Session E

HBO_2 OPERATIONS, CHAMBERS & EQUIPMENT

SATURDAY, JUNE 30

UHMS ANNUAL SCIENTIFIC MEETING
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E 1

Preprogrammed bailout and surface decompression schedules for multiplace treatment profiles

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Background: There is not an accepted standard for computing chamber attendant decompression requirements. Most decompression tables are not optimal for computing decompression obligations for non-standard dives such as stepped dive profiles. When medical emergencies or mechanical problems necessitate immediate egress, decompression solutions must be readily available to prevent injury to the chamber attendant. Emergency bailout and surface decompression are seldom used low-frequency/high-risk procedures that must be performed during stress situations.

Method: The hyperbaric team at St. Luke's Medical Center, utilized a decompression computation and analysis program (DCAP) to generate and analyze all treatment profiles and their associated decompression. The algorithm parameters were adjusted to obtain schedules that were minimally more conservative than the DCIEM decompression schedules.

Results: Each treatment profile was analyzed at five-minute intervals to determine emergency bailout and surface decompression solutions. All treatment profiles and their associated decompressions were compiled into a chamber operator handbook in an easy-to-read format.

Summary: A computer decompression computation and analysis program (DCAP) was used to formulate emergency bailout schedules and surface decompression schedules for all of the departments treatment profiles. The treatment profiles and all of their associated decompression schedules were organized into a book for quick, easy access. Through preplanning, organization and staff training it is possible to respond rapidly and appropriately when stressful emergency decompressions are necessary.

E 2

Hyperbaric oxygen simulation education

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Introduction/Background: Fortunately, the incidence of complications and critically ill patients in hyperbaric medicine is relatively low. However, this poses a challenge to those tasked with educating trainees, as well as maintaining the skills of staff. A hyperbaric medicine fellowship is only a year long, and it is conceivable that fellows may not be exposed to certain patient care situations or complications of hyperbaric medicine. Additional staff, including chamber operators and inside observers, may also be unfamiliar or uncomfortable dealing with these situations. The purpose of hyperbaric simulation curriculum is to train health care providers in various roles in situations that rarely occur in hyperbaric medicine practice.

Materials/Methods: The need for a simulation curriculum in hyperbaric medicine has been identified by the occurrence of rare situations with which team members may not have regular or any experience. Two different simulation cases have been developed that involve caring for a patient with oxygen toxicity during hyperbaric treatment as well as an ICU patient. The cases outline events and critical actions, and are followed by debriefing.

Results: Simulation curriculum allows for training health care providers in situations that rarely occur in hyperbaric medicine practice as well as identifying content areas in which more education is needed. We present the development of a new curriculum for medical simulation training for the hyperbaric chamber. These simulations are also unique in that, unlike other medical training simulations that focus on a single role, these can be used to simultaneously train physicians as well as nurses, technicians and other team members.

Summary/Conclusions: A hyperbaric simulation curriculum is an achievable educational initiative that is able to train multiple team members at once in situations that they may not encounter on a regular basis. We believe that this could be easily exported to other institutions for further education.

E 3

PARAMETER	TEST 1	TEST 2	TEST 3	TEST 4	TEST 5	TEST 6
airway resistance (cm H_2O/L/sec)	20	20	20	50	50	50
barometric pressure (fsw)	0	30	60	0	30	60
respiratory rate	15	16	15	15	17	15
inspiratory time	2	1.9	1.9	2	1.8	1.9
expiratory time	2	1.8	2	2	1.8	2.1
peak Inspiratory flow (L/min)	105	76	68	62	30	22
pulsatile flow rate	26	22	22.5	18	15.2	13.6
oscillatory CPAP	6	7	8	9	8.5	7
release volume (mL)	880	547	513	400	253	180
MAP (cm H2O)	17-18	17-19	19-20	17-18	18-19	18-20

E 3

Performance characteristics of high-frequency percussive ventilation (HFPV) under hyperbaric conditions

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Introduction: We tested the Bronchotron® Transport ventilator with a digital multimeter (Percussionaire Corporation, Sandpoint, Idaho) under hyperbaric conditions. This is a pneumatically powered, time-cycled and pressure-limited high-frequency flow interrupter. Release volume is a product of pulsatile flow rate (PFR) over oscillatory CPAP (OCPAP) and the non-convective subtidal volumes produced by the percussive rate. A sliding Venturi valve (Phasitron®) regulator is driven by a 50-psi gas supply at a high-frequency rate from 200-800 beats/minute superimposed on a conventional pressure controlled cycle [1].

