Safety Manual/Monthly Safety Awareness Program

SerenaGroup Hyperbaric Medical Center

2014
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.


“14.3.1.3.2 Each hyperbaric facility shall designate an on site hyperbaric safety director to be in charge of all hyperbaric equipment and operational safety requirements of this chapter” (14)

14.3.1.3.2.3 “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
5.3 All Oxygen-8 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 Center provided 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 a 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
- Perfume
- After shave lotion
- Oil-based creams/ointments (petroleum jelly), or cover wound or skin area with 100% cotton or cotton/polyester blend 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: Cover all dressings with 100% cotton or cotton polyester blend linens.

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
• Holter monitors
• External TENS or similar product
• External insulin pump
• Silk
• Wool

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 patients will be oriented in alternative care options

2.3. All staff will be oriented and updated to the emergency preparedness plan with safety as a primary focus

2.4. 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. The will interrupt the supply power to the battery charger.

4.1.4.4. Cover the chambers with the cloth chamber cover.
2017 Safety Program Schedule

January – Sinus Blockage
February – Static Electricity
March – Gas Contamination
April – Power Failure
May – Gas Supply Failure
June – Pneumothorax Under Pressure
July – Emergency Decompression
August – Cardiac/Respiratory Arrest
September – Confinement Anxiety/Claustrophobia
October – Ear Barotrauma
November – Fire Safety
December – Seizures in the Hyperbaric Chamber

Sinus Blockage
Overview: This type of blockage is much more difficult to treat because you have no surgical intervention such as PE tubes. This type of blockage is not as common as the blocked ears. The frontal sinus is extremely sensitive to barotrauma and the pain is severe. If the blocked sinus can not be cleared by the use of oral decongestants or nasal sprays then the patient will need to see and ENT.

Procedure: If the patient has a sinus blockage the physician may order an oral decongestant or vasoconstrictive nasal spray. Consult ENT if these medications don’t relieve the pressure.

Reference: Eric P. Kindwall, Hyperbaric Medicine Practice, pp.287
1. Sinus Blockage can be treated by a myringotomy.  
   (circle) True  False

2. If the blocked sinus cannot be cleared a ____________ consult should be ordered.

3. ____________ and ____________ can be ordered to help clear the blocked sinus.

4. The frontal sinus is extremely sensitive to barotrauma.  (circle) True  False

5. Sinus Blockages are very common during compression.  (circle) True  False
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.

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

Gas Contamination
Overview: **Oxygen** - your hospital will have a Test Protocol for regularly testing the purity of the hospital oxygen. Request a copy of the hospital’s protocol to place in your safety manual.

**Air** - supplied by an H cylinder delivers the air required for the hyperbaric patient’s air break. You can assure the purity of the air being delivered to your patient by receiving a copy of your Gas Distributors Quality Assurance Log Book.

Procedure: If the purity of the gas being utilized is in question, notify Facility Services, Nurse Manager and the Safety Officer of the occurrence. The following steps should be taken to insure purity of the gas being delivered to your patient.

**Oxygen** - The oxygen is checked for concentration and gaseous purity at each outlet and particulate contamination at least once each zone valve. Other points checked are: alarms, temperature, shut-off valves, flow, leakage, pressure, and proper installations (i.e. Brazing, Labeling, and Hanging).

**Air** - All cylinders have a lot number. This can be found on the top portion of your cylinder. The lot number may resemble these types of characters K8723213. Contact your oxygen/air supplier with the lot number of your tank, they will pull their Quality Assurance Record on that particular lot which include the following information: Location, Date, Lot Number, Cylinder/ID#, Grade, Analyze, Test Equipment, Test Results, Tester, Test Date, Released By and Release Date.

References: (place the name and number for your Oxygen supplier) Director of Facility Services (place the name and number of your contact here).

Date:________________________________________
Name:________________________________________

Post-Test
**Gas Contamination**

1. There is no true way to test the purity in your H cylinder.  
   (circle) True  False

2. Your H cylinder will have a ____________number on it for tracking.

3. Your hospital will have a record of the procedure for testing the purity of the oxygen going to the chamber. (circle) True  False

4. The Air Cylinder is yellow. (circle) True  False

5. The purity of the oxygen is usually tested at each ____________valve.

6. List two items that are inspected when the hospital checks for oxygen purity.  
   ___________________________ and ___________________________.

