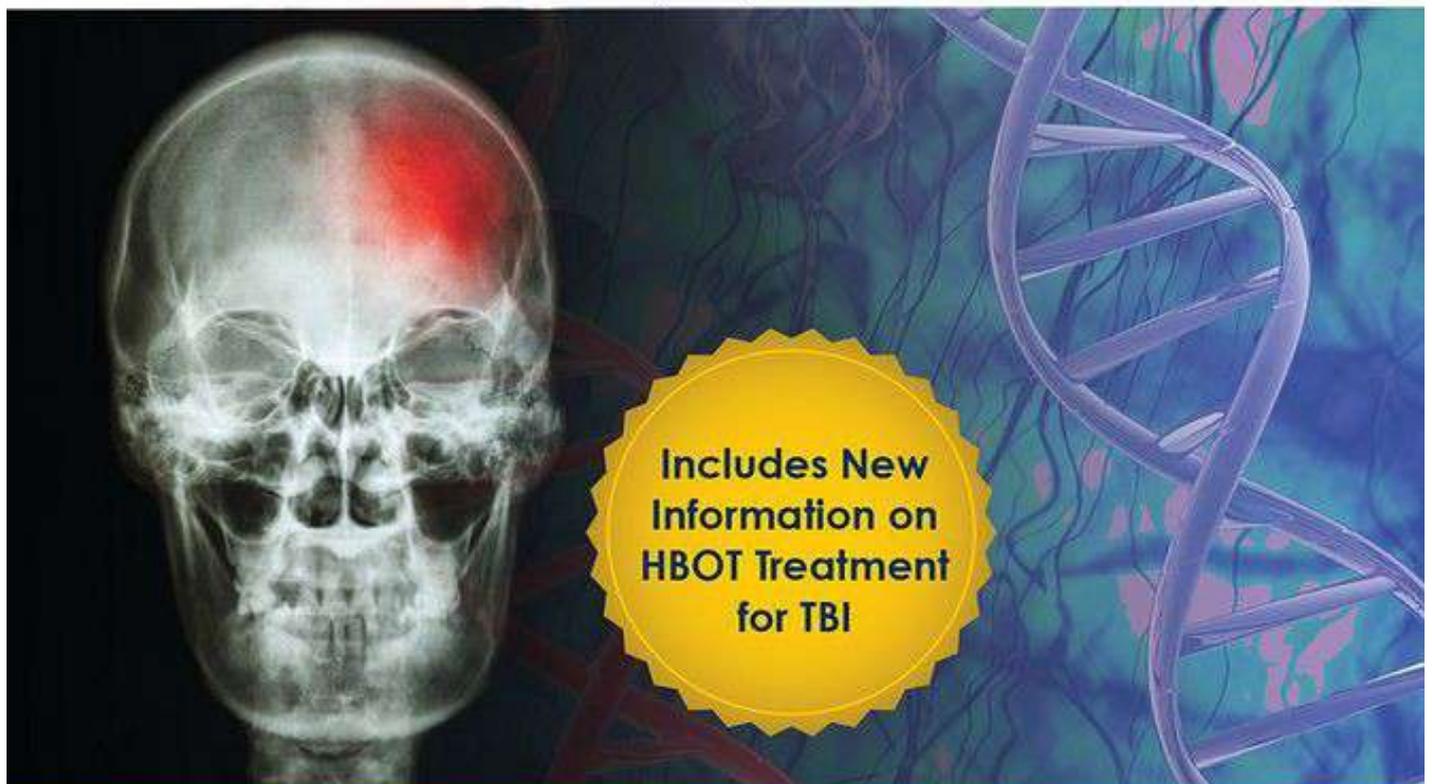


THE OXYGEN REVOLUTION

THIRD EDITION

HYPERBARIC OXYGEN THERAPY:

Breakthrough Gene Therapy for
Traumatic Brain Injury & Other Disorders



Includes New
Information on
HBOT Treatment
for TBI

PAUL G. HARCH, M.D., AND VIRGINIA MCCULLOUGH

Foreword by William A. Duncan, Ph.D.

