Safety Report

Essential Attributes of Effective Emergency Action Plans

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News from the Safety Committee

One good definition of an emergency action plan, or EAP, is "*a predetermined course of action intended to mitigate a potential emergency or damaging situation that might endanger or harm people, property or a facility's ability to function safely.*" In this article we will explore the underlying purpose and essential elements of an EAP for a hyperbaric chamber facility.

The needs of a hyperbaric treatment facility can be distilled into four primary areas:

INDIVIDUAL

The protection of staff, patients and the public – hyperbaric exposures and pressurized systems are not without risk.

FACILITY

The protection of facilities and assets – including the building, facility, chamber and support equipment.

RISK MANAGEMENT

The mitigation of liability risks – from staff and patient exposure, compromised treatments and public safety.

MISSION-CRITICAL

The ability to be able to provide essential services for HBO_2 patients or injured divers.

An effective plan requires a detailed assessment of the risks and potential situations that can occur and an understanding of what mitigating actions may be necessary.

Facilities can start with a vulnerability assessment to determine the probable hazards and then decide which of these are real and which are purely theoretical.

While the scope of your facility's services will dictate the need for a specific EAP, the following situations could apply to many hyperbaric facilities. These emergencies require rapid and well thought-through responses.

Chamber emergencies: system events:

- loss of primary air and/or oxygen supply
- loss of back-up air and/or oxygen supply
- contamination of air or oxygen
- rapid increase or decrease in chamber pressure
- fire inside or outside the chamber
- fire inside or outside the compressor or gas storage facilities
- loss of electrical power
- failure of any chamber systems (lighting, communications, etc.)
- activation of deluge system (either accidental or intentional)
- abandonment, trapped inside the chamber
- external threats (weather, unrest, criminal)

Facilities providing medical treatment may encounter medical situations applying to the patient or attendant, which could include:

- oxygen toxicity
- arrhythmias, cardiac arrest (and defibrillation)
- pneumothorax
- barotrauma (middle ears, sinuses, teeth, lungs, intestinal)
- emergency myringotomy
- arterial gas embolism
- respiratory distress or bronchospasm
- suspected hypoglycemia
- vomiting
- loss of consciousness
- claustrophobia
- uncooperative or aggressive patient

Once the relevant hazards and their probability, frequency and severity are established, the likely risks and their potential impact can be determined.

The next step is to decide on how to respond immediately and without any doubt about what to do. Your facility safety director and/or medical director should be primarily involved in the development of these action steps.

The primary response should be the direct mitigation of the initial threat, which may include any or all of the following actions:

- Extinguish, contain, control and react appropriately.
- Communicate the situation to rapidly obtain assistance.
- Take care of any injured people.
- Emergency equipment needs to be readily available and functional.
- Follow the plan, react appropriately and not overthink predetermined actions.

Other elements that can be considered to mitigate emergencies and help defend the facility and personnel in the event of accusations, investigations or criminal hearings include:

- standard operating procedures – these help with prevention and at the very least, early warning in an emergency situation;
- EAP checklists– these provide structured reactions, reduce thinking and aid training;
- incident forms and reporting documents– these offer learning opportunities and help reduce legal consequences;
- training – this provides knowledge and awareness, and aids in prevention; and
- realistic drills – these ensure the ability to react correctly without panic and are the cornerstone of prevention, preparedness and competence.

Emergency action plans are useless if not practiced. During each chamber safety assessment performed by the Divers Alert Network, which include some 130 facilities around the globe to date, this has been found to be the most important and most poorly managed of all the risks facing a hyperbaric treatment facility.

It is through practicing these regularly that a facility can:

- Determine their effectiveness – i.e., do they achieve the required result?
- Iron out any problems – ensure that all steps are able to be performed; consider alternate plans if plan A does not work, and then review and adjust these plans as needed.
- Perform under pressure – making mistakes while colleagues are watching is better than missing an essential step during a real emergency; it is important to understand that this is a team effort.
- Build confidence and competence – knowing that it can work and exactly what to do in what will be a very stressful situation.
- Skills diminish with time so an appropriate drill frequency should be established and records kept of each one.

Realistic drills ensure the ability to react correctly without panic and are the cornerstone of prevention, preparedness and competence. Emergency action plans are useless if not practiced.

Drills must be taken seriously, every time.

Facilities often ask for examples of EAPs. The problem with this is that every facility is different: Staff are different, the equipment and the building are different and the availability of emergency services varies greatly, especially in more "remote" areas.