**Power Failure**

**Overview:**

**Sechrist** – The Pneumatic Pressure Control System is non-electronic and operates from the gas supply pressure. A standard 110 volt, 60 Hz wall socket must be provided, this operates the intercom system. In case of a power failure the intercom will operate on a back-up battery.

**Sigma 34/Sigma Plus** – The gas control system pressurizes, ventilates and depressurizes the chamber within preset parameters. The system operates totally on pneumatic logic and does not require electricity. The Perry communications system operates normally on a AC voltage input range of 120 volts at 60 Hertz or 240 volts at 50 Hertz. In the event of a AC power failure the communications unit will continue to operate for a limited time.

**ETC Bara-Med** – The Chamber is equipped with a redundant back up power system and will operate in a normal fashion with no action necessary on the part of the operator. The ETC communications system operates normally on a AC voltage input range of 120 volts at 60 Hertz or 240 volts at 50 Hertz. In the event of a AC power failure the communications unit will continue to operate for a limited time.
**Procedure:** A power outage will not interrupt treatment. The chamber is gas powered and the communication system has a battery back-up. If power has not been restored within 10 minutes abort the treatment and decompress the chamber at a normal rate. Hold treatments until situation is corrected.

**Reference:** Scchrist pp. 1.2, 2.6, 4.4, Sigma 34 pp. 14, 18, Sigma Plus pp.17, ETC BARA-Med manual chapter 7 pp 8

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Post Test
Power Failure

1. Loss of electricity will cause the chamber to malfunction.  
   (circle) True False

2. The Hyperbaric Chamber is ____________ powered.

3. The ____________ is powered by electric and will continue to operate during a
power failure.

4. The chamber is equipped with a battery back-up.
   (circle) True   False

5. Installation of the chamber needs to be located by a power source.
   (circle) True   False

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**Gas Supply Failure**

**Overview:** The Sechrist and Perry Chamber are gas pressurized. Loss of pressure to the chambers will automatically decompress the chamber.

**Procedure:**

**Sechrist**
- Set the Set Pressure Gauge to zero
- Turn the Master Valve to the off position. The chamber will automatically decompress at a rate of approximately 3-5 psi per minute.
- When the Chamber Pressure Indicator shows black, open the chamber door and remove the patient.

**Sigma 34/Sigma Plus**
- Depressurization will begin immediately when loss of supply pressure occurs.
- Flip the system on/off switch to the off position.
- Adjust the rate of depressurization with the Ventilation Control Valve; turn the control valve fully clockwise to the minimum setting.
- When chamber reaches zero open the door.

**ETC Bara-Med**
- Switch the supply to a secondary source if available. (if not step 2)
- Press the end treatment button (if in Auto mode)
3. (If in manual mode) Close the Manual Pressure Control valve
4. Depressurize the chamber with the Manual Vent Control valve

BARA-Med manual chapter 7 pp 8

Date:_______________________________________________

Name:______________________________________________

Post-Test
Gas Supply Failure

1. The Sechrist and Perry Chambers are gas powered.
   (Circle) True    False

2. The chamber will ____________________ decompress when we have loss of gas pressure.

3. If you lose electrical power the chamber will automatically decompress the patient.
   (circle) True    False
4. When the patient reaches the surface, you will proceed with normal operation procedures for removing the patient, such as waiting for the chamber to reach zero or the indicator eye to turn black. (circle) True  False
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

Post Test
Pneumothorax

1. Patients may experience the following symptoms during decompression __________ and ____________.

2. During the decompression the pneumothorax expands. (circle) True  False

3. A patient suffering a pneumothorax in the Hyperbaric Chamber is not serious. (circle) True  False

4. The patient may exhibit signs of cyanosis in the chamber. (circle) True  False

5. Patients with any kind of pulmonary lesions on x-ray should have a __________ descent rate.
Emergency Decompression

**Introduction:** Use Emergency Vent or Exhaust By-Pass only in extreme emergency situations. Rapid loss of chamber pressure may result in barotrauma.

**Procedure:**

- **Sechrist** - Turn the Master Valve to the Emergency Vent position and then press the Emergency Vent Button. The chamber will decompress at a rate of 0.5 psi to 1.0 psi per second.

- **Sigma 34/Sigma Plus** - Turn the system On/Off switch to the off position. Press and hold the Exhaust By-Pass button. The chamber will depressurize in approximately 110 seconds from 30psig to 0psig.

