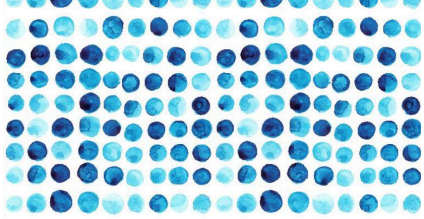


Hyperbaric Oxygen Therapy: Understanding the Science and Exploring the Benefits

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Laura Smith OHT, LPN



Introductions

- 4 **Chelsea Johnson** – Director of CentraCare Wound Centers
 - 4 **Laura Smith** – Certified Hyperbaric Technologist, LPN - St. Cloud Wound Center
- A little about us...
- 4 Wound centers in St. Cloud, Monticello and Willmar
 - o Outreach programs in Sauk Centre and Paynesville
 - 4 Two monoplace chambers in both the St. Cloud and Monticello wound centers



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Objectives

- 4 Identify and explain the core principles of hyperbaric oxygen therapy
- 4 Provide attendees with a clear understanding of hyperbaric oxygen therapy indications
- 4 Understand benefits of hyperbaric oxygen therapy
- 4 Understand how hyperbaric oxygen therapy can support patient healing both pre and post surgically
- 4 Demonstrate understanding of safety protocols and potential risks associated with hyperbaric oxygen therapy

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What is Hyperbaric Oxygen Therapy (HBOT)?

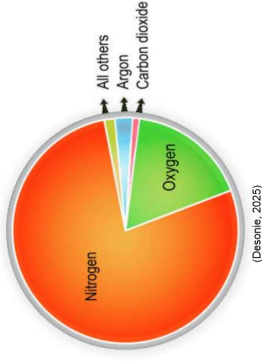
- 4 Breathing in 100% oxygen in a pressurized space
 - Monoplace chambers – small chamber for one person
 - Multiplace chambers – large room with several people



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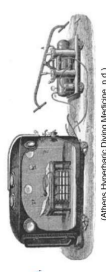
Air versus oxygen

- 4 Air composition
 - 78.1% Nitrogen
 - 20.9% Oxygen
 - 1% Other gasses such as carbon dioxide, argon, neon, helium, hydrogen, methane, nitrox oxide



Hyperbaric oxygen history

- 4 Early 1600's – Dr. Nathaniel Henshaw build the first air pressurized room to treat respiratory problems, called a "conclium"
- 4 Mid 1800's – First device developed to provide pressurized air to coal and caisson workers
- 4 1891 – First U.S. chamber was in Rochester, NY. Built to support cerebral spinal therapeutics
- 4 Early 1900's – British Royal Navy developed decompression tables for safe diving practices
- 4 1922 – Used acrylic chambers with oxygen to treat cancer patients for soft tissue damage from radiation therapy
- 4 1937 – U.S. Navy officially used hyperbaric oxygen with air to treat decompression sickness (aka the bends)
- 4 1969 – U.S. Navy used hyperbaric chambers with oxygen to study treatment of decompression sickness for divers
- 4 1974 – School of Aerospace Medicine used hyperbaric chambers to study decompression sickness and then converted it to a clinical chamber.
- 4 Mid 1970's to present – U.S. have been increasing hyperbaric chambers from 30 chamber to nearly 1,200 medicine program with multiple chambers.



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U.S. Navy Dive Tables

Table 3-2. No-Decompression Limits and Repetitive Group Designation for No-Decompression Air Dives.