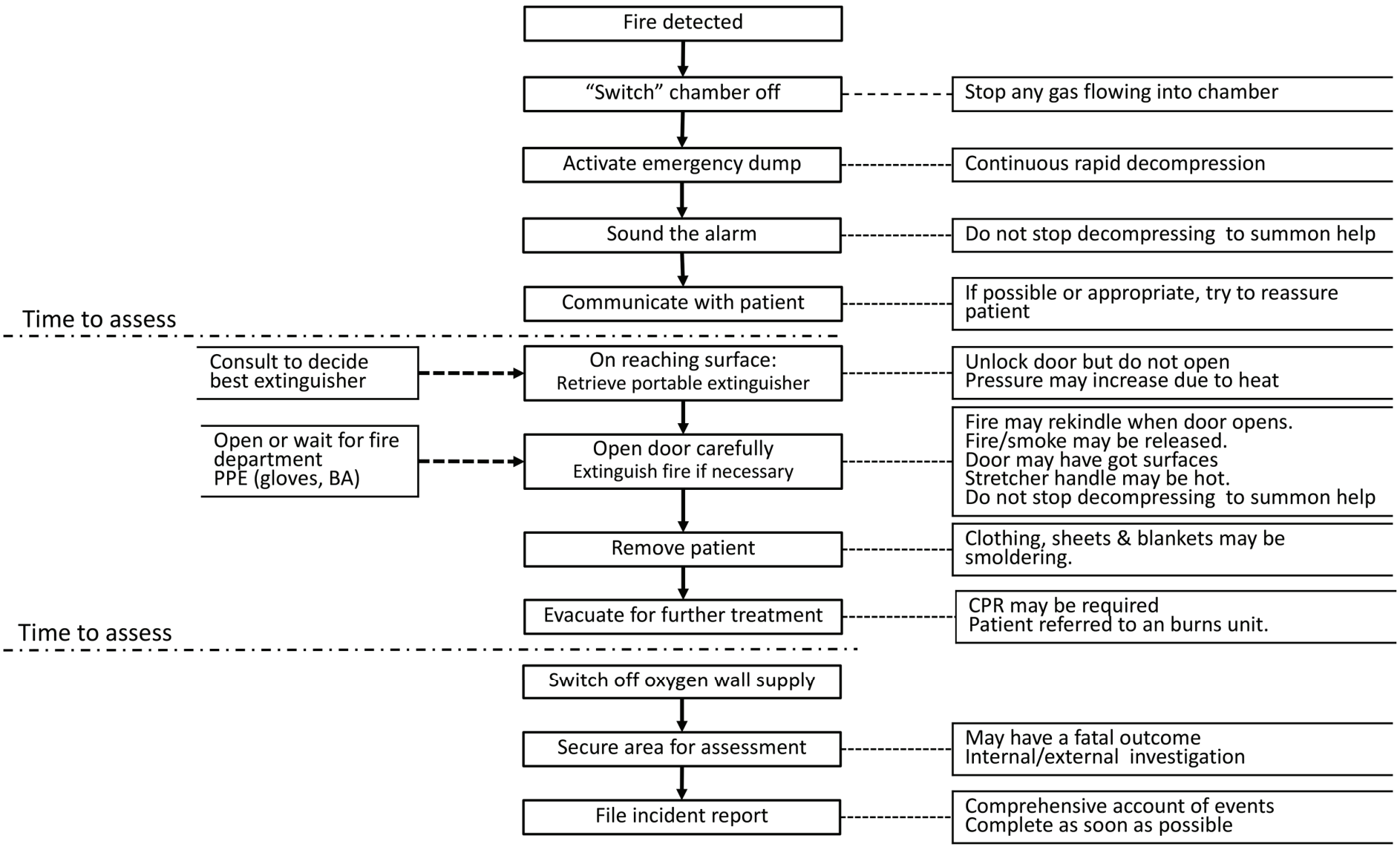
Medical emergencies are less of a concern, as medicine is a very well-developed series of practices. One can provide some guidance as to the important elements of medical emergencies but remember that skills have to be refreshed regularly.