- **ETC Bara-Med**
  Place chamber into Manual Mode Press and hold the Exhaust By-Pass (RED) button. The chamber will depressurize in approximately 110 seconds from 30psig to 0psig.

To slow the rate of decompression, the Emergency Vent/Exhaust By-Pass may be pushed intermittently instead of being held down constantly.

**Reference:**

- Perry Sigma 34 Manual, pp.30; Perry Sigma Plus Manual, pp. 27
- Sechrist Manual 4.9, ETC BARA-Med manual chapter 7 pp 8
Post Test
Emergency Decompression

1. A patient that is suffering from anxiety 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?
   _________________
Cardiac/Respiratory Arrest

Introduction: Cardiac arrest is a rarity in the chamber since most arrhythmias seem to improve under hyperbaric conditions. It is important to remember that a patient at depth is well oxygenated and will remain so for 5-8 minutes. This allows time for you to call “911” or activate your hospitals “Code Team.”

Procedure: If cardiac arrest occurs in the chamber decompress your patient at a rate of 5 psig (decompression will be between 3-5 minutes) utilizing the emergency button places the patient in danger for a pneumothorax. When chamber door is opened move patient minimum Of 10 feet away from chamber and strip off their clothing prior to defibrillation. Cold oxygen falls to the floor and dissipates in 30 seconds.

Equipment: Basic Life Support will be available

Post Test
Cardiac/Respiratory Arrest

1. When the chamber door is opened after an arrest the oxygen will filter throughout the room immediately causing a fire hazard within the room. (circle) True    False

2. If it is necessary defibrillate your patient you must move the gurney____________ and remove__________ prior to defibrillation.

3. Cardiac arrest is very common in patients being treated in the Hyperbaric Chamber. (circle) True      False

4. If a patient is at 2ATA and you decompress the chamber at a rate of 5.0 psi/min how long will it take the patient to decompress? ______________________

5. The patient’s arterial oxygen level is approximately____________ at pressure.
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.

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   False
Ear Barotrauma

Overview: Barotrauma to the ear is the most common complication of hyperbaric therapy. It is more difficult to inflate the middle ear because the inner ends of the Eustachian tubes have slit like openings. These openings tend to close tighter if not opened actively by swallowing, yawning or doing the Valsalva maneuver.

Procedure: If the patient experiences mild to moderate pain, stop the pressurization and decrease to the point of no pain. Make sure the patient does not try to clear while the chamber is decompressing. Reinforce equalization techniques and continue to pressurize when patient states they have no more discomfort. If patient experiences severe pain and it is not relieved by stopping the pressurization or decompressing, remove patient from the chamber and notify the Hyperbaric Physician.

Ear Exam: Classification system for the degree of ear squeeze is based on the appearance of the ear drum. It was devised by Wallace Teed, a United States Navy Submarine Medical Officer during World War II.

TEED SCALE
TEED 0 - Symptoms with no physical findings
TEED 1 - Erythema or injection around the handle of the malleus
TEED 2 - Erythema or injection 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
**TEED SCALE DESCRIPTIONS**

Grade 0 - No visible damage, normal ear

Grade 1 - Congestion around the umbo; occurs with a pressure differential of 2 pounds per square inch (PSI)

Grade 2 - Congestion of entire TM; occurs with a pressure differential of 2–3 PSI

Grade 3 - Hemorrhage into the middle ear

Grade 4 - Extensive middle ear hemorrhage with blood bubbles visible behind TM; TM may rupture

Grade 5 - Entire middle ear is filled with dark (deoxygenated) blood
Post-test
Ear Barotrauma

1. What is the most common complication of Hyperbaric Therapy___________.

2. The TEED Scale was developed to assess patients for potential oxygen seizures.  
   (circle) True  False

3. Patients should be instructed not to try to equalize during___________________.

4. Equalizing techniques include all of the following except: Valsalva, Yawning,  
   Blinking, Swallowing _____________________________.

