

Added Value Of Hyperbaric Oxygen Therapy To General Hospitals Strategic Overview And Technical Secrets

BY

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Appendix A: Conditions treated with Hyperbaric Oxygen

Carrying Hyperbaric To Everywhere

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Hyperbaric oxygen therapy (HBO) is a well-established form of treatment in which a patient breathes 100% oxygen at higher than normal atmospheric pressure. Hyperbaric oxygen therapy is given in special therapeutic chambers, which were earlier used primarily to treat illnesses of deep sea divers. The pressure in this treatment chamber is increased to higher than normal atmospheric pressure and the patient then breathes oxygen at this higher pressure

In the sixties of the 20th century HBO went out of practice because of its use without adequate scientific validation. Over the last two decades, animal studies, clinical trials and well-validated clinical experience has proved efficacy of HBO in many indications and there is recently a renewed interest in this field all over the world. With continuing growth all over the world Hyperbaric Medicine has found a distinct role in the modern era of evidence-based medicine.

Treatment can be carried out in either a monoplace or multiplace chamber. The former accommodates a single patient; the entire chamber is pressurized with near 100% oxygen, and the patient breathes the ambient chamber oxygen directly (figure 1). The latter holds two or more people (patients, observers, and/or support personnel); the chamber is pressurized with compressed air while the patients breathe near 100% oxygen via masks, head hoods, or endotracheal tubes (figure 2).



figure 1



figure 2

Internationally Approved Accredited Indications fort HBOT

By 1967, The Undersea and Hyperbaric Medical Society (UHMS) was formed, and is currently responsible for publishing the indications for HBOT.

According to the UHMS definition and the determination of The Centers for Medicare and Medicaid Services (CMS) and other third party carriers, the following indications are approved uses of hyperbaric oxygen therapy as defined by the Hyperbaric Oxygen Therapy Committee (table 1):

1. *Air or Gas Embolism*
2. *Carbon Monoxide Poisoning*
Carbon Monoxide Poisoning Complicated By Cyanide Poisoning
3. *Clostridial Myositis and Myonecrosis (Gas Gangrene)*
4. *Crush Injury, Compartment Syndrome and Other Acute Traumatic Ischemias*
5. *Decompression Sickness*
6. *Arterial Insufficiencies:*
Enhancement of Healing In Selected Problem Wounds
Central Retinal Artery Occlusion
7. *Severe Anemia*
8. *Intracranial Abscess*
9. *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*

Table 1 Condition Accepted By UHMS 2013

The European Committee for Hyperbaric Medicine (ECHM) and Consensus Conferences organized by it aims to reach an agreement on how Hyperbaric Medicine should be delivered with regard to its different aspects: indications, organizational aspects, education and training of personneletc.

The second ECHM Consensus Conference was held in 2004 giving the current working recommendations (table 2) which will be updated by the end of this year (December 2014) and it uses a 3 grade scale according to the strength of each recommendation has been evaluated.

Type I= HBOT Is Strongly Recommended

1. CO poisoning
2. Crush syndrome
3. Prevention of osteoradionecrosis after dental extraction
4. Osteoradionecrosis (mandible)
5. Soft tissue radionecrosis (cystitis)
6. Decompression accident
7. Gas embolism
8. Anaerobic or mixed bacterial anaerobic infections

Type II= HBOT Is Recommended As A Good Adjuvant Treatment

1. Diabetic foot lesion
2. Compromised skin graft and musculocutaneous flap
3. Osteoradionecrosis (other bones)
4. Radio-induced proctitis / enteritis
5. Radio-induced lesions of soft tissues
6. Surgery and implant in irradiated tissue (preventive action)
7. Sudden deafness
8. Ischemic ulcer
9. Refractory chronic osteomyelitis
10. Neuroblastoma Stage IV

Type III= HBOT Is A Good Optional Recommendation

1. Post anoxic encephalopathy
2. Larynx radionecrosis
3. Radio-induced CNS lesion
4. Post-vascular procedure reperfusion syndrome
5. Limb replantation
6. Burns >20 % of surface area and 2nd degree
7. Acute ischemic ophthalmological disorders
8. Selected non healing wounds secondary to inflammatory processes

Table 2- Condition Accepted By ECHM 2004

The Medical Care Law considers that general hospitals are the best type of hospitals, which is set up to deal with many kinds of disease and injury, and normally has an emergency department to deal with immediate and urgent threats to health. A general hospital typically is the major health care facility in its region, with large numbers of beds for intensive care and long-term care; and specialized facilities for surgery,.....etc.