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INTRODUCTION

Why is someone with a doctorate in political science and economics writing an introduction to a book about hyperbaric medicine, and specifically, one that includes using hyperbarics to treat brain injuries? In fact, this book explains that, contrary to popular belief, treating brain injury can be as routine as breathing, watching TV, and being able to fly in an airplane. This medical treatment, hyperbaric oxygen treatment (HBOT), dramatically changed my life, the lives of my brother and my mother, along with other members of my family. The changes have been positive and permanent. Over the 15 years I've been involved with HBOT (and part of what I consider a true movement within medicine), I have seen hyperbaric medicine change the lives of thousands of individuals. Taking it one step further, seeing this treatment in action, I now believe we were bioengineered to use oxygen to heal and live.

For 10 years I had the privilege of serving the American people as one of just 34 congressional staff with direct oversight of the appropriated budget for the nation's healthcare infrastructure, including the National Institutes of Health (NIH), the Centers for Disease Control (CDC), the Agency for Healthcare Research and Quality (AHRQ), Medicare, the Food and Drug Administration (FDA), and so forth. In addition, I had considerable input into the welfare infrastructure, prisons, and education policy, and oversaw the budgets of over 80 federal agencies. In the course of my work, I learned of hyperbaric oxygen therapy, an effective treatment for brain injuries (insults), which had been in use since 1937. At the time I learned about HBOT, it was already approved for three kinds of brain injury and three kinds of non-healing wounds.

Nearly 80 years of world-wide research existed that confirmed what I witnessed in a number of people. Despite this record of effectiveness, HBOT was either not being used at all, or woefully underused. Further, research conducted at the Department of Defense (DoD) and the Veterans Administration (VA) was looking at diagnostics, not treatment. Across the board, government agencies charged with healthcare had not moved beyond the myth that no treatment existed, or could exist to heal the brain. Hanging on to this stubborn belief prevented even looking at treatments that had the potential to work. The myth really prevented medical professionals—clinicians, researchers, and administrators alike—from adopting rational prevention and treatment strategies at the public policy level.

Sadly, I also discovered that at each critical point in the history of hyperbaric medicine, the decision to not recommend HBOT was never about its effectiveness or the science supporting it. It was always some other consideration. However, at the public policy level, some of us working with HBOT and advocating for it set out to correct that problem, through the appropriations process. Dr. Harch and I gave DoD Medicine, the VA, the CDC, and the NIH the complete chronic brain injury protocol in 2001 that Drs. Harch, Neubauer, Van Meter, and Gottlieb had developed over the previous 23 years. (Acute protocols were already known.) Had the treatment been used starting at the time, we could have prevented the tragedy of over 1 million improperly treated young war veterans in our society (and countless millions of civilians). From the point of view of self-interest, the treatment would likely have saved billions in VA disability claims and medical benefits. HBOT found success in other areas.

For example, using Dr. Harch's research and protocol, HBOT was approved for Medicare reimbursement for diabetic foot wound healing. The International Hyperbaric Medical Foundation (IHMF) created the National Brain Injury Rescue & Rehabilitation Project (NBIRRP) and as a result, hundreds of veterans and civilians have received HBOT. Government researchers received millions in research dollars and Dr. Harch, through my efforts with ex-Secretary of the Army, Martin Hoffmann, received \$ 1.2 million to conduct his present TBI study. But, not all the news is good. Suicide rates among veterans continue to rise, and have now reached 22 per day. On day-to-day practical terms, think of the billions in lost manpower from untreated injuries, and all because some in medicine refuse to recommend the treatment for chronic brain injuries because they have failed to conduct the so-called "definitive" study. In the end, the inability to do the necessary work

to make this treatment an accepted healing tool has cheated both patients and tax payers. It's often said that watching legislation be written and passed is akin to watching sausage being made. And so it is. Starting in 2008, the International Hyperbaric Medical Association (IHMA, sister organization to the IHMF)-endorsed bill, the TBI Treatment Act, passed in the U.S. House of Representatives, only to have the VA and others in military medicine block it in the Senate. Unfortunately, it became clear that the VA did not want HBOT to be paid for or become the standard through which their other therapies for TBI could be compared to. As a result, veterans were unable to go outside the VA system for reimbursable treatment.

