Pre-Treatment Assessment Tool (PAT). The PAT outlines all the elements of medical necessity for the variety of diagnoses that we treat in our centers. The PAT was created with CMS regulations in mind.

Diabetic Foot Ulcers:

- Documentation of Type I or Type II diabetes with lower extremity diabetic wound
- Documentation of Wagner III or higher
- Documentation of standard wound care for 30 days with no measurable signs of healing
  - Vascular Assessment and correction of issue (support: ABI >.6)
  - Optimization of glucose & education
  - Optimization of nutritional status & education
  - Debridement by any means to remove devitalized tissue
  - Maintenance of a clean moist wound bed
  - Appropriate offloading
  - Treatment to resolve infection
  - Appropriate moist dressing
  - Documentation of one or more: Tendonitis, Osteomyelitis, Osteitis, Abscess, Pyarthrosis, Gangrene (wet or dry)

Chronic Refractory Osteomyelitis:

- Definitive imaging (i.e. MRI, X-ray, Bone Scan) and bone culture with C&S
- Failed appropriate antibiotic regimen
- Bone debridement (when possible)
- Definitive evidence condition is chronic & unresponsive to conventional tx (ABX/wound care)

Skin Graft/Flap Failure:

- Documentation of graft/flap date
- Documentation of compromised state of flap site

April - Medical Necessity

Osteoradionecrosis:

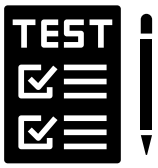
- Documented dates, dosage, anatomical site, and # of treatments of prior radiation. Must be ≥ 6 months post radiation
- Diagnosis from referring physician
- Plan to or documented debridement/resection of nonviable tissue if present in conjunction w/ antibiotics

Soft Tissue Radionecrosis:

- Documented dates, dosage, anatomical site, and # of treatments of prior radiation. Must be ≥ 6 months post radiation
- Documentation of treatment with conventional therapy

Medical necessity for additional indications can be found on the SerenaGroup Pre-Treatment Assessment Tool (PAT) checklist.

Each insurance plan may have its own specific caveats to meet medical necessity so if there is any question, consult the medical policy. If you need further assistance, use SerenaGroup as a resource and phone a friend!



Name: _____

Date: _____

Post-Test: Medical Necessity

1.How do we prove a patient with osteomyelitis has chronic refractory osteomyelitis?

_____

2.We need to prove osteomyelitis to qualify a patient as a Wagner Grade III.
True or False

3.Which of the following is NOT an element of medical necessity for a Wagner Grade III diabetic ulcer?

a. glucose optimization
b. nutrition optimization
c. hemoglobin optimization
d. vascular optimization

4. Radiation damage must be > or = to ___ months to qualify for HBOT.

May - Clinical and Non-Clinical Emergencies and Preparedness

Every emergency should be handled in a calm, collected, comprehensive manner. The best way to ensure this is to practice and know the emergency procedures! We perform clinical emergency drills quarterly and fire drills semi-annually in the hyperbaric center, per SerenaGroup® Policies and Procedures; however, every hospital system may have a different standard so make sure you are aware of what is necessary for your center to be compliant. Medical emergencies such as seizures, respiratory distress, hypoglycemia, and oxygen toxicity put patients at severe risk that could lead to injury or death. Non-clinical or environmental emergencies such as fire, active shooter, aggressive patients, and hospital evacuations or lockdowns are equally as important to practice. In the event of any emergency, you should know how to manage the hyperbaric department. Emergency drill cards are located on each chamber. All drills that are performed should be documented and saved in your center's safety binder.

Preventing Fires in the Chamber Room

- Mandatory no smoking/oxygen in use signs
- Prohibited items poster easily located
- Checklist reviewed with each patient prior to every dive
- Grounding (chamber, gurney, wrist strap)
- Anti-static flooring or cleaner
- Humidifier
- Use of hyperbaric only linens
- No floor or low electrical outlets
- No power strips or unauthorized electrical devices plugged in in chamber room
- Fire drills performed and documented
- Daily and weekly maintenance performed, and any questions, concerns, or inconsistencies reported to the National Safety Director and Hyperbaric Service Technician
- Annual Preventative Maintenance performed by Hyperbaric Service Technician

Preventing Hypoglycemia

- Check the blood glucose level of diabetic patients pre and post hyperbaric treatment
- Make sure blood glucose is above 100 mg/dL or whatever level the overseeing physician is comfortable with for that patient. 120 mg/dL is

SerenaGroup®'s ideal pre-treatment number, but not for all patients. Cases in which diabetes is managed, 100 mg/dL may be sufficient, but in an uncontrolled diabetic or a patient that admits to only having had sugary cereal with their insulin that morning, an elevated blood glucose level may be more ideal

Preventing Oxygen Toxicity

- Treat patients at 2.4 ATA or below to lower the likelihood of oxygen toxicity, unless a higher ATA is required
- Incorporate air breaks in treatment protocols (SerenaGroup® recommends two 5-minute air breaks, 30 minutes apart)
- Know the signs and symptoms of oxygen toxicity
  - Blurry vision
  - Coughing
  - Chest pain
  - Confusion
  - Dizziness
  - Feeling of unease
  - Muscle twitching in hands and face
  - Nausea
  - Seizures
  - Throat irritation
  - Trouble breathing

Preventing Barotrauma

- Patients should be treated at a standard rate of 1.5 psi/minute unless otherwise ordered by their physician
- Lower the set rate if patients have difficulty equalizing their ears during descent or complain of tooth squeeze, pain in the sinus cavity areas, and/or pain in the ears
- If a patient experiences respiratory distress, abort treatment
- If a patient is complaining of difficulty equalizing, lower the set pressure and wait for the pressure to decrease, guide the patient through equalizing techniques until their ears "pop" or are no longer uncomfortable, then attempt pressurization again. It is suitable to attempt this approximately three times before aborting treatment

Emergency Procedures

Pneumothorax

Signs and Symptoms:

- Sudden, stabbing chest pain
- Sudden shortness of breath
- Uneven chest excursion during respiration
- Increasing respiratory distress
- Deviated trachea
- Distended neck veins
- Acute cardiovascular changes