Methods: Following a modified Navy protocol [2], we used a test lung with analytical software (Test Lung with PneuView [3] Software, Michigan Instruments, Grand Rapids, Michigan) for data collection. Testing took place in a multiplace hyperbaric chamber at 0, 30 and 60 feet of seawater (fsw). The ventilator was maintained at a PFR/OCPAP ratio of 30/10, percussive rate of 500, and inspiratory and expiratory time of two seconds each.

Results: See table above.

Discussion: As barometric pressure increased, entrained flow through the Phasitron® decreased. This resulted in lower peak flow and release volume, as commonly seen in conventional ventilators used in hyperbaric environments. The mean airway pressure (MAP) remained stable throughout all test conditions, theoretically supporting adequate lung recruitment and gas exchange.

References

1. Salim A, Martin M. High-frequency percussive ventilation. Crit Care Med. 2005;33(3 Suppl):S241-245.
2. Stanga D, Beck G, Chimiak J. Evaluation of respiratory support devices for use in the hyperbaric chamber. Naval Sea Systems Command: Navy Experimental Diving Unit; November 2003. NEDU TR 03-18.

E 4

Observations on O2% during air breathing periods using a non-rebreather face mask in a monoplace chamber

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Introduction: We tested a non-rebreather (NRB) reservoir face mask delivering medical air (20.9% O_2) in an oxygen-filled monoplace chamber and impact on the chamber O_2%.

Methods: A free-flow air-break assembly, with flow meter (Sechrist PN 100443), was installed on a Sechrist 3600E chamber. An adult NRB mask (Hudson RCI, #1061) was used to supply medical air to the occupant of the chamber. The flow meter was set to provide ≈15 liters per minute (lpm) and ≈30 lpm equivalent at 2.0 ATA and 2.4 ATA.

Medical air was delivered to the NRB for five-minute periods after the chamber atmosphere was >98% O_2. The chamber was operated with a ventilation rate of 350 lpm. The chamber atmosphere was monitored at the chest level with a calibrated oxygen analyzer (Quantek Instruments, model 905P, range 0-100% oxygen, accuracy ±1%). A nasal cannula (Hudson RCI, # 1864) was used to monitor the inspired NRB O_2%, at the chamber occupant's face, with a calibrated oxygen analyzer (AMI, model 111, range 0-95% oxygen, accuracy ±1%)

Results:

	2.0 ATA end of 5 min air breathing		
medical air, lpm	**chamber O_2%**	**O_2% at NRB**	**time to return to >98% @ 350 lpm**
22	96.8%	68 %	12 minutes
22	97.2%	64.2 %	14 minutes
42	95.0%	34%	15 minutes
42	94.7%	35.3%	12 minutes

	2.4 ATA end of 5 min air breathing		
medical air, lpm	**chamber O_2%**	**O_2% at NRB**	**time to return to >98% @ 350 lpm**
23	97.2%	69.8 %	9 minutes
23	97.1%	65.6 %	10 minutes
45	95.3%	44.6%	14 minutes
45	93.8 %	51.4%	13 minutes

Conclusions: The NRB does not provide air (20.9% O_2) during a five-minute "air break." After NRB use, the chamber O2 level is diminished, requiring 9-15 minutes to return to >98 O2%.

E 5

Interim analysis of mucosal atomizer use to maintain myringotomy patency during elective hyperbaric treatments

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Introduction/ Background: The most common side effect of hyperbaric oxygen (HBO_2) treatments is otic barotrauma. Historically patients who were unable to equalize were referred for pressure equalization tubes (PETs). Elective myringotomies are a relatively safe and more readily available alternative to PETs but have a higher failure rate over a course of HBO_2. A possible solution to this issue is the use of a mucosal atomizer device (MAD) and syringe to maintain myringotomy patency.

Materials/Methods: Patients who underwent elective bilateral myringotomies were randomized to use a MAD in one of their ears with the other ear acting as a self-control. This is done by gently insufflating 5 mL of air gently into the ear using a MAD.

Results:

1. 19 patients have been enrolled thus far with an enrollment goal of 90 patients.
2. 8/19 (42.1%) of atomized ears did better than controls.
   a. 2 patients underwent subsequent unilateral PETs, both of which were in non-atomized ears.
   b. 2 patients underwent repeat unilateral myringotomies of the control ear.
3. 2/19 (10.5%) of atomized ears did worse than controls.
   a. Both had repeat unilateral myringotomies of the atomized ear.
4. 9/19 (47%) had similar outcomes in both ears.
   a. 3 had subsequent bilateral PETs.
   b. 3 had repeat bilateral myringotomies.
   c. 3 had no issues with either ear.