After this failure at the federal level, the states have begun to rebel, since their budgets are being destroyed by untreated brain injury, especially in veterans. As a result, in 2013, Oklahoma led the way when the legislature passed the Oklahoma Veteran Recovery Plan. (The Oklahoma bill is discussed in this book.) It eventually passed in spite of efforts to prevent its passage. Under the Veterans Bureau Act of 1921, the state will be able to recover its costs of treating veterans with hyperbaric and other effective therapies for brain injury, PTSD, Agent Orange dementia, and other brain insults caused by federal government military service. Ten states are prepared to follow Oklahoma's example. This is tangible progress, and has occurred despite efforts to block it. Finally, in 2014, I created Patriot Clinics, Inc., in Oklahoma, in order to start providing free treatment for our war veterans, my fellow service members (I served in the Army for eight years), who were being abandoned and harmed by the managed care system that focuses on treating symptoms and not the cause of the symptoms.

We also treat others who need hyperbaric oxygen therapy, especially for those whose lives have been shattered by brain injury. The Patriot Clinics have done 10,000 hyperbaric treatments in the past 21 months for nearly 300 patients, starting with a two-person multiplace chamber and growing to five treatment berths, and now adding another three at our new location. We expect to treat over 100 per day at our Oklahoma City facility, and eventually will have equipment to treat 300 per day. We have also combined other synergistic therapies with hyperbaric oxygen. This is just the beginning. We have demonstrated to many state officials that our system should be adopted nationwide. We are partnered with many private clinics across Oklahoma who are prepared to join in getting veterans treated through this state partnership.

Clinics all across the nation are poised to join in the effort to deploy effective treatment for brain injury. At the International Hyperbaric Medical Foundation, we have launched a major nationwide charity effort to raise money to enable patients to be treated as close to their homes as possible. We are raising money for every qualified clinic willing to treat these men, women, and children. (For more information about this charity, check our resource list in the back of this book. You'll find our website address and I urge you to explore the information on our site. On a personal note, I urge every reader to act, and join our movement.) Making this treatment routine, from acute treatment at ERs or urgent care centers, to treatment for chronic conditions, will cut mandatory and entitlement spending by many billions per year. It will restore lives, restore families, restore productivity, and reduce substance abuse, crime, and suicide.

As we sit, 15 years into the 21st century, we are poised for an effective care revolution. Hyperbaric medicine shows the pathway to the kind of effective care I'm talking about. Its routine adoption is essential in order to achieve the kind of health care we want for our loved ones and for society. By the time you finish this book, you'll understand the wide range of diseases that can be effectively treated with HBOT. One million men and women have battle casualties from our current military conflicts; but we can't forget victims of car accidents, those with sports injuries, and those injured in crimes, such as battered and abused women and children. Plus, we can address a range of work-related industrial injuries and those sustained by police officers and fire fighters. In other words, serious brain injuries treatable with HBOT can occur in countless situations we encounter in everyday life. Put simply, current and future generations are depending on us to succeed. This book will show you why I feel so strongly about the possibilities of HBOT. With the publication of this new edition, I hope many more individuals will come to know the true miracle that a little

oxygen can create in the lives of billions around the world who suffer from a range of diseases and disabilities. For those readers who themselves suffer, I assure you that there are few experiences in life as wonderful as feeling your brain switch on. For me, it all started with Dr. Harch restoring my health and the health of several people close to me. The impact it has had on us is profound and life-changing.