1. Halt further pressure reduction immediately. Note time and complaint
2. Notify hyperbaric physician
3. Increase pressure slightly to relieve symptoms
4. Prepare chest tube tray
5. Once all necessary thoracenthesis equipment is assembled, decompress patient as ordered
6. Inform patient of what is suspected and its likely required management
7. Order STAT chest x-ray

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Oxygen Toxicity

Premonitory signs & symptoms of oxygen toxicity:

1. Immediately convert patient to air breathing. (Note complaint and time of occurrence)
2. Within 1-2 minutes of patient beginning air breathing, ask patient if complaint has resolved, improved, remained the same or worsened
3. If patient complaint/problem has resolved/improved - have patient complete an entire air break (10 minutes); the decision to continue or abort therapy will rest with the hyperbaric physician. It is important that staff maintain direct visual observation of patient throughout the ascent
4. If patient complaint/problem is unresolved or unchanged return patient immediately to surface pressure while patient continues breathing from air mask
5. With seizure activity DO NOT reduce to increase pressure until free air movement is clearly established

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Uncontrollable Depressurization

Should the automatic pressure control system malfunction and the chamber starts depressurizing perform the following steps:

1. Notify the patient that the chamber is depressurizing
   a. Warn not to hold breath
2. Flip the system NO/OFF switch to the OFF position
3. Adjust the rate of depressurization with the VENTILATION CONTROL valve
   a. The rate of depressurization can be slowed slightly by turning the ventilation control valve fully clockwise, to the minimum setting
4. When chamber pressure reaches zero (0), open the chamber door

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Oxygen Leak

- Pressurize the chamber to 30psig (3 ATA)
- Use snoop or an equivalent leak testing solution
  - (a few drops of soap or detergent mixed with water for example)
- Leak-check all control and hose connections
- Tighten all connections that leak
- If unable to stop leaking, contact National Safety Director

WARNING!
Before tightening the leak fittings, make sure that all pressure is relieved

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Cardiopulmonary Arrest

- Activate hospital code system. Note time of occurrence
- Turn set pressure to zero
- Emergency decompress the chamber. Observe patient continually
- Move patient away from chamber
- Remove stretcher mattress, sheets, gown and blankets from patient and stretcher (or patient may be moved to another stretcher if available)
- Assist code team as required
- Document on code record.
- Complete charting as time permits

NOTE: Defibrillation/Cardioversion should be held until the patient is clear of the chamber entrance and all linens and mattress removed

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FIRE

RACE = Rescue, Alarm, Contain, Escape/Extinguish

In Hyperbaric Facility:

- Put on smoke hood
- Turn Chamber oxygen valve off
- Remove anyone in immediate danger
- Activate hospital alarm
- Contain fire (extinguish with hand held equipment)
- Inform patient
- Turn chamber master valve off - remain by chamber
- When immediate flames contained, open door and remove patient
- Evacuate room and close doors
- Turn off main zone value (in hall)

In-Chamber Fire:

- Do not remain at either end of the chamber
- Emergency decompress the chamber
- Turn chamber oxygen value off
- Activate hospital alarm
- Unplug and/or turn off all electrical equipment
- Notify medical director and nurse manager

In the immediate/adjacent area:

- Call security
- Ensure doors to the HBO room are closed
- Inform patients and decompress at 5 psi/min
- Evacuate area if warranted
- Resume treatments when possible, and when cleared by hospital emergency personnel

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Emergency Procedures Cont.

Emergency Decompression

Any situation where it is necessary to have the most rapid access possible to the patient:

1. Set chamber pressure to zero
2. Inform patient
3. Turn master valve to EMERGENCY VENT 3 sec on/3 sec off
4. Open door when pressure indicator shows black
5. Remove patient, proceed as ordered and patient's condition dictates
6. Consider STAT chest x-ray to rule out pulmonary barotrauma

SerenaGroup

Safety Pin Jam Communication Failure

Door Safety Pin Jammed

If the chamber door will not open with the chamber pressure gauge showing zero, the pressure safety lock pin may be jammed in the extended position.

To release the safety lock pin:

1. Insert a blunt instrument (pencil, etc.) into the hole
2. Push safety lock pin into the retracted position.
3. Note this in the maintenance log, and inform nurse manager

Communication Failure

1. Use cue-cards to advise patient of communication failure
2. Begin ascent to surface pressure, continue to communicate with patient via cue-cards
3. Report failure to the nurse manager and Clinical Engineering

SerenaGroup

Failure of Oxygen Supply

In the event that the oxygen supply/storage system is depleted or interrupted during operation, perform the following procedure:

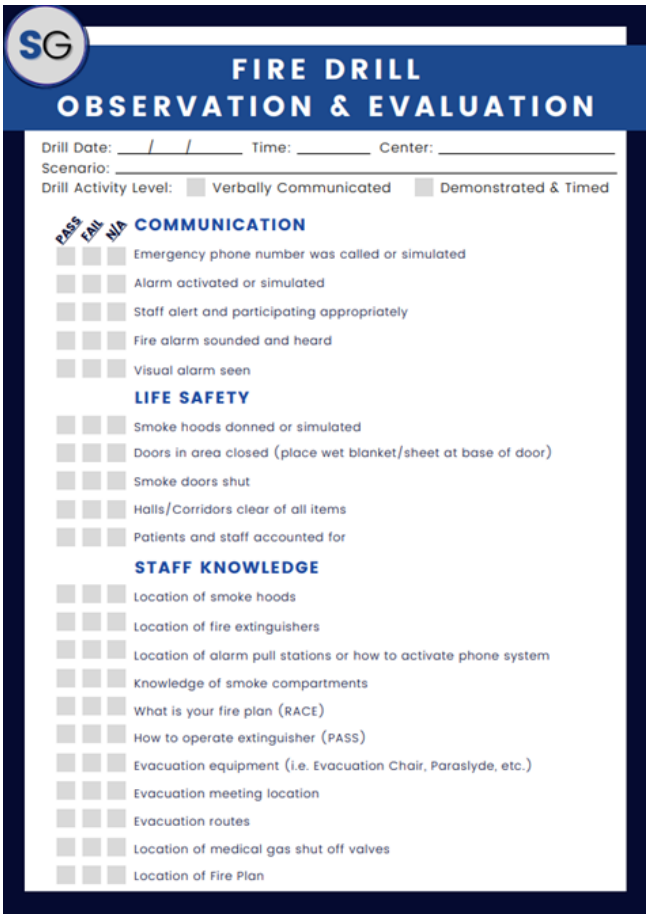
1. Notify the patient that the chamber is depressurizing
   a. Depressurization will already be in progress - when loss of supply pressure occurs, the chamber will automatically begin depressurizing by venting off through the ventilation control valve
2. Flip the system ON/OFF switch to the OFF position
3. Adjust the rate of depressurization with the VENTILATION CONTROL valve
   a. The rate of depressurization can be slowed somewhat by turning the ventilation control valve fully clockwise to the minimum setting
4. When chamber pressure reaches zero (0), open chamber door