Summary/Conclusions: Our interim analysis suggests that air insufflation with atomizer use may help maintain myringotomy patency. Further patient enrollment is ongoing.

E 6

Multiplace hyperbaric chamber modifications for safe utilization of a non-hyperbaric rated cardiac monitor

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Introduction: Cardiac monitoring is required when treating critical care patients in the hyperbaric chamber. We had limited budget to purchase new equipment and were given a surplus Philips Intellivue MP30 monitor to use in our facility. Ensuring that electronic equipment meets NFPA 99 standards for use in a hyperbaric environment is difficult; however, multiplace operations makes this task much easier with the versatility of through-hull penetrators.

Materials/Methods: Our first step was determining if the MP30 met NFPA 99 standards for battery operated devices. Unfortunately, the MP30 batteries failed the NFPA 99 standard, as each of its two batteries exceeded 48W. We determined that the MP30 can utilize the multi-measurement server (MMS) extension brick that meets NFPA standards because it does not contain batteries, the power output from the monitor to the bricks is no more than 5V, and the power supply comes from a through-hull penetrator cable. The MMS brick is mounted inside the chamber while the monitor is mounted outside the chamber. For the inside chamber staff to see the monitor, the MP30 output was slaved to the television monitor located inside the chamber. While there is no sound, the screen can be monitored closely by the inside critical care team during a treatment.

Results: We successfully tested our setup and demonstrated that the MMS brick can simultaneously monitor 3-, 5- or 10-lead ECG, respiration, SpO_2, non-invasive and invasive blood pressure monitoring, and temperature. This allows us to closely monitor a critical care patient during hyperbaric oxygen therapy while minimizing changes to patient care.

Conclusions: Through creative engineering we could utilize our existing equipment rather than purchasing a new monitor. We identified discrete barriers and solved each one to allow for our current equipment to be used.

E 7

Leg ulcer characterization by photographic imaging pre and post hyperbaric oxygen treatment: Lessons learned with first 10 cases

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Introduction/Background: Hyperbaric oxygen (HBO_2) treatment can improve healing of leg ulcers. HBO_2 effectiveness still demands investigation. Characterization of tissue by ultrasonography (CATUS), a technique to quantitate image brightness, was adapted to photographic imaging of leg ulcers (p-CATIM). Lessons learned during the first 10 cases are described herein.

Methods: P-CATIM was applied to photos of leg ulcers of diabetic patients, pre- and post 10-40 HBO2 sessions. Color photo was transformed into grayscale with 256 brightness levels. Rescale to diminish variability was based on "black" and "white" bars of a sticker placed by the ulcer. Observed variables are listed in results.

Results: A) Reduction in open ulcer area was documented by pixel ratio between ulcer and "black" square (1 cm^2 reference). B) Open ulcer brightness histograms were wide, showing peaks associated to "necrosis" or "granulation." "Necrosis" had low 0-40 brightness and its pixel percentages decreased with HBO_2. "Granulation" brightness varied from 40 to 150, depending on skin type. C) Skin brightness surrounding open ulcer differed but tended to "normal" skin with HBO_2. D) "Normal" skin brightness varied individually. HBO_2 decreased brightness variability and increased percentage of pixels tending to "normal" skin. E). Technical considerations: illumination, camera-ulcer distance and angulation, leg circumference effects, i.e. cylindrical leg exposed to straight light rays, are factors that need to be optimized and controlled during p-CATIM investigations.

Conclusions: P-CATIM quantitated leg ulcer conditions by: a) area based on number of pixels; and b) distinct tissue brightness. Regions evaluated included: a) open ulcer; b) surrounding region, and c) "normal" skin. Brightness levels were easily associated with "necrosis," a low brightness condition that decreased with HBO_2. "Normal" skin brightness and "granulation" may require individual definition by an expert analyzing each photo. P-CATIM is a promising technique to quantitate HBO_2 effectiveness and timing in ulcer healing.

E 8

Responding to an active shooter: Learning from one facility's experience

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Introduction/Background: FEMA defines an active shooter as an individual actively engaged in killing or attempting to kill people in a confined and populated area. Active shooter events in health care facilities are a rare occurrence; however, FEMA has reported six of these events in health care facilities in the United States from 2000 to 2015. Active shooter situations present challenges that are unique from other medical emergency situations. The current response advocated by FEMA is "run, hide, fight," which is very different from the way most health care providers respond to an emergency.