William A. Duncan, BA, MBA, PhD, HMT President, Patriot Clinics, Inc. President, International Hyperbaric Medical Association Vice President (Development), International Hyperbaric Medical Foundation Oklahoma City, Oklahoma 2015

AUTHOR'S PREFACE

JUST FOR A MINUTE, IMAGINE THAT I'M TELLING YOU a story about being locked in a stifling hot, sealed room, empty but for one chair. I explain that I had been in the room for hours, and the only window, though large, was painted shut. Every few minutes I tried to open that window, but it just wouldn't budge. Finally, I tell you that I'd given up and accepted my doom. "If someone hadn't rescued me," I say, "I'm certain I would have died for lack of oxygen." You've been listening politely while I've told my story, but you're puzzled. Surely, a piece of information is missing. Finally, you scratch your head and ask the question that's been on your mind from the beginning: "Dr. Harch, why didn't you just pick up the chair, break the window, and let the air in?" I slap my forehead with the heel of my hand. "Wow," I say, "why didn't I think of that?"

The first edition of this book was about breaking the window. With this new edition, we have broken the "big picture" window. In the 351 years since the advent of hyperbaric therapy in England (in 1664), no one has understood exactly what we are doing when we deliver a hyperbaric treatment. We know now. As I explain below (and have published previously in a medical journal), the ground-breaking news is that we are performing gene therapy. (You can read this important article online, as well as view the lecture I gave on this subject at HBOT 2014 in Albuquerque in August 2014 at the 9th International Symposium on Hyperbaric Medicine: Roadmap for the Future, at HBOT.com.) Hyperbaric oxygen therapy (HBOT) is the "stupidly simple" answer to many health problems. Some of these conditions result from injury, some from disease. They can occur at any time of life, including during the birth process itself.

I originally wrote this book to help you understand the theory behind HBOT and to help you seek the treatment for yourself or your family should the need arise. My mission hasn't changed. In fact, it has become more urgent. A rapidly increasing amount of clinical use and research validates the contents of the first edition of this book, so much so that I can't overemphasize your need to learn more about this overlooked and misunderstood treatment. It is a life- and quality-of-life saving treatment that you can't ignore—and one that you should demand when the situation calls for its use. Patients routinely ask me why their doctors either know little about the treatment or have a dismissive attitude about it. At one time, I would have dismissed HBOT out of hand, too. I recall the day I first heard about hyperbaric oxygen therapy. I was in my third year of medical school at the Johns Hopkins University School of Medicine, and HBOT was mentioned in passing.

Having never heard of it before, I asked my supervising resident doctor what it was. He didn't know a great deal about it himself, so he repeated what someone else had told him: "It's a type of oxygen therapy, it's performed in chambers, and it's worthless, unscientific, been thoroughly disproven, is charlatanism, snake oil sales, and fraud." This incident occurred in 1978, and I quickly filed his answer in the same place I put all the other so-called cures or remedies that had been labeled snake oil. I also took his dismissive words as gospel, considering the source, the setting, and the school. In other words, I let someone else, in this case a doctor, do my thinking for me. It might come as a surprise to some readers that therapies such as acupuncture, chiropractic, and biofeedback were once relegated to the snake oil file of medicine, too. In fact, some doctors still have little faith in these therapies. For a variety of reasons, most of which are rooted in ignorance and the "boom-bust" cycles of HBOT, the treatment has long had a cloud hanging over

it. With the exception of a few applications, the treatment remains on the fringes of medicine—part of alternative or complementary medicine, much of which is subject to great suspicion. We'll explain the reasons for this in great detail as we go on. Much has changed. I believe HBOT is now poised for acceptance into mainstream medicine. In fact, this is already occurring, for a number of reasons. Reports about the usefulness of the treatment for a variety of diseases have made their way into the media. For example, many heard about HBOT for the first time when the sole survivor of the Sago mine accident was transported from West Virginia to Pittsburgh, Pennsylvania, where a hyperbaric chamber was available. In addition, there has been a dramatic increase in the number of high-quality scientific studies on HBOT published in medical journals in the past 10 years. It seems that hyperbaric oxygen therapy has made its way into public awareness through popular culture as well.