5. Hemorrhage in the tympanic membrane is classified as a TEED 1.  
   (circle) True  False

6. You should stop HBOT if a patient has a grade TEED 1.5?  
   (circle) True  False
**Fire Safety/On Site**

**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

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
Subject: 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 plan

◊ FIRE INSIDE THE HYPERBARIC CHAMBER OFF SITE

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
Seizures in the Hyperbaric Chamber

Introduction: Oxygen toxicity occurs in approximately 1.3 times in 10,000 exposures. Pre-treatment assessment is one of the major tools in preventing oxygen toxicity. Air breaks can be used to decrease the potential for oxygen toxicity in patients that are on high doses of steroids, narcotics (narcotics decreases the respiratory drive that can lead to increased oxygen levels) or febrile. The room environment plays a role decreasing the chance of a seizure by eliminating fluorescent lighting in the chamber room.

Signs/Symptoms: Patients may exhibit one or more of the symptoms, however the seizure may happen without warning. Careful monitoring of your patient at all times is essential. Signs of oxygen toxicity begin with: sweating, nausea, vomiting, apprehension, shortness of breath, tunnel vision, tinnitus and muscle twitching.

Other Considerations: Seizures may also be caused by hypoglycemia, high doses of steroids, hyperthermia, and chemical/alcohol abuse.

Procedure: If patient is observed or complains of any of the above symptoms have the patient breathe off their air break system, this will lower their oxygen level. Notify the Hyperbaric Physician supervising the treatment. Continue air breathing for 5-10 minutes until patient states they feel better. Discontinue patient’s treatment and decompress the patient at a normal rate. If patient is a Diabetic immediately check blood sugar, episode could be hypoglycemia. Prior to the next treatment incorporate an air break in the patient’s treatment protocol. If patient has a seizure it will consist of a tonic phase where the patient may hold their breath. Never decompress at this phase. When the patient begins a jerking motion this is the clonic phase. Patient should be observed for breathing, chamber can be decompressed at a rate tolerated by patient. Patient should have a complete assessment done post treatment. The Hyperbaric Physician will determine the course of action for the patient.

Post Test

Seizures in the Hyperbaric Chamber

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

2. The seizure will consist of two phases:______________ and ______________ .

3. You can only decompress the patient during the clonic phase. (circle) True  False

4. ________________is the major tool used to help you prevent oxygen toxicity.

5. During your pre-treatment assessment what at some of the factors that would determine if the patient should get an air break incorporated in the their treatment protocol. ______________, ______________, ______________.
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. Choose one of the other three topics each quarter.

<table>
<thead>
<tr>
<th>TOPICS</th>
<th>DATE</th>
<th>MET</th>
<th>NOT MET</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fire Safety</td>
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<tr>
<td>Cardiac/Respiratory Arrest</td>
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<tr>
<td>Pneumothorax Under Pressure</td>
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<tr>
<td>Seizures in the Hyperbaric Chamber</td>
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SAFETY DIRECTOR________________________MEDICAL DIRECTOR_______________________
## II. HYPERBARIC ADVERSE EVENTS

<table>
<thead>
<tr>
<th>ADVERSE EVENTS</th>
<th>ADVERSE EVENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Ear Squeeze</td>
<td>6. Air Embolism</td>
</tr>
<tr>
<td>2. Sinus Squeeze</td>
<td>7. Seizure – Oxygen Related, Diabetic Related, Other</td>
</tr>
<tr>
<td>3. Oxygen Toxicity – CNS &amp; Pulmonary</td>
<td>8. Confinement Anxiety</td>
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<tr>
<td>5. Pneumothorax</td>
<td>10. Other – <em>Please Specify</em></td>
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</table>

MONTH: ____________________

<table>
<thead>
<tr>
<th>Medical Record #</th>
<th>Adverse Events</th>
<th>Intervention</th>
<th>Comments</th>
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<tbody>
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SAFETY DIRECTOR________________________________________MEDICAL DIRECTOR________________________________________
IMPLEMENTATION DATE: ________________

MEDICAL DIRECTOR: ______________________ DATE: _________

PROGRAM DIRECTOR: ______________________ DATE: _________

SAFETY DIRECTOR: ______________________ DATE: _________
These Emergency Procedures are specific to the monoplace chamber pressurized with oxygen. In an emergency, it is vital to respond appropriately to the situation. These Emergency Procedures should be rehearsed, so as to become second nature. It is important to understand the reasons for the Primary and Subsequent Actions, and why they are taken. The Physician and Chamber Operator must work as a team to resolve the emergency quickly and efficiently.

I have read and understand the Emergency Procedures, and will respond accordingly in the event of an emergency.