Depending on its technical availability, the location, and the available medical services, the Hyperbaric Centre can be a hospital based unit, or an open standing alone Centre.

A hospital based Hyperbaric unit must guarantee its assistance 24 hours a day, and must be able to offer adequate treatment for all kinds of diseases, including those requiring critical care inside the Chamber.

As general hospitals deal with many kinds of diseases and injuries, either in emergency or elective states on both outpatient and inpatient basis ranging from intensive care department to rehabilitation units, so addition of hyperbaric oxygen services to its scope of services carries a lot of advantages and the added value of these units to general hospitals could be discussed on the following three aspects:

1- Added Medical Value:

- The unique diversity of the spectrum of indications of hyperbaric oxygen therapy and the wise understanding of its clinical applications lead to a great development in the treatment programs in a lot of hospital departments.
- In Egypt and after our 15 years cumulative experience in hyperbaric field we can conclude that HBO services could be considered a good added treatment modality to the following three programs which could receive patients from a large number of hospital departments leading to improvement in their final outcome and decrease in their morbidity and mortality rates (Table 3).

<i>Treatment program</i>	<i>Advanced wound care program</i>	<i>Advanced rehabilitation program</i>	<i>Intensive care program</i>
Referring Hospital Department	General surgery	Neurosurgery	Intensive care units
	Orthopedic surgery	Neurology	Emergency unit
	Vascular surgery	Orthopedic surgery	Trauma center
	Plastic surgery	Physical medicine	
	Diabetic foot care units	Sport medicine	

Table 3 Treatment programs and Hospital departments

- Needless to say that those critically ill patients will receive their sessions:-
 - As early as possible.
 - As adequate as needed (2or3 times/day as required)
 - Without the undue risk of transportation to another facility having HBOT
 - With double supervision of hyperbaric specialist and intensivist in severe cases

2- Added Scientific Value:

- Hyperbaric oxygen therapy is considered investigational in the treatment of any condition not listed in recommendations of UHMS and ECHM.
- UHMS and ECHM continuously update recommendations for research projects
- Implementation of HBOT inside General Hospitals will allow a lot of research work on clinical basic scales especially randomized controlled trials which could be an exceptional pilot piece of work all-over the world (*see appendix A*).

3- Added financial value:

- Comprehensive Hyperbaric Oxygen therapy program coupled with an advanced wound care, rehabilitation, and intensive care programs represents a significant incremental revenue opportunity.
- A comprehensive visibility study identifying the opportunity, writing the business plan based on the need of the individual hospital, will lead to a successful and profitable hyperbaric oxygen therapy program.
- Some hospitals faced with a decreasing inpatient population. One solution to this dilemma is to have an increasing number of therapeutic modalities which attracts an increasing number of patients and once patients attend a hospital for one purpose, they commonly use the facilities for other (profitable) activities.
- There is another informational advantage to the hospital as the installation of a new HBO chamber is usually recognized in the media with glowing, shiny image especially if this unit is implemented in an area lacking this service.

Finally we have to answer this question

How to implement a successful hyperbaric unit in a general hospital??

This can be easily achieved successfully by following these steps very carefully:

- ✓ Evaluate market conditions and identify hyperbaric medicine programs to optimize your business success
- ✓ Create a working financial model that includes profit forecast and ROI estimates, operating budget, cash flow and patient projections based on local market demographics
- ✓ Identify the best business model that fits your institution.
- ✓ Provide facility location and design criteria to optimize facility operations
- ✓ Determine the best technical specifications of the suitable hyperbaric chamber for your hospital
- ✓ Provide a list of necessary equipment, supplies and build out costs
- ✓ Proper selection of a medical director, program director, HBO technicians and other support staffing
- ✓ Get an access to the updated hyperbaric treatment policy and procedures
- ✓ Provide access to various training programs for physicians, nurses and technicians on hyperbaric chamber operation and continuous technical evaluation for their performance
- ✓ Get a competent scientifically based marketing plane to increase your patient referrals, and increase your market share

The role of Hyperbaric Oxygen Therapy is “evidence based” in certain well defined conditions and the Hyperbaric Chamber is now an integral part of hospital services. Doctors in all fields should be familiarized with recent evidence on this mode of therapy, so that their patients are not deprived of the gains of this modern treatment.