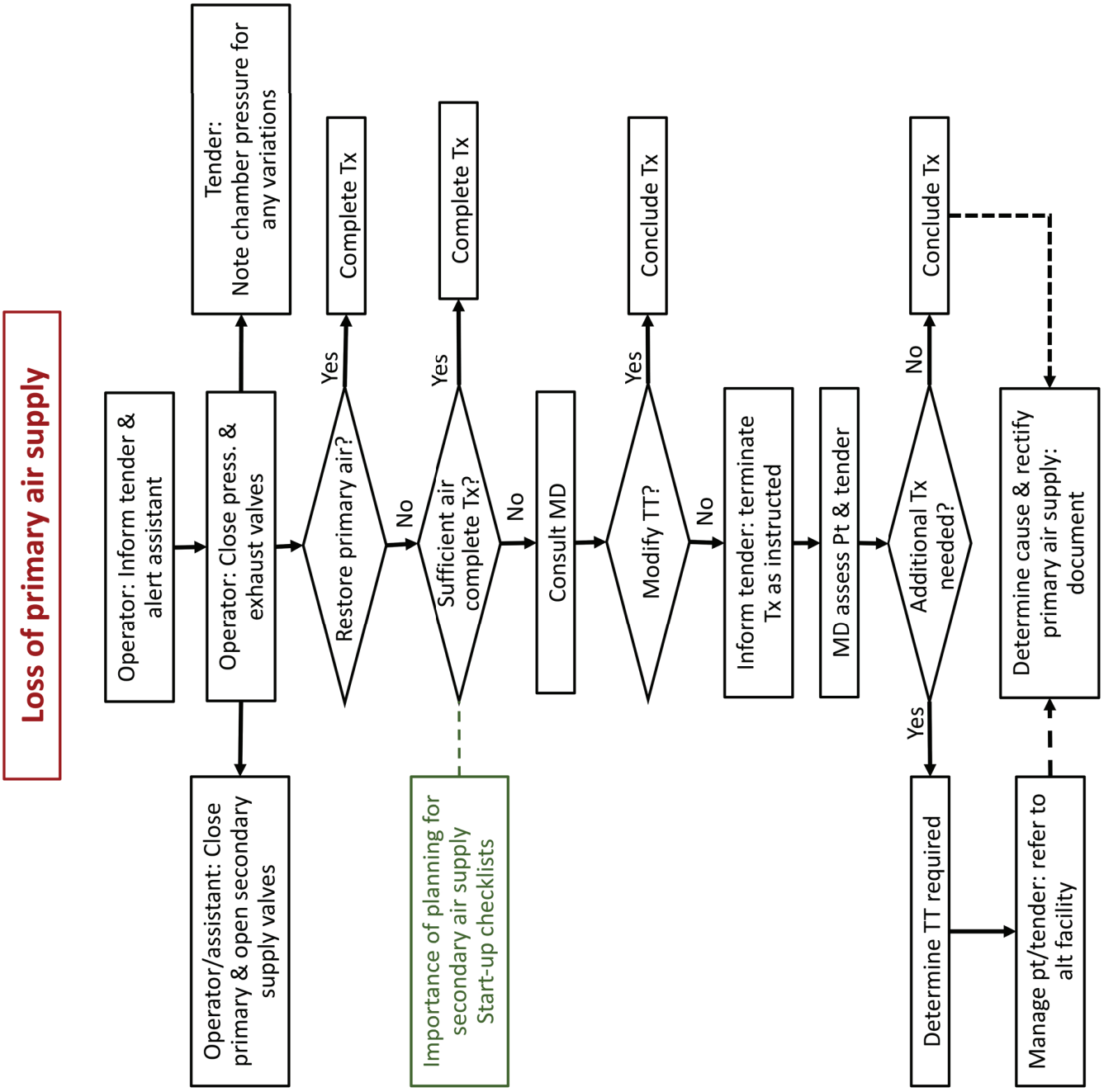
Operational or system emergencies require very system-specific plans. The one dreaded the most, and validated through history, is fire inside the chamber. The one more likely, and critical in the event of a seriously injured diver who cannot simply have their treatment terminated, is loss of air supply to the chamber.

A sample version for fire inside a monoplace chamber – possibly the one situation we pay closest attention to in ensuring no flammable fuels or ignition sources are ever allowed into the chamber – is illustrated in the accompanying chart. Note the possible action steps that are not commonly considered: The EAP does not stop once the chamber reaches the surface.

A sample version for a multiplace chamber is provided. This is for review and for adjustment to fit a facility's actual air supply systems, common points of failure and available equipment. While there might well be two independent, non-power-dependent air supply systems, there is often only one final connection between these systems and the chamber. If the main pressurization valve seizes or fails, both air supply systems will be lost simultaneously. Plan for this!

Fire inside monoplace chamber




Loss of primary air supply
Operator: Inform tender & alert assistant
Operator: Close press. & exhaust valves
Tender: Note chamber pressure for any variations
Operator/assistant: Close primary & open secondary supply valves
Restore primary air?
Yes
Complete Tx
No
Sufficient air complete Tx?
Yes
Complete Tx
No
Importance of planning for secondary air supply Start-up checklists
Consult MD
Modify TT?
Yes
Conclude Tx
No
Inform tender: terminate Tx as instructed
MD assess Pt & tender
Additional Tx needed?
No
Conclude Tx
Yes
Determine TT required
Manage pt/tender: refer to alt facility
Determine cause & rectify primary air supply: document