Uncontrolled Pressurization

If the automatic pressure control system malfunctions and the chamber starts pressurizing, perform the following steps:

1. Flip the system ON/OFF switch to the OFF position
   a. This will stop chamber compression and start the decompression of the chamber
   b. The rate of decompression can be controlled by opening (increase) or closing (decrease) the vent value
2. Notify the patient that the treatment has been aborted, and that the chamber is depressurizing
3. Adjust the rate of depressurization with the VENTILATION CONTROL valve
4. When chamber pressure reaches zero (0), open the chamber door

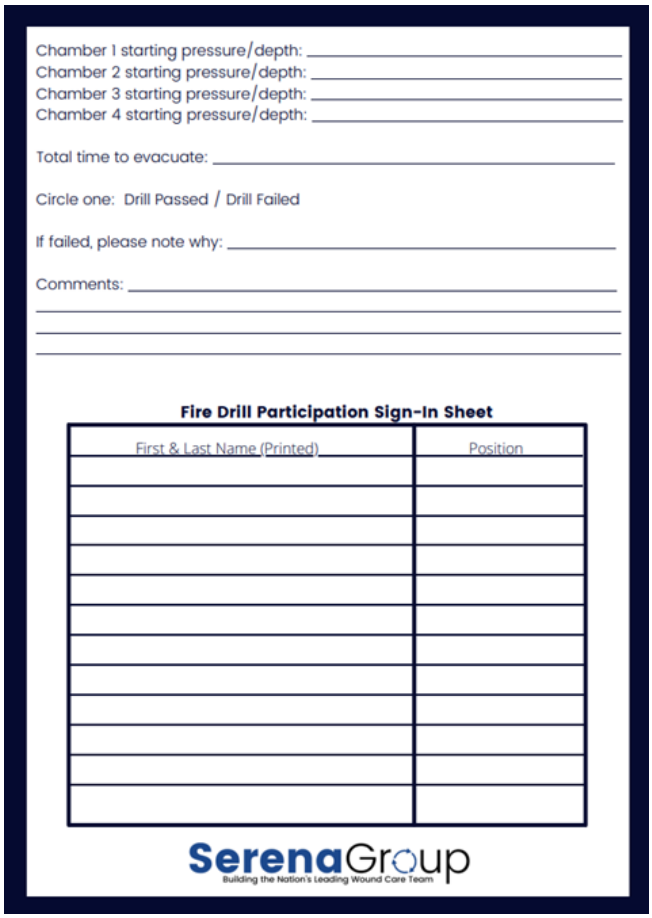
Use the below SerenaGroup Fire Drill Observation and Evaluation Form



FIRE DRILL
OBSERVATION & EVALUATION

Drill Date: ___/___/___ Time: _____ Center: _____
Scenario: _____
Drill Activity Level: ☐ Verbally Communicated ☐ Demonstrated & Timed

PASS	FAIL	N/A	COMMUNICATION
☐	☐	☐	Emergency phone number was called or simulated
☐	☐	☐	Alarm activated or simulated
☐	☐	☐	Staff alert and participating appropriately
☐	☐	☐	Fire alarm sounded and heard
☐	☐	☐	Visual alarm seen
			LIFE SAFETY
☐	☐	☐	Smoke hoods donned or simulated
☐	☐	☐	Doors in area closed (place wet blanket/sheet at base of door)
☐	☐	☐	Smoke doors shut
☐	☐	☐	Halls/Corridors clear of all items
☐	☐	☐	Patients and staff accounted for
			STAFF KNOWLEDGE
☐	☐	☐	Location of smoke hoods
☐	☐	☐	Location of fire extinguishers
☐	☐	☐	Location of alarm pull stations or how to activate phone system
☐	☐	☐	Knowledge of smoke compartments
☐	☐	☐	What is your fire plan (RACE)
☐	☐	☐	How to operate extinguisher (PASS)
☐	☐	☐	Evacuation equipment (i.e. Evacuation Chair, Paraslyde, etc.)
☐	☐	☐	Evacuation meeting location
☐	☐	☐	Evacuation routes
☐	☐	☐	Location of medical gas shut off valves
☐	☐	☐	Location of Fire Plan



Chamber 1 starting pressure/depth: _____
Chamber 2 starting pressure/depth: _____
Chamber 3 starting pressure/depth: _____
Chamber 4 starting pressure/depth: _____