Materials/Methods: A hyperbaric facility with two monoplace chambers was actively treating one patient at 2.4 ATA when an active shooter was reported on campus via computer and audible alert. Previous training for an active shooter event consisted of one computer-based training module. For the next 4.5 hours the staff and patient were locked down in the hyperbaric room, managing issues that had not been previously considered, until the active shooter was located and apprehended by law enforcement.

Results: Staff debriefing post-event was held to identify what went well and opportunities for improvement. A number of issues that had not been considered or discussed during training were identified; including issues with communication, text messages from people inside and outside the institution, the inability to lock areas of the facility, use of cell phones to access police scanners, and the description provided of the active shooter.

Summary: Although rare, facilities should prepare for this low-frequency but high-impact event. There is no definitively correct response, and response will depend on many factors. Staff can be better prepared to deal with the situation through practice drills, detailed discussions about various situations and ongoing training.

E 9

Use of high-frequency percussive ventilation (HFPV) in a patient with carbon monoxide poisoning

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Introduction: We tested the Bronchotron® Transport ventilator with a digital multimeter (Percussionaire Corporation, Sandpoint, Idaho) under hyperbaric conditions. This is a pneumatically powered, time-cycled, and pressure-limited high-frequency flow interrupter. Release volume is a product of pulsatile flow rate (PFR) over oscillatory CPAP (OCPAP) and the non-convective subtidal volumes produced by the percussive rate. A sliding Venturi valve (Phasitron®) regulator is driven by a 50 psi gas supply at a high-frequency rate from 200-800 beats/min superimposed on a conventional pressure controlled cycle [1].

Case description: The patient is a 66-year-old female who was found unresponsive in a house fire. She had a Glasgow Coma Scale of 3 and was intubated less than an hour from when she was removed from the house. The carboxyhemoglobin (COHb) was 36.8% in the emergency department (ED). An initial arterial blood gas (ABG) was done in the ED on conventional mechanical ventilation (CMV). The patient was transferred to the burn center and placed on HFPV as part of the smoke inhalation protocol. We treated the patient with a USAF 66-fsw treatment table using our Bronchotron® Transport ventilator breathing 100% oxygen. We obtained ABGs before and during HBO_2 therapy while on HFPV.

Results: The patient was successfully treated and had no issues with ventilation during HBO_2 therapy (see table below). The ventilator was maintained at a PFR/OCPAP ratio of 28/10, percussive rate of 500, and inspiratory and expiratory time of two seconds each.

Discussion: We were able to maintain oxygenation and ventilation using HFPV. HFPV can be successfully used in a hyperbaric environment.

Reference

1. Salim A, Martin M. High-frequency percussive ventilation. Crit Care Med. 2005;33(3 Suppl):S241-245.

E 9

location	time	pH	pCO_2	pO_2	HCO_3	base excess
initial ED on CMV	08:23	7.07	45	318	13	-17.3
pre-HBO_2 on HFPV	10:06	7.35	32	320	17	-7.2
66 fsw on HFPV	12:04	7.25	42	>700	18	-9.0
33 fsw on HFPV	13:10	7.33	39	>700	20	-5.4

E 10

Continuous bladder irrigation in the monoplace hyperbaric chamber: A cautionary tale

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Introduction: We previously published an article in the *UHM* Journal, presenting our method of performing continuous bladder irrigation (CBI) in a monoplace hyperbaric chamber using an IV pump to infuse saline into the chamber to a three-way Foley catheter. However, the specter of causing iatrogenic rupture of the bladder was raised by our urologic colleagues after the following case at our institution.

Case report: An 80-year-old female with severe hemorrhagic cystitis secondary to radiation therapy was being treated with hyperbaric oxygen (HBO_2) therapy as an outpatient shortly before admission and was to continue as an inpatient on CBI. CBI was set up in the HBO_2 chamber on a pump, as per our previous report. She received two HBO_2 treatments with this setup. One day after her second treatment, she received an alum instillation on the inpatient floor, which was mistakenly done on a pump. This led to bladder rupture and cystectomy. Obviously, this rupture could have as easily occurred on the CBI pump.