As an example of the latter, the final episode of *Star Trek* features a scene in which a character was rushed to a hyperbaric chamber in an effort to save his life. A popular soap opera used a hyperbaric chamber as a “prop” in a hospital set, and even made it part of a story line. A few years before the *Oprah Winfrey Show* ended, frequent guest Dr. Mehmet Oz rolled out a hyperbaric chamber to demonstrate HBOT as one of the modern anti-aging tools. This trend will undoubtedly continue as HBOT enters the mainstream. In addition, information about HBOT has been available for many years in a variety of sources, and patients seeking treatment for themselves and their loved ones have done their own research. Some patient advocacy organizations (discussed later in this book) have spread the word about the value of HBOT for specific conditions.

Unfortunately, however, a few badly designed studies have convinced some doctors that the treatment is worthless. Imagine hearing about a new, revolutionary pain medication. Some doctors show mild interest, but others are very skeptical because they believe they have all the necessary knowledge about controlling pain. Still, they agree to conduct a study of this new drug, but they give half the recommended dose and the patients in the study aren't helped. That study is a big step on the road to a bad reputation for this new drug. In medicine, that kind of reputation is difficult to overcome. Let's say another group of scientists also decides to study the new pain relief drug, but they triple the dose and some patients in their study become ill—some even report internal bleeding. Now reports go out that the treatment is not only worthless, it's dangerous, too! Had a similar sequence of experimental under-dosing and overdosing been used at the outset of its application and development, aspirin would not be available to us today.

Very low doses of aspirin are ineffective for pain relief and very high doses frequently cause stomach bleeding. Were it not for its long and established history, one of the most common medications on our planet could have ended up in the snake oil file— not because it's ineffective, but because it was misused. In the wrong hands, any treatment can become worthless. The modern-day example of this misuse, mis-dosing, misunderstanding, and misperception of treatment lies in the unfortunate studies put out on the use of hyperbaric oxygen therapy in the treatment of persistent post-concussion syndrome of U.S. war veterans. As a result of widespread public and congressional pressure, as well as the precedent I set with treatment of U.S. veterans in 2008, a series of poorly-designed studies were conducted by the U.S. Department of Defense and individuals with very little experience treating chronic brain injury with HBOT.

The result has been a confusing mixture of data. However, when examined, the data showcases the effectiveness of the doses that I, and others like me, have used to treat brain injury. Other data show an ineffectiveness of some doses, which have never before been used to treat brain injury; still more data suggest the possible harm of yet another dose. The issue of dosing will become clear as you move through the information in this book; however, the result of this research is the unequivocal proof that HBOT is effective in the treatment of traumatic brain injury of all severities and injuries of any age and in any person. The evidence is now so compelling that every patient with a brain injury should seek this treatment as soon as possible after receiving a brain injury. Someday, medical history books are going to say that HBOT is an example of a treatment that

came into acceptance not because doctors introduced it to patients, but because patients demanded access to the treatment from their doctors. This is going to start with traumatic brain injury. In my experience, patients and the lay public in general do not have difficulty understanding the vast benefits of the judicious use of oxygen therapy in situations in which oxygen deprivation has resulted in injury. For patients, “breaking the window” usually makes perfect sense. Based on countless conversations with patients and their families, once these individuals understand the specific and unique way we use oxygen therapeutically, they embrace its possibilities. You will get the scientific foundation from this book, which will then help you seek HBOT on your own. I know for certain that once you absorb the information in this book, you will never let anyone, not even physicians, tell you that HBOT is without value.

This brings me to a final, critical point that I want you to burn into your memory. An unfortunate and damaging habit has permeated and dominated the medical profession for decades, and must now come to an end. Perhaps it is simply a specific example of a more ubiquitous human habit, but in the medical profession it has had devastating consequences and should no longer be tolerated. In a nutshell, the habit is: offering negative opinions, often in strident tones, without a factual basis for these statements. Others presume doctors have authority and knowledge of medical matters far beyond that of the lay public. And in some ways this is true— but in a commonsense way, it is not. Because doctors are exposed to vast amounts of medical information, this has led to the presumption that we possess vast knowledge— indeed we are expected to have knowledge about all matters in medicine.