Total time to evacuate: _____

Circle one: Drill Passed / Drill Failed

If failed, please note why: _____

Comments: _____

Fire Drill Participation Sign-In Sheet

First & Last Name (Printed)	Position

SerenaGroup
Building the Nation's Leading Wound Care Team

Use the below SerenaGroup Emergency Drill Observation and Evaluation Form

EMERGENCY DRILL OBSERVATION & EVALUATION

Drill Date: ___/___/___ Time: _____ Center: _____

Scenario: _____

Drill Activity Level: ☐ Verbally Communicated ☐ Demonstrated & Timed

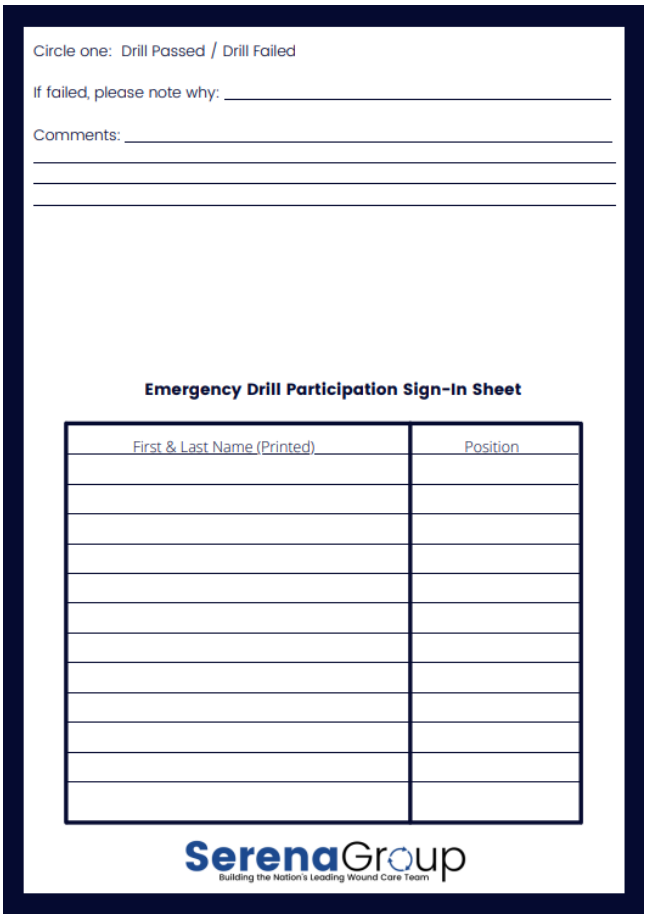
PASS	FAIL	N/A	COMMUNICATION
☐	☐	☐	Emergency phone number was called or simulated
☐	☐	☐	Alarm activated or simulated
☐	☐	☐	Staff alert and participating appropriately
☐	☐	☐	Simulate communication and explanation to patient

LIFE SAFETY

☐	☐	☐	Halls/Corridors clear of all items
☐	☐	☐	Patients and staff accounted for

STAFF KNOWLEDGE

☐	☐	☐	Location of alarm pull stations or how to activate phone system
☐	☐	☐	Evacuation equipment (i.e. Evacuation Chair, Paraslyde, etc.)
☐	☐	☐	Evacuation meeting location
☐	☐	☐	Evacuation routes
☐	☐	☐	Appropriate and correct responses to the scenario
☐	☐	☐	Verbalized or practiced decompression specific to the scenario
☐	☐	☐	Location of chest tube tray
☐	☐	☐	Location of defibrillator
☐	☐	☐	Safety measures taken or simulated if defibrillation is required



Circle one: Drill Passed / Drill Failed

If failed, please note why: _____

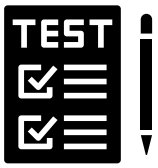
Comments: _____

Emergency Drill Participation Sign-In Sheet

First & Last Name (Printed)	Position

SerenaGroup
Building the Nation's Leading Wound Care Team

For further procedural guidelines regarding emergencies and preparedness, review the SerenaGroup® Policies and Procedures located in every center and online at serenagroupinc.com on the member's portal. Full page copies of these forms can be found on the member's portal.



Name: _____

Date: _____

Post-Test: Clinical and Non-Clinical Emergencies and Preparedness

1. Per SerenaGroup® guidelines, how often should a fire drill be performed?

a. Monthly
b. Quarterly
c. Biannually
d. Yearly

2. Name 3 measures taken to prevent fires in the chamber room.

_____

_____

_____

3.Who has responsibility for maintaining the Hyperbaric Center's Safety Binder?

_____

4.An announcement comes over the loudspeaker to initiate lockdown procedures. The hyperbaric technician should _____

a. Emergently decompress the patient (2 minutes)
b. Decompress the patient at the normal rate of 1.5 psi/min
c. Decompress the patient at an increased rate as tolerated
d. Wait for verification of why the facility is being locked down to determine if your area is threatened or at-risk

5. If you suspect oxygen toxicity, you should put the patient on an air break and abort the treatment.

True or False

June - Seizures

Initially described by Paul Bert in the late 19th century, exposure to high levels of oxygen can lead to acute oxygen toxicity. The manifestations of which are neurologic in nature. The early signs are nonspecific such as twitching of the lip, changes in vision, tinnitus, or a sudden change in behavior. Left untreated the toxicity will progress to seizures.

Oxygen toxicity seizures are uncommon, occurring only 0.52 times per 10,000 hyperbaric treatments. Air breaks reduce the potential for acute oxygen toxicity. If a patient undergoing HBOT exhibits the early signs of oxygen toxicity give him or her an air break, and consider lowering the pressure in the chamber. Alternatively, the physician can choose to end the treatment. In addition, eliminating fluorescent lighting in the chamber room decreases the risk of seizure.

Signs and Symptoms

Oxygen toxicity can lead to mild symptoms or progress rapidly to a seizure without prodromal symptoms. Careful attention to the patient throughout the treatment is key to identifying oxygen toxicity and intervening in a timely fashion. The acronym VENTID identifies the early signs of oxygen toxicity:

V=changes in vision
E= ears including symptoms such as tinnitus
N=nausea
T=twitching
I=irritability
D=dizziness

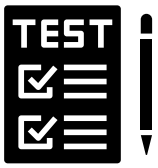
Differential Diagnosis

Most Seizures in a hyperbaric environment are not due to oxygen toxicity. The differential diagnoses includes hypoglycemia, fever, new seizure disorder, medications that lower the seizure threshold, electrolyte abnormalities, and substance or alcohol abuse.

June - Seizures

Procedures

If the patient is observed or complains of any unusual neurologic symptoms, have the patient take an air break. Immediately, notify the physician supervising the treatment. Under the direction of the physician, consider decreasing the pressure in the chamber or discontinuing the treatment. In the case of a seizure, do not decompress the patient until seizure activity ceases (postictal phase). In diabetic patients, check a blood glucose level to rule out hypoglycemia as the source of the seizure. The patient is sent to the emergency room for a seizure work up. If the seizure is secondary to oxygen toxicity, the patient can resume HBOT. Prior to the next treatment incorporate an air break or more air breaks in the treatment protocol.