Discussion: A normal urinary bladder can distend remarkably if outflow is obstructed but the ability of a pathologic bladder to tolerate pressure is markedly impaired. A literature review of 40 cases of spontaneous urinary bladder rupture was published as long ago as 1931. Spontaneous urinary bladder rupture associated with delayed effects of therapeutic radiation have been reported. How much more susceptible may a bladder with radiation cystitis be to rupture with pressures exceeding that done in passive (gravity-fed) continuous irrigation? Subsequently we have discontinued the use of our previously published CBI method. Either an arrangement of gravity-fed CBI will be done in the chamber or HBO_2 treatment will be withheld until CBI is no longer required. Most CBI cases require several liters of saline instilled over the course of a typical HBO_2 treatment, making a gravity-fed system in a monoplace chamber cumbersome. Given that CBI is used short-term for acute and relatively severe hemorrhagic cystitis and that HBO_2 is used for chronic radiation cystitis over a period of weeks, a few days' delay in HBO_2 treatment is likely to cause little harm.

Conclusion: Due to the danger of bladder rupture while providing CBI with a pump, we retract our previously reported method and encourage the use of either a gravity-fed system or delay in HBO_2 until CBI is no longer necessary.

E 11

The use of indocyanine green fluorescence angiography to assess perfusion of chronic wounds undergoing hyperbaric oxygen therapy

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Objective: The purpose of this study is to determine the utility of using indocyanine green fluorescence angiography (IGFA) in assessing perfusion of chronic wounds after hyperbaric oxygen (HBO_2) therapy.

Method: From May 2016 to January 2018, 26 patients underwent both HBO2 and IGFA. Near-infrared charge-coupled camera measured the flow of intravenous indocyanine green into the wound. IGFA was done pre-HBO_2, after approximately 10 HBO_2 sessions and upon completion HBO_2. Ingress rate at baseline, mid-therapy and post-HBO_2 values were compared using descriptive statistics.

Results: Total of 26 chronic wounds were identified. Baseline median ingress rate was 0.90 units/sec (IQR: 0.28 to 6.10). Median ingress rate after approximately of 10 HBO_2 sessions was 2.45 units/second (IQR: 0.48 to 6.35). Finally, median ingress rate post-HBO_2 was 3.70 units/second (IQR: 0.30 to 9.90). Median increase in ingress and rate from baseline to mid-HBO_2 0.30 units/second (IQR: -0.25 to 3.10) and from mid to post-HBO_2 was -0.40 units/sec (IQR: -1.50 to 2.60).

Conclusion: This preliminary study shows capability of IGFA to detect changes in blood flow to wounds following HBO_2. Results support the use of IGFA to evaluate the effectiveness of HBO_2 in enhancing perfusion to chronic wounds. Larger sample size may help clarify the benefit of IGFA to predict potential for wound healing.

E 12

Utilization of fluorescence microangiography (LUNA) in a pediatric patient with acute compartment syndrome

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Introduction: Acute compartment syndrome is a critical condition commonly associated with significant trauma and crush injuries. It is rarely reported in pediatric patients. We report utilization of fluorescence microangiography to monitor tissue perfusion in the setting of compartment syndrome.

Case report: A 5-year-old female presented to the emergency department after sustaining a crush injury to her left foot. Exam revealed marked edema and ecchymosis of the distal forefoot wand pain with dorsiflexion, plantar flexion. Capillary refill and protective sensation was absent. Imaging revealed subtle displaced fractures of the fourth and fifth middle phalanx. Adjunctive daily hyperbaric oxygen therapy was started. LUNA performed 17-hours post-injury demonstrated hypofluorescence to digits the distal digits. 26 hours post injury she developed compartment syndrome and had emergent fasciotomies, with large hematoma evacuation and cauterization of bleeding vessels. Immediate visual improvement of digital perfusion was noticed. However, the most distal aspects of digits four and five remained dusky, with continued guarded prognosis. Serial fluorescence microangiography done one week and seven weeks postoperatively demonstrated normal perfusion of the dorsal left foot and first to third digits. Hypoperfusion of the fourth and fifth digits was noted, and the decision was made to allow auto-amputation. Follow up at four months revealed successful auto-amputation of the fourth and fifth digits. Patient returned to her normal pre-injury activity level, with no pain, sensory deficits or functional disability at six months.

Conclusions: LUNA is a useful imaging modality to assess tissue perfusion of affected extremity with real-time visual images. Adjunctive HBO_2 and monitoring with monitoring with LUNA may benefit patients with crush injury or compartment syndrome.

E 13

Public awareness of carbon monoxide poisoning

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Introduction/Background: Carbon monoxide (CO) is present in the exhaust of machines burning carbon-based fuel. Mortality and morbidity from carbon monoxide poisoning is a substantial, often unrecognized, problem in the United States.