So, when patients ask questions and seek opinions, doctors feel compelled to give answers. Many doctors find it difficult— nearly impossible— to answer a medical question by saying, “I don’t know.” However, as you likely know from your own experience, titles do not confer knowledge— they presume knowledge. Just because someone has the title of “Doctor,” or is Chairman of the Department at XYZ University School of Medicine, does not mean that that person has specific knowledge about everything in medicine. This is especially true when it comes to a subject about which so few doctors have ever received instruction, like hyperbaric medicine. Like all doctors or experts in any field, any doctor you consult should be required to demonstrate their supposed expertise; in fact, you should demand it. In the case of hyperbaric oxygen therapy, and especially hyperbaric oxygen therapy for neurological conditions, many physicians almost compulsively give the answer that I was given in medical school.

The problem, aside from it being totally false, is that this answer violates the Hippocratic Oath. Traditionally, physicians have tried to abide by the Hippocratic Oath (or at least some components of it). The single component of the oath that should be viewed as inviolate and to which all doctors must adhere is the promise to “do no harm.” And the first step in doing no harm is “saying no harm;” if physicians don’t have a sound factual basis on which to offer an opinion, they should say, “I don’t know,” or else defer to someone more knowledgeable. The consequences of a negative, ignorant opinion are devastating beyond comprehension. Patients will take that opinion as authoritative, which will in turn deny them, their family members, loved ones, or friends the possibility of life or an improved quality of life. And that is totally unacceptable. I admonish you not to accept a physician’s negative opinion about this therapy.

As you will see, very few people in medicine are as informed about hyperbaric oxygen therapy as you will become after reading this book. Case in point: Dr. Sarah Parks is a seasoned cancer surgeon, now retired from Tulane University School of Medicine. She was one of my hyperbaric medicine doctors-in-training, and in 2011 she performed a survey of 120 U.S. medical schools and found that 75 percent of them had nothing in their curriculum about hyperbaric medicine. This means that current doctors-in-training (along with those from my generation) have never received formal instruction in the principles and practice of hyperbaric medicine. This, more than any other fact, should provide all the proof necessary to understand the need to do your own research. Ask questions, seek answers, read this book, and come to your own conclusions. Life-Changing Discoveries It’s interesting that medical therapies are often advanced by famous individuals who

are afflicted with certain diseases. For example, Mary Tyler Moore has been a tireless public advocate for juvenile diabetes. Both Michael J. Fox and Mohammed Ali have testified before Congress about Parkinson's disease. Former Attorney General, Janet Reno, has also gone public and discussed her experience with Parkinson's disease. Ronald Reagan's family has raised awareness about Alzheimer's disease, and while they were alive and able, Dana and Christopher Reeve educated others about spinal cord injuries. It's certainly true that "celebrated" cases stimulate both advances in medical application and additional research. This happens in part because the public begins to advocate for it, too. From time to time in this book, you will read about "non-famous" citizens who have joined together to help educate each about HBOT and find the treatment they need.

On a personal level, it's been interesting to come across a curious feature of hyperbaric medicine. The field has always been filled with physicians who have tried HBOT on patients and saw such dramatic— often phenomenal— results that the physician's career changed just as dramatically. I know this is true, because it happened to me. In the late 1980s and early 1990s, I used HBOT with divers who had resistant, untreatable, or delayed cases of brain decompression illness, and the results so impressed me that it altered the course of my career and by extension, the course of my life. I saw patients improve to such an extent that it couldn't be explained in any way other than to attribute it to a single cause, the HBOT they had received. Or, put another way, the effectiveness of the therapy was proved by treating individual cases, and no other treatment had brought about these results. In the late 1980s and early 1990s, when I began to work with HBOT for neurological conditions, I saw the positive— even amazing— results firsthand.