Name: _____

Date: _____

Post-Test: Seizures

1. Patients will always exhibit one or more signs/symptoms prior to having a seizure in the chamber.

True or False

2. Initially described by _____ in the late 19th century, exposure to high levels of oxygen can lead to acute oxygen toxicity.

A. Dan Kelly
B. Antonine Lavoisier.
C. Paul Bert
D. Ida Boerema

3. Immediately decompress a patient that begins seizing.

True or False

4. Most seizures that occur in the hyperbaric chamber are due to oxygen toxicity.

True or False

July - What Can and Cannot Go in the Chamber?

This question can confound HBO techs daily, some have gone to the extreme of removing all medical related dressings and skin barriers prior to HBOT; of course, you cannot be too safe, right? Well, not really. You do run the risk of making the patient's wound worse by drying it out and exposing it to the atmosphere as well as denying the patent a treatment that a physician has deemed necessary.

"The physician or surgeon in charge, with the concurrence of the safety director, shall be permitted to use prohibited items in the chamber that are one of the following:

1. Suture material
2. Alloplastic devices
3. Bacterial barriers
4. Surgical dressings
5. Biological interfaces" (NFPA 14.3.5.4.3)

The answer lies in the balance between the risks associated with the dressing and its potential benefits in treating the wound. First ask, "is the dressing necessary?" If the answer is no, the dressing is removed prior to treatment. If the answer is yes, decide whether to cancel the treatment or mitigate the risk.

When evaluating a dressing it is important to first understand the roll of fuel in the chemical reaction know as fire. Normally this reaction is between oxygen in the atmosphere and some sort of fuel (wood or gasoline, for example). Of course, wood and gasoline do not spontaneously catch on fire just because they are surrounded by oxygen. Fuel must be heated to its ignition temperature for combustion to occur. The reaction will keep going as long as there is enough heat, fuel, and oxygen. This is known as the fire triangle.

Fuels can be solids, liquids or gases. During the chemical reaction that produces fire, fuel is heated to such an extent that (if not already a gas) it releases gases from its surface. Only gas can be used as fuel. Gas is made up of molecules (groups of atoms). When these gases are hot enough heated molecules are loosened, moving apart to form a gas. The gas molecules combine with oxygen in the air resulting in fire. This is important for us for two reasons: first they hyperbaric environment is 100% oxygen under pressure. There are 15 times more molecules of oxygen available to "mix" with molecules

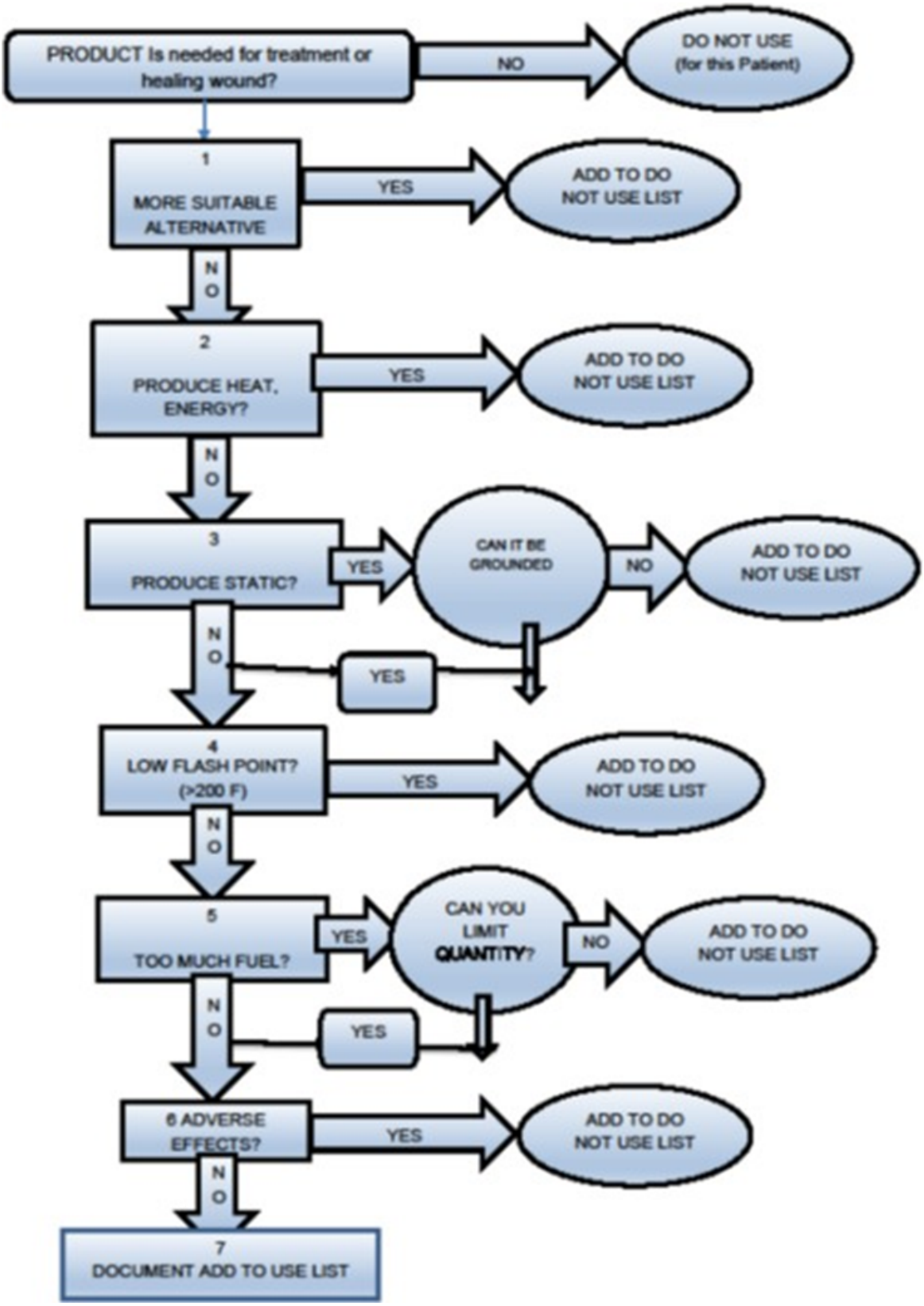
of fuel. This lowers the heat required for combustion, or flash point. The second factor is the need to convert fuel to gas, meaning that any product that evaporates or 'off gases' at room temperature becomes exceptionally rich fuel as no heat is required to convert the solid or liquid to gas. An example of this can be found in the oily rags left in the attic that on a hot summer day spontaneously combust. This happens at temperatures as low as 120 degrees Fahrenheit in room air (21% oxygen).