Public awareness of the dangers of CO poisoning is essential. The CDC has several ongoing projects, including a national initiative to develop educational tools to increase knowledge, attitudes and practices relative to CO poisoning. Its website has educational materials in 17 languages and a diagnostic training tool for health care professionals.

Methods:

1. Bethany and her 5-day-old baby, Jane, had CO exposure from a malfunctioning gas-powered furnace. The Taylors did not feel well, and Jane was sleepy and not eating. After presenting to the ED, we treated them with hyperbaric oxygen (HBO_2) therapy. Jane's improvement was significant after just one treatment. She went from lethargic and no response to touch to nursing well and responding age-appropriately.
2. Paramedics were called to an office building when employees became sick. Painters next door were using a gas-powered machine. Sally was the worst and was sent for treatment. Upon arrival, we learned of four others treated and released. We called them in, and ALL had symptoms of CO poisoning. They were treated and improved significantly.

Results: Utah does not mandate that landlords install smoke detectors. During this legislation session, a bill was presented to change this. Bethany took Jane and testified to legislators that the law should change. The Taylors' story was presented during local news.

We also developed a program we presented to eight local fire departments. Paramedics are taught CO symptoms, possible long-term effects/neurological sequelae. We also have a flier for public distribution.

Summary/Conclusion: Education of first responders and the public on CO prevention and treatment is essential.

E 14

Surviving an active shooter event

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An active shooter event takes place every two to three weeks in the United Sates. The Federal Bureau of Investigation study from 2000 to 2016 shows there were 220 active shooter events that resulted in 1,486 casualties (661 people killed and 825 people wounded). Approximately 2.5% of these events occurred within the health care setting. On average, the event lasts 12 minutes, and one person is shot every 15 seconds; 39% percent of these incidents are over within five minutes, and 60% end prior to the arrival of law enforcement personnel.

Whether the shooter is a disgruntled employee, committing an act of domestic violence, or some type of terrorist, the apparent goal is to kill or injure as many people as possible in the shortest amount of time. As a 25-year veteran police officer with extensive training in responding to, and handling dynamic, rapidly evolving situations, my goal is to provide you with training that will enable you to survive an active shooter event.

Even though this topic is not directly related to hyperbaric medicine, surviving an active shooter event can be accomplished by having a plan in place and by exercising that plan. How do you train to survive an active shooter?

The natural reaction when faced with a life-threatening event is to be startled, express fear, anxiety, disbelief and even denial. Planning ahead and practicing that plan can mean the difference between life and death. Numerous organizations have various acronyms for how to respond to different events (RACE/PASS). Under stress, the easier the plan the easier it is to execute it. The plan I like the best is:

Run. Hide. Fight.
At the first indication, run away.
If you are unable to run, hide.
At the last resort FIGHT. Never give up.

E 15

Compartment syndrome of the forearm related to carbon monoxide intoxication

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Introduction: Carbon monoxide (CO) poisoning is one of the most common forms of intoxication around the world. One of the complications associated with CO exposure is direct toxicity to the skeletal muscles. Though compartment syndrome induced by CO intoxication is rare, it is a well-known complication. In this study, we present a case of CO poisoning concerning a patient who developed compartment syndrome in his forearm.

Case report: A 22-year-old man was found unconscious in a motel where a beehive briquette had burned. He was later diagnosed with rhabdomyolysis associated with CO poisoning. After he regained consciousness, he experienced difficulty in moving his left arm, with sensory impairment in the same arm. He was diagnosed with compartment syndrome, and an emergency fasciotomy was performed. One month later, electromyography was performed which revealed ulnar, radial and musculocutaneous nerve palsy in the left median.

Discussion: Carbon monoxide has 200 times more affinity to hemoglobin than oxygen, but hemoglobin cannot carry oxygen to the tissues when it is affected by CO poisoning. This causes hypoxia in the tissue, with adverse effects due to free carbon monoxide in the plasma [5]. As a result, carbon monoxide has a direct toxic effect on skeletal muscles. Compartment syndrome induced by CO intoxication is rare, but it is a well-known complication [2].

Conclusion: Side effects of CO poisoning can be prevalent, especially for those who are unconscious since they cannot express pain, numbness and motor weakness. It is important to not overlook compartment syndrome, to double-check whether there is swelling, change in skin color, or skin firmness in extremities, and to observe the patient closely.

END of UHMS ASM 2018 SESSION E