I saw divers whose lives had been completely shattered by chronic brain decompression illness recover and begin to live normally again. My early work challenged previous assumptions in diving medicine and it led to an expansion of the potential applications for HBOT, especially to brain injured children. What I had been told was impossible happened before my eyes. (You will read brief case histories of a few of these and other patients throughout this book.)

IMPORTANT NOTE: A critical feature of this book is the series of Internet links to videos, articles, newspaper pieces, patient testimonials, and so forth, all of which powerfully illustrate the healing power of hyperbaric oxygen therapy. These have been included to augment the information in this book and lead you to resources that will expand your knowledge of this important treatment. To view these news articles and patient testimonials, go to www.hbot.com and click on the Oxygen Revolution tab on the home page.

This will take you to all of the videos, articles and other resources mentioned in this book. I've arranged this book to be as informative and helpful as possible, with the goal of making you aware of all your treatment options for a wide range of diseases and conditions. The medical profession claims that randomized, controlled experimental clinical studies are the foundation of medical care. However, the medical decisions made by every doctor for a patient are often dictated by a previous patient's response to a given treatment. Similarly, a patient's choice of treatment is often guided by the results a friend or family member experienced with a given treatment. We know these as individual testimonials, and when doctors publish them they're called case reports.

Throughout this book, you will be encouraged to read articles and view videos documenting patient responses, before and after HBOT treatment. In all but one of these news articles (the Major Ben Richards' story is the exception), the piece was prompted by the patient, television or radio station, or some institution because of the life-changing effect HBOT had on the patient. In these cases, the patient or family was so moved by the response of the person to HBOT that they went to the media to announce the result. One day, HBOT will be a universally recognizable term, with its uses widely known. However, since the numerous applications of the treatment are still relatively new and some are not yet accepted within conventional medical circles, I have arranged the information in this book to first provide a foundation on which the rest of the information builds.

In the following chapters, you'll find essential explanations of HBOT, the body's inflammatory

reaction, and a discussion of the range of conditions for which HBOT is currently used. It's been my experience that when individuals comprehend the mechanisms of the treatment, they gain confidence in its usefulness. Any medical treatment can sound theoretical or abstract, but the provided case studies should help illustrate the way in which this treatment has changed lives. I've arranged the information in such a way as to help you find the disease or condition of primary interest to you, and I've also addressed a range of medical emergencies, from cardiac arrest to serious accidents, such as near drowning and carbon monoxide poisoning.

You will also find individual chapters that discuss the application of HBOT for a wide variety of diseases, including: traumatic brain injury, seizures, birth injuries, strokes or cerebrovascular accident (CVA), autism, a range of neurological diseases, from multiple sclerosis (MS) to Alzheimer's disease, diabetes and cardiac disease, joint replacement and arthritis, alcohol and drug detoxification, cancer, and a variety of other illnesses, from environmental disease to AIDS to chronic fatigue syndrome.

Unfortunately, for some conditions, such as Alzheimer's disease and MS, few good treatments are available and currently, most believe that the best they can hope for is to control symptoms and perhaps retard the progression of the disease. Although HBOT is not yet "approved" (which means "typically reimbursed") for use with these common neurological diseases, a considerable body of research (including my own) demonstrates that it is a safe and effective treatment option. For this reason, I believe that patients have a right to explore HBOT. (I also address the issue of "off-label" use of HBOT so that you will understand the context in which the term is used.) This book offers my vision for the future of HBOT, including expanded research applications and its potential use in anti-aging medicine. I assume that you're curious about the practical issues surrounding treatment, so later in this book you will find information about the experience of HBOT treatments, including descriptions and photos of hyperbaric chambers.