Most skin and wound care products have petroleum, alcohol, or benzine base. These are all rich fuels and according to our prohibited items list should not enter the chamber. Let's examine this a little more closely. These highly flammable products are used in most cases as 'carriers'; in others words they keep the product moist or pliable for storage and once exposed to air they evaporate. Once they evaporate, they are no longer a 'rich fuel' and no longer pose an unacceptable fire risk.

Fuel is not the only consideration in deciding on whether an item can enter the chamber. We must consider the amount of fuel, potential energy sources, interactions with high dose oxygen, ability to produce a static charge, and potential damage to the chamber acrylic.

When developing a "go" or "no go" list, it is also important to consider ways to mitigate risk, minimizing the likelihood of an incident. Mitigating risk can include covering a dressing with a damp cloth, increasing the vent rate, padding over a device, and substitution with a compatible product.

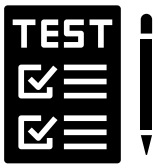
Utilizing the decision tree below, let's walk through a go/no-go list.


PRODUCT Is needed for treatment or healing wound?
NO
DO NOT USE (for this Patient)
1
MORE SUITABLE ALTERNATIVE
YES
ADD TO DO NOT USE LIST
NO
2
PRODUCE HEAT, ENERGY?
YES
ADD TO DO NOT USE LIST
NO
3
PRODUCE STATIC?
YES
CAN IT BE GROUNDED
NO
ADD TO DO NOT USE LIST
NO
YES
4
LOW FLASH POINT? (>200 F)
YES
ADD TO DO NOT USE LIST
NO
5
TOO MUCH FUEL?
YES
CAN YOU LIMIT QUANTITY?
NO
ADD TO DO NOT USE LIST
NO
YES
6 ADVERSE EFFECTS?
YES
ADD TO DO NOT USE LIST
NO
7
DOCUMENT ADD TO USE LIST

	**Unna Boot**	YES OR NO
	**Continuous Glucose Monitoring (CGM)**	YES OR NO
	**Loop Recorder Implant**	YES OR NO
	**External Fixator Device**	YES OR NO
	**Pacemaker**	YES OR NO
	**Vaseline Gauze**	YES OR NO
	**Silver Alginate**	YES OR NO

Procedure:
When evaluating a dressing for use in HBOT, employ a logical method and document the reasoning underpinning the decision. To lesser extent, consider the psychosocial results when considering low risk personal items; however, never compromise safety: when in doubt leave it out.

References:
**“Hyperbaric Medicine Practice” 2nd edition by Dr. Kindwall (pp. 417). NFPA 99, 2012 addition chapter 14 SerenaGroup policy and procedure.2020



Name: _____

Date: _____

Post-Test: What Can and Cannot Go in the Chamber?

1. A 2 x 2 Vaseline gauze dressing may be permitted in the monoplace chamber.
   True or False

2. The first question to ask is

_____

3. The physician or surgeon in charge, with the concurrence of the safety director, shall be permitted to use prohibited items in the chamber that are one of the following: (list two)

_____

_____

4. If the doctor orders a dressing, then it is safe to go in the chamber without further investigation.
   True or False

5. If a product contains a small amount of a questionable ingredient, such as a petroleum base, a good practice is simply to cover it during treatment.
   True or False

August - To Dive or NOT to Dive?

Overview:
Comorbidities can add additional complications to a patient undergoing hyperbaric oxygen therapy. It is important to know when it is safe to treat a patient and how the risk can be reduced to protect them. Pre-treatment testing can rule out contraindications before the patient begins HBOT. Working with your overseeing hyperbaric physician to create the safest treatment protocol for a complex patient, can produce better outcomes.

Comorbidities that pose a risk and how:

Chronic Obstructive Pulmonary Disorder (COPD) – COPD is a respiratory disorder. Pulmonary barotrauma from lung overinflation is a rare, but potential side effect of HBOT in patients that are at risk for air trapping during decompression with active bronchospasm, mucous plugging, and bullous lung disease.

Congestive Heart Failure (CHF) – CHF is a condition in which the heart does not pump blood as well as it should. Patients with CHF, especially those with ejection fractions less than 30%, are at a higher risk for CHF exacerbation and acute pulmonary edema during HBOT due to fluid shift because of the pressure increase and decrease. Patients should not be fluid overloaded and a pre-treatment, baseline echocardiogram may be considered.

Renal Dialysis Patients – Patients receiving dialysis are at a higher risk of complications during hyperbaric treatment due to sudden fluid shifts from volume overload, causing acute pulmonary edema.

Long-Term Use of High-Flow Oxygen – Patients that utilize High-Flow Oxygen regularly, are at an increased risk of Pulmonary Oxygen Toxicity which could burn the lungs.

Procedure:
1.Complete hyperbaric consultation as normal, but ensure the physician clearing the patient is aware of the patient's comorbidities.

2.Discuss the treatment protocol with the physician, such as treating at 2.0 ATA.

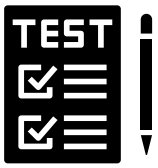
3.Make sure the pre-treatment testing that was ordered, has been carefully reviewed and signed off by the physician.

4.Obtain additional clearances if the hyperbaric physician has requested this be obtained from the patient's specialist, i.e., cardiac clearance from the patient's cardiologist, pulmonology clearance from the patient's pulmonologist, etc.

5.Watch the patient closely during treatment. Do not hesitate to abort the treatment if the patient exhibits any sign of respiratory distress. Address any concerns with the overseeing physician, whether it is in pre-treatment vital signs, after the treatment, or anything in between.