Appendix A

Conditions Treated With HBOT

	<i>Accredited Internationally Approved Indications</i>	<i>Accepted Investigational Indications (With Good Provisional Results)</i>
<i>Emergency Conditions</i>	<ul style="list-style-type: none"> • Air embolism* • Decompression sickness* • Burns* (Thermal Burns) • Carbon Monoxide poisoning* • Central Retinal Artery Occlusion* • Cyanide poisoning* • Exceptional blood loss Anemia* • Gas Gangrene* 	<ul style="list-style-type: none"> • Blast injury • Crisis of Sickle Cell Anemia • Hydrogen Sulfide poisoning • Ileus • Near Drowning • Near Hanging • Severed limbs • Smoke inhalation
<i>Neurological Conditions</i>	<ul style="list-style-type: none"> • Idiopathic Sudden Sensorineural Hearing Loss* • Radiation encephalitis, myelitis 	<ul style="list-style-type: none"> • Stroke - acute and chronic residuals • Acute Traumatic Brain Injury • Post Concussive Syndrome • Hypoxic Encephalopathy - suffocation, drowning, strangulation <ul style="list-style-type: none"> ○ Cognitive Brain dysfunction following Bypass Surgery and Angioplasty ○ Post-Cardiac Arrest, near Hanging, near Choking, Lightning Strikes, etc. • Cranial Nerve Syndromes <ul style="list-style-type: none"> ○ Trigeminal Neuralgia ○ Bell's Palsy ○ Vestibular disorders - Vertigo, Tinnitus, Meniere's syndrome ○ Acoustic trauma • Diabetic Peripheral Neuropathy • Autism • Cerebral Palsy (CP) • Spinal Cord contusion <ul style="list-style-type: none"> ○ Physiological transection ○ Partial motor or sensory loss

Conditions Treated With HBOT

	<i>Accredited Internationally Approved Indications</i>	<i>Accepted investigational indications (with good provisional results)</i>
<i>Orthopedic Conditions</i>	<ul style="list-style-type: none"> • Acute and Chronic Osteomyelitis* - bone infection • Acute Necrotizing Fasciitis* - flesh-eating bacteria • Clostridial Myonecrosis* - Gas Gangrene • Crush injuries* - vascular compromise • Necrotizing soft tissue infections* 	<ul style="list-style-type: none"> • Aseptic Necrosis of bones • Bone Grafting • Delayed wound healing • Edema under cast • Fracture healing and delayed union • Severed limbs and digits • Compartment Syndrome • Sports injuries • Stump infections following amputation • Tendon and ligament injuries post-surgical repair
<i>Miscellaneous Conditions</i>	<ul style="list-style-type: none"> • Diabetic foot Ulcers* • Intracranial Abscesses* • Compromised Skin Flaps and Grafts* • Osteoradionecrosis* - post radiation damage • Radiation Cystitis and Enteritis* • Suturing of severed crushed limbs* 	<ul style="list-style-type: none"> • Buerger's disease • Crohn's Disease • Fibromyalgia • Frostbite • Gangrene - wet and dry, atherosclerosis, more common in diabetes • Lepromatous Leprosy • Migraine & cluster headache • Peripheral Vascular Ulcer* <ul style="list-style-type: none"> ○ Arterial - atherosclerosis ○ Decubitus - bed sores ○ Neuropathy related - diabetes ○ Venous - deep vein thrombosis complication • Plastic Surgery - speeds healing with less scarring • Pseudo membranous Colitis • Refractory Mycoses* - fungal infections • Retinal Vein Thrombosis • Rheumatoid Arthritis - acute • Scleroderma • Slow healing wounds • Ulcerative Colitis

N.B. * Means accepted insurable indication