Depth	Repetitive Group Designation														
	S	T	R	Q	P	O	N	M	L	K	J	I	H	G	Z
0	Unlimited	07	05	04	03	02	01	00	00	00	00	00	00	00	00
10	Unlimited	36	60	88	121	153	217	297	448	*					
20	Unlimited	26	43	61	82	103	135	185	255	350	480	*			
30	1002	20	33	47	62	79	107	145	198	268	364	488	602	710	
40	1002	16	26	37	50	65	85	112	150	198	268	364	488	602	710
50	1002	14	23	32	42	53	69	91	117	153	198	268	364	488	602
60	1002	12	20	27	36	44	55	69	89	115	145	185	235	305	375
70	1002	10	17	24	31	38	46	55	65	78	95	115	145	185	235
80	1002	9	15	21	28	34	41	49	58	69	81	95	115	145	185
90	1002	8	14	19	25	30	37	43	50	58	67	77	88	98	108
100	1002	7	13	18	23	28	33	39	45	52	59	67	75	83	91
110	1002	6	12	16	21	25	29	34	39	44	50	56	62	68	74
120	1002	5	11	15	19	23	26	30	34	38	42	46	50	54	58
130	1002	4	10	14	17	20	23	26	29	32	35	38	41	44	47
140	1002	3	9	13	16	19	21	24	26	28	30	32	34	36	38
150	1002	3	8	11	14	17	20	22	24	26	28	30	32	34	36
160	1002	2	8	11	14	17	20	22	24	26	28	30	32	34	36
170	1002	2	7	10	13	15	18	20	22	24	26	28	30	32	34
180	1002	2	7	10	13	15	18	20	22	24	26	28	30	32	34
190	1002	2	6	9	12	14	16	18	20	22	24	26	28	30	32
200	1002	2	6	9	12	14	16	18	20	22	24	26	28	30	32
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270	1002	2	6	9	12	14	16	18	20	22	24	26	28	30	32
280	1002	2	6	9	12	14	16	18	20	22	24	26	28	30	32
290	1002	2	6	9	12	14	16	18	20	22	24	26	28	30	32
300	1002	2	6	9	12	14	16	18	20	22	24	26	28	30	32
310	1002	2	6	9	12	14	16	18	20	22	24	26	28	30	32
320	1002	2	6	9	12	14	16	18	20	22	24	26	28	30	32
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990	1002	2	6	9	12	14	16	18	20	22	24	26	28	30	32
1000	1002	2	6	9	12	14	16	18	20	22	24	26	28	30	32

(U.S. Navy Diving

Contraindications

- 4 The following must be assessed further prior to diving:
 - Heart and lung diagnosis (ex: severe aortic stenosis and spontaneous pneumothorax)
 - Brain and spine stimulators
 - Implanted devices
 - Certain chemotherapy agents
 - Retinal detachment
- 4 Most people can dive; there are very few absolute contraindications



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Potential risks to treatment



Barotrauma – Middle ear, sinus, lung, GI, and tooth



Oxygen toxicity – increases risk for seizures



Hypoglycemia – increases risk for seizures

(Undersea and Hyperbaric Medical Society, 2020; U.S. Food and Drug Administration, 2021)

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Fire risk



(Arana, 2025)

- 4 Things we do to mitigate the risk of a fire:
 - Follow all chamber manufacturer guidelines for cleaning protocols and operational use
 - Strict protocols for what can and cannot go into the chamber
 - Grounding
 - No alcohol-based products allowed in the HBO suite
 - Yearly fire drills to ensure staff competency

(National Fire Protection Agency, 2021)

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HBO in the perioperative and OR Setting

- **Diagnosis:**
 - Soft Tissue Radiation Necrosis
 - Osteoradionecrosis
 - Refractory osteomyelitis
 - Diabetic foot wounds/amputation
 - Compromised grafts and flaps
 - Crush injury
 - Compartment syndrome
 - Acute thermal burn injury
 - Necrotizing soft tissue infections
 - Gas gangrene
- **Referral sources:**
 - Urology
 - GI
 - Oral surgery
 - ENT
 - Plastic surgery
 - Orthopedics
 - Podiatry
 - Vascular



(Shutterstock, n.d.)

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Patient Experience and Education



What to expect before, during and after treatments



Patients are in clinic for approximately 2 hours, daily (M-F) for 30-60 treatments



Go and no-go list



Vitals obtained and physician assessment prior to each treatment



Teach how to clear ears to reduce risk of barotrauma



Discuss concerns regarding claustrophobia

Multidisciplinary Collaboration

- 4 Collaboration between surgeons, nurses and wound care specialists
- 4 Team approach to advocate for HBO therapy which includes an awareness of FDA approved indications
- 4 A referral for HBO should be placed, and the HBO team can review if patient is a candidate or not. You don't need to be the expert!
 - How to refer a patient in Epic: AMB CONSULT HYPERBARIC MEDICINE to SCH WOUND CARE or MONT WOUND CARE



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Emerging Research and Innovations

- 4 Currently being studied for potential FDA approval in the future:
 - TBI/stroke
 - PTSD
 - Post-concussion Syndrome
 - Neurological disorders (Fibromyalgia)
 - Psychological disorders (Depression)



(Shutterstock, 2020)

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Key Takeaways

- 4 FDA approved indications
- 4 How hyperbaric oxygen works within the body
- 4 Collaboration between the specialties both pre and post op to support optimal wound healing
- 4 What patients can expect from hyperbaric oxygen therapy
- 4 How to refer a patient for hyperbaric oxygen therapy



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