<table>
<thead>
<tr>
<th>Print Name</th>
<th>Signature</th>
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</tbody>
</table>

All chamber operators and supervising physicians must sign.
## Patient Seizure

<table>
<thead>
<tr>
<th>RESPONDER</th>
<th>PRIMARY ACTIONS</th>
<th>SUBSEQUENT ACTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHAMBER OPERATOR</td>
<td>Stop travel/maintain constant depth – Notify Physician</td>
<td>Maintain depth until directed to surface patient</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Log all events</td>
</tr>
<tr>
<td>PHYSICIAN</td>
<td>Determine appropriate treatment Direct patient care</td>
<td>Perform clinical treatment as appropriate</td>
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<td></td>
<td></td>
<td>Chart as required</td>
</tr>
</tbody>
</table>
# Suspected Pneumothorax

<table>
<thead>
<tr>
<th>RESPONDER</th>
<th>PRIMARY ACTIONS</th>
<th>SUBSEQUENT ACTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHAMBER OPERATOR</td>
<td>Stop Travel – Notify Physician</td>
<td>Follow emergency dive termination procedure</td>
</tr>
<tr>
<td></td>
<td>Maintain constant depth until directed to</td>
<td>Log all events</td>
</tr>
<tr>
<td></td>
<td>terminate dive</td>
<td></td>
</tr>
<tr>
<td>PHYSICIAN</td>
<td>Determine appropriate treatment</td>
<td>Perform clinical treatment as appropriate</td>
</tr>
<tr>
<td></td>
<td>Direct patient care</td>
<td>Chart as required</td>
</tr>
</tbody>
</table>
## Unresponsive Patient/Cardiac Arrest

<table>
<thead>
<tr>
<th>RESPONDER</th>
<th>PRIMARY ACTIONS</th>
<th>SUBSEQUENT ACTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHAMBER OPERATOR</td>
<td>Stop Travel – Initiate Code ___ by calling___</td>
<td>Follow emergency dive termination procedure</td>
</tr>
<tr>
<td></td>
<td>Notify Physician – Maintain constant depth until</td>
<td>Log all events</td>
</tr>
<tr>
<td></td>
<td>directed to terminate dive</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Notify RN</td>
<td></td>
</tr>
<tr>
<td>PHYSICIAN</td>
<td>Supervise patient care and emergency procedures.</td>
<td>Perform clinical treatment as appropriate</td>
</tr>
<tr>
<td></td>
<td>Determine appropriate treatment</td>
<td>Chart as required</td>
</tr>
</tbody>
</table>

Note: Patient must be clear of the chamber and oxygen saturated linen removed prior to defibrillation.
# Loss of Chamber Pressurization

<table>
<thead>
<tr>
<th>RESPONDER</th>
<th>PRIMARY ACTIONS</th>
<th>SUBSEQUENT ACTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHAMBER OPERATOR</td>
<td>Notify patient of planned action</td>
<td>Follow emergency dive termination procedure</td>
</tr>
<tr>
<td></td>
<td>Notify Physician</td>
<td>Log all events</td>
</tr>
<tr>
<td></td>
<td>Adjust rate of depressurization with VENTILATION CONTROL valve</td>
<td>Complete fault investigation</td>
</tr>
<tr>
<td>PHYSICIAN</td>
<td>Supervise patient care, evaluations and determine if transfer to back-up facility is required.</td>
<td>Perform clinical treatment as appropriate</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Chart as required</td>
</tr>
</tbody>
</table>

Note: Fault Investigation must be completed IAW manufacturers manual prior to resuming chamber operation
## Uncontrollable increase in chamber pressure

<table>
<thead>
<tr>
<th>RESPONDER</th>
<th>PRIMARY ACTIONS</th>
<th>SUBSEQUENT ACTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHAMBER OPERATOR</td>
<td>Shut all chamber gas supply valves</td>
<td>Follow emergency dive termination procedure</td>
</tr>
<tr>
<td></td>
<td>Notify Physician</td>
<td>Log all events</td>
</tr>
<tr>
<td></td>
<td>Notify patient of planned action</td>
<td>Complete fault investigation</td>
</tr>
<tr>
<td>PHYSICIAN</td>
<td>Supervise patient care, evaluations and determine if transfer to back-up facility is required</td>
<td>Perform clinical treatment as appropriate</td>
</tr>
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<td></td>
<td></td>
<td>Chart as required</td>
</tr>
</tbody>
</table>