Safe Treatment Protocols

- The clearing HBO physician will determine the treatment protocol. Dr. Serena and Matt Schweyer, SerenaGroup's National Hyperbaric Safety Director, can work with the physician to answer any questions. The general recommendation from SerenaGroup for patients that are not deemed "at-risk" is 2.4 ATA for 90 minutes with two 5-minute air breaks with a rate set of 1.5 psi/min.
- Why do we treat patients at 2.4 ATA? The deeper you go; the more Oxygen is driven into the body's compartments.
- If a patient is deemed "at-risk" their treatment protocol should be modified. 2.0 ATA is a therapeutic treatment pressure and does not require air breaks. Why should we treat "at-risk" patients at a lower pressure? We lower the treatment pressure to decrease the likelihood of HBOT side effects.
- When should you lower the rate set? Rate set should be lowered when patients are new to treatment and are still adjusting to pressure differentials, as well as when patients have potential air-trapping diseases.



Name: _____

Date: _____

Post-Test: To Dive or NOT to Dive?

1. A patient with a history of CHF comes in and the physician cleared them for treatment. You take their blood pressure and it is 220/108. Their BP at every other treatment has been between 112-140 systolic and 70-90 diastolic. What should you do, primarily?

a. Dive the patient but keep a watchful eye.
b. Chart the BP and make sure the physician signs off on it when he/she completes the note.
c. Notify the physician for further instruction before diving the patient.
d. Wait 15 minutes and retake the BP.
e. Do not treat the patient that day.

2."At-Risk" patients should be treated at _____ ATA unless otherwise determined by the clearing physician.

3.Which patients should have clearance by a cardiologist?

_____

4.A patient with COPD and CHF, that has an Ejection Fraction of 40% can NOT receive HBOT.

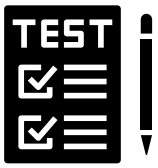
True or False

September - Clean Chambers are Safe Chambers

Maintaining clean chambers protects their longevity and the health of your patients. The chambers should be cleaned with approved cleaners weekly or between patients if the patient has contact precautions due to infection, such as MRSA. Always clean the chambers sooner if they become visibly soiled with anything including fingerprints on the acrylic. Use a cotton cloth when wiping the acrylic, such as a pillowcase, and do not clean the acrylic in a circular motion. When cleaning the acrylic be sure to check for crazing or scratches, if you notice any acrylic damage, notify your hyperbaric service technician and national safety director right away. Mattresses must be cleaned between each patient with non-alcohol wipes and fresh, clean linens. The muffler should be removed from the chamber weekly and cleaned with soapy water and a wire brush, if necessary. Make sure that the area surrounding the chamber is always kept clean and free of dust. If you notice an accumulation of dust in the door lock of the chamber, attempt to clean the dust away, but let the hyperbaric service technician know if the integrity of the door lock becomes compromised. Use a swifter or other duster to clean the outside of the chamber including between the bottom of the acrylic and the base of the chamber.

Approved cleaning products can be found at perrybaromedical.com and sechristusa.com

Hand sanitizers can be utilized in the hyperbaric center, but the hand sanitizer cannot have a high percentage of alcohol as alcohol-based products cannot go in the chamber. Therefore, it is not recommended to have alcohol-based hand sanitizers in the hyperbaric chamber room.



Name: _____

Date: _____

Post-Test: Clean Chambers are Safe Chambers

1. If the first patient of the day has MRSA, it is adequate to clean the chamber at the end of the day.
   True or False

2. Where do you find the list of approved chamber cleaners?

_____

3. How often should the chambers be cleaned?

_____

4. Alcohol-based cleaners are best for cleaning the mattress.
   True or False

5. What cloth is best to be used to wipe the acrylic?
   a. Paper towels
   b. Microfiber towels
   c. Cotton fabric

October - Physiology of HBOT for Each Indication and When to Consider Continuation

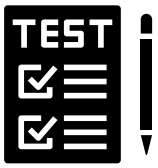
How important is it to understand the physiological effects and understand the 'what' and 'why' in hyperbaric oxygen? Extremely! An informed educated technician/technologist is the best way to assure patient adherence and provider buy-in that you are knowledgeable in the delivery of hyperbaric oxygen. And it makes a significant contribution to the team of care givers.

If the patient is being treated for an approved diagnosis, are you aware of what and why for treatment? Understanding the rationale of hyper-oxygenations, angiogenesis, osteogenesis, and perfusion is key to understanding your responsibilities as a technician/technologist with the patient and the provider and care team. Likewise, it is paramount to compliance.

Sharing your knowledge with patients and providers will reassure them that they are in great hands. That reassurance will increase their compliance to their treatment program. Knowing that you are experienced can also help to ease their anxiety.

Ask yourself, "If the patient asked me how this treatment is beneficial to me and my wound?" How would you answer this question? Professional training, knowledge, and experience are directly linked to helping the patient understand that being compliant is essential to "best care and practice". The more education the patient has, the more apt they are to comply.

Discuss each diagnosis and tie in the physiological rationale of why we treat these conditions, when we have reached a therapeutic plateau, and an end point. Understanding when continuation of treatment is necessary is important to healing. It is this component of the lecture that is extremely beneficial.



Name: _____

Date: _____

Post-Test: Physiology of HBOT for Each Indication and When to Consider Continuation

1. How does hyperbaric work for a Wagner Grade 3 Diabetic Foot Ulcer?

_____

2. When should continuation of treatment be discussed?

_____

3. Define "Osteogenesis":

_____

November - Diabetes Management for the Hyperbaric Patient

Diabetic patients need to manage their blood glucose level. The level needs to be at least 110 mg/dL before they go in the hyperbaric chamber, unless otherwise stated by the attending physician. The ideal minimum pre-treatment number is 120 mg/dL. It is also important to make sure their blood glucose is not too high. Maximum numbers vary but encourage the patient to try to keep their blood glucose level under 180 mg/dL at all times unless otherwise suggested by the patient's healthcare professional. As a hyperbaric technician, always ask diabetic patients if and what they ate prior to coming in. You should also ask if they took their medications. Both can significantly impact the patient's blood glucose levels and can help you to anticipate and prevent hypoglycemic events.