Note: Fault Investigation must be completed IAW manufacturers manual prior to resuming chamber operation
# Oxygen leak

<table>
<thead>
<tr>
<th>RESPONDER</th>
<th>PRIMARY ACTIONS</th>
<th>SUBSEQUENT ACTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHAMBER OPERATOR</td>
<td>Notify Physician</td>
<td>Follow emergency dive termination procedure</td>
</tr>
<tr>
<td></td>
<td>Determine leak source and correct if possible</td>
<td>Log all events</td>
</tr>
<tr>
<td></td>
<td>Secure electronic equipment.</td>
<td>Complete fault investigation</td>
</tr>
<tr>
<td>PHYSICIAN</td>
<td>Supervise patient care, evaluations and determine if</td>
<td></td>
</tr>
<tr>
<td></td>
<td>transfer to back-up facility is required.</td>
<td>Chart as required</td>
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</tbody>
</table>

Note: Fault Investigation must be completed IAW manufacturers manual prior to resuming chamber operation
## Fire in the Chamber Room

<table>
<thead>
<tr>
<th>RESPONDER</th>
<th>PRIMARY ACTIONS</th>
<th>SUBSEQUENT ACTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHAMBER OPERATOR</td>
<td>(R) Initiate patient evacuation/shut oxygen zone valve</td>
<td>Follow emergency dive termination procedure</td>
</tr>
<tr>
<td></td>
<td>(A) Activate Fire Alarm/Call _____ for CODE</td>
<td>Log all events</td>
</tr>
<tr>
<td></td>
<td>(C) Set fire compartmentation</td>
<td></td>
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<tr>
<td></td>
<td>(E) Extinguish fire if safe to do so</td>
<td></td>
</tr>
<tr>
<td>PHYSICIAN</td>
<td>Evaluate patients after evacuation to determine if transfer to back-up facility is required.</td>
<td>Chart as required</td>
</tr>
</tbody>
</table>
# Fire in the Chamber

<table>
<thead>
<tr>
<th>RESPONDER</th>
<th>PRIMARY ACTIONS</th>
<th>SUBSEQUENT ACTIONS</th>
</tr>
</thead>
</table>
| CHAMBER OPERATOR | (R) Initiate patient evacuation by decompressing the chamber, shut oxygen zone valve, remove patient.  
(A) Activate Fire Alarm/Call ___ for CODE  
(C) Set fire compartmentation  
(E) Extinguish fire if possible  
NOTE: Assess the situation prior to opening the chamber door—this could cause a back draft effect. Under certain circumstances it would be better to wait for EMS arrival prior to opening the chamber door. | Follow emergency dive termination procedure  
Log all events                                                  |
| PHYSICIAN       | Evaluate patients after evacuation to determine if transfer to back-up facility is required.                                                                                                                                 | Chart as required                                                 |
## Emergency Dive Termination

<table>
<thead>
<tr>
<th>RESPONDER</th>
<th>PRIMARY ACTIONS</th>
<th>SUBSEQUENT ACTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHAMBER OPERATOR</td>
<td>Notify patient of imminent rapid decompression.</td>
<td>Log all events</td>
</tr>
<tr>
<td></td>
<td>Warn patient NOT to hold breath during depressurization.</td>
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<tr>
<td></td>
<td>Turn the <strong>ON/OFF</strong> switch to the <strong>OFF</strong> position</td>
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<tr>
<td></td>
<td>Depress and hold <strong>EXHAUST BYPASS</strong> button</td>
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<tr>
<td></td>
<td>The chamber can depressurize in approximately :2::00 from 30 psi</td>
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<tr>
<td></td>
<td>To slow the rate of depressurization, the <strong>EXHAUST BYPASS</strong> button may be pressed</td>
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<tr>
<td></td>
<td>intermittently, instead of being held down constantly</td>
<td></td>
</tr>
<tr>
<td>PHYSICIAN</td>
<td>Determine appropriate treatment</td>
<td>Perform clinical treatment as appropriate</td>
</tr>
<tr>
<td></td>
<td>Direct patient care</td>
<td>Chart as required</td>
</tr>
</tbody>
</table>

**Note:** The Red indicator is activated whenever the **EXHAUST BYPASS** button is depressed.

At the physician’s discretion, the rate of depressurization may be slowed.