Hyperbaric can lower the patient's blood glucose significantly as a metabolic response, so it is important to make sure levels are high enough to prevent any drop in glucose from becoming a hypoglycemic medical emergency inside the chamber. Also, account for the 2-hour treatment, in which the patient will be without food.

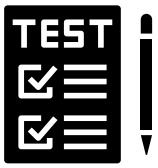
Hypoglycemia symptoms may include:

- Diaphoresis
- Fatigue
- Lightheadedness
- Shakiness
- Nausea/vomiting
- Confusion
- Unresponsiveness
- Anxiety
- Seizures

Procedure:

1. Take patient's blood glucose level upon arrival. If it is 110 mg/dL or higher, but still normal, continue with treatment. If the glucose level is lower (not a critical low = follow hospital policy), consider glucose administration.
2. Follow your hospital protocol for hypoglycemia management. This could be the administration of Glucerna, fruit juice, glucose tablets, etc.
3. Recheck the patient's blood glucose 15+ minutes after administration. If it is lower than the initial level, the attending physician may refuse the patient's treatment for the day for safety concerns of a hypoglycemic event. If the glucose has elevated above 100 (or the number your attending physician is comfortable with) continue with hyperbaric treatment. If the glucose has risen but not as high as it needs to be, with your physician's approval, you may repeat glucose administration and/or another 15+ minute recheck if the schedule allows.

***Always follow hospital protocols and the attending physician's orders!**



Name: _____

Date: _____

Post-Test: Diabetes Management for the Hyperbaric Patient

1. Name 5 symptoms of hypoglycemia:

1.
2.
3.
4.
5.

2. A diabetic patient is on treatment 15 and has never had issues with confinement anxiety but is now 1 hour into treatment and presenting with anxiety symptoms. His blood glucose was 125 mg/dL upon arrival. What should be your first 3 steps?

1.
2.
3.

3. What is your hospital's protocol for hypoglycemia management/prevention?

_____

December - Patient Education and Compliance

All patients entering the Advanced Wound Care Center will be evaluated for educational needs and abilities to learn on initial visit to the wound care center or at the hyperbaric consult. The following are assessed:

- Educational levels
- Motivational level
- Knowledge level of required medication
- Knowledge level of diagnosis
- Knowledge level of treatment plan
- Language barrier
- Cultural barrier
- Emotional barrier
- Physical barrier
- Reading barrier
- Sensory barrier
- Altered mental status due to medication
- Altered mental status due to aging process
- Financial concerns

All education performed is dated and documented in the medical record as seen below.

- Patient's preferred learning style
- Patient's level of support system for learning
- Patient's educational goal for attending the Center
- Attendees during patient visit

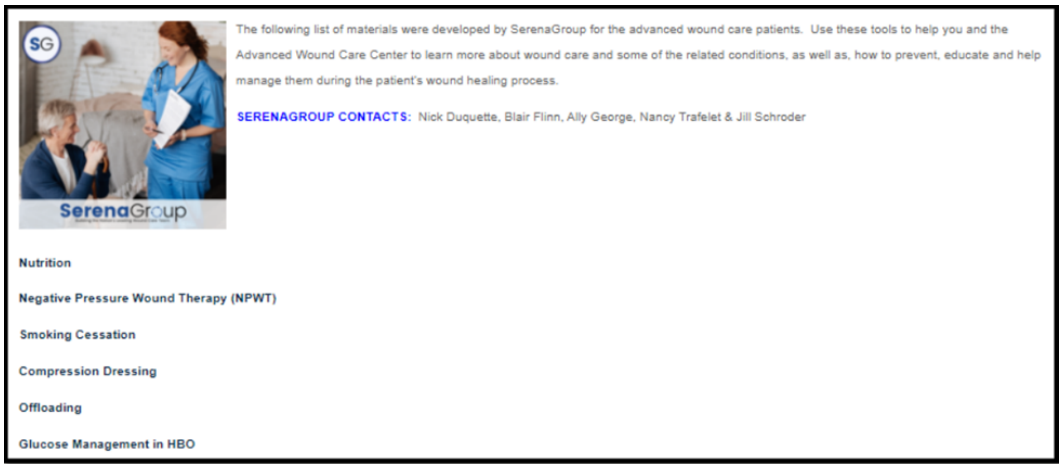
Family Education

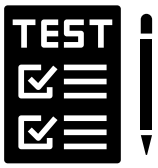
The patient's family and/or caregiver will be provided with appropriate education and training to increase knowledge of the patient's illness and treatment needs, and to learn skills and behaviors that promote healing and improve function. The education and training will be specific to assessed needs, abilities, and will be appropriate to the anticipated length of treatment. We encourage a family member or caregiver to attend hyperbaric consults to maximize education retainment.

Education for Hyperbaric Patients

HBOT offers a unique opportunity to provide patients with continuing, daily educational opportunities. Hyperbaric, offloading, diabetes management, wound dressings, debridement, Negative Pressure Wound Therapy, etc. are

topics that are frequently discussed with patients during their time in hyperbaric. By maximizing this time with education, compliance can be improved significantly as the patient's begin to develop a genuine understanding of the 'how' and 'why' of wound healing. Handouts that can be found on the member's portal at www.serenagroupinc.com can reinforce these discussions.





Name: _____

Date: _____

Post-Test: Patient Education and Compliance

1. What do we hope to improve upon by providing quality patient education?

    a. Compliance
    b. Better Outcomes
    c. Faster Healing
    d. Healthier Understanding
    e. All of the above

2. If I have a need for an educational handout and I can't find anything helpful on the member's portal, what should I do?

_____

3. List 3 barriers to learning:

_____

_____

_____

Department of Hyperbaric Medicine
Adverse Event Record

1. Ear Barotrauma
2. Sinus or Tooth Squeeze
3. Oxygen Toxicity
4. Nausea/Vomiting
5. Pneumothorax
6. Air Embolism
7. Seizure
8. Anxiety/Claustrophia
9. Diabetic Reaction
10. Other - Please Specify

Medical Record #	Adverse Event	Intervention	Comments

Safety Director: _____

Medical Director: _____

SerenaGroup
Building the Nation's Leading Wound Care Team

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