Throughout the book, you will see SPECT brain scans that show the physiological changes brought about by HBOT. (In addition, you can see brain scans and patient video exams at www.hbot.com). HBOT stands poised to take its rightful place in the world of healthcare, but in order to complete its journey to acceptance and entrance into mainstream medicine we will need a coalition of educated patients, physicians and researchers, and public and private policy makers. I hope we can use recently gathered research information to strengthen the current dialogue about this treatment, and my hope is based in part on the contribution of educated citizens like you. Finally, a glossary that defines medical terms and presents the "language of HBOT" appears at the back of the book, along with a list of resources you may find helpful as you do your own research. Without question, my work with brain-injured children has been incredibly rewarding, which is why I dedicated this book to the mothers whose determination to find help for their children has touched me so deeply. It isn't easy to put into words, but I have been privileged to witness the painful beauty of these mothers, who often do so much more than simply seek treatment for their individual children.

These women are driven by the most basic biological and human instinct in that they each seek to improve the ability of their child to be self-sufficient. They know that once they are gone, their children's fates are likely to be determined in a harsh economic environment where only the strongest survive. The mothers whose children I treat have also faced the heartbreaking reality that their children will never be normal. Given the framework of reduced expectations they set their sights on simply improving the quality of life for their injured children. These women have formed support and exchange networks and have even raised their own research funds. Over the last decade, I've treated children diagnosed with cerebral palsy, autism, certain learning disabilities, and genetic disorders. In addition, I know of a child diagnosed with fetal alcohol syndrome (FAS) who has also benefited from HBOT.

One driving force behind this book is to educate parents, and parents-to-be, about HBOT. Far too many remain unaware that the treatment may benefit their children, even long after the event that

caused the injury. For the last 26 years or more, the driving force behind my professional life has been treating patients and conducting HBOT research. Some of my patients had been seen by multiple specialists, and were told that “nothing more could be done.” They were also given a list of what I have come to refer to as “never-ers:” your child will never ever smile, drink from a cup, sit up, interact with you, walk, talk, know you, and so forth. These are predictions that can never be accurately made in the very early stages of an injury or disease, and one after another, many of these children exceed these predictions before they receive HBOT, only to go even farther after HBOT. I’ve also lectured widely to my colleagues about the many applications of HBOT. In addition to my rewarding clinical practice, I’ve been especially gratified by speaking to audiences comprised of lay men and women, most of whom don’t allow outdated information to prevent them from absorbing new ideas.

This book is a natural outgrowth of my work with patients, patient advocacy organizations, the lay public, and my colleagues. It’s a far cry from my original intentions of practicing surgery. Mine has been a non-linear, unpredictable path. What I first thought was just happenstance, I now know was a calling. Countless patients come into Room #3 at my clinic, imbued with the drive from a higher power. I finally realize that I have been driven by the same. If not for God’s hand in my life, I would have died in a life-changing auto accident 35 years ago, at the start of my surgical training. Unknowingly, it launched me onto my current path, one that has defined my purpose in life. I exist to advance this life-saving and quality-of-life-saving therapy, plain and simple. I believe that it’s no exaggeration to say that HBOT represents a healthcare revolution in the making. By the time you finish reading this book and you understand the vast number of conditions for which HBOT is a valuable treatment, I think you will agree. Then, together, we will “break the window.” Paul G. Harch, M. D 2015

PART I WHAT IS HYPERBARIC OXYGEN THERAPY?

By the time you finish the chapters included in Part I, you will have a working understanding of hyperbaric oxygen therapy, including an overview of its history. It often surprises newcomers to this information that innovative pioneers have been looking at ways to harness the power of oxygen since the late nineteenth century! However, HBOT pioneers exploring the possibilities of the therapy in the twentieth century worked at significant disadvantage. While they could see that the treatment had positive effects on a variety of diseases, they were unable to explain why HBOT worked; furthermore, they were unable to demonstrate physiological changes in the brain. Today, however, we understand why HBOT is effective and modern technology allows us to demonstrate our results using Single Photon Emission Computed Tomography (SPECT), the sophisticated imaging technology described in this book. Chapter 2 is of particular importance, because an understanding of the body’s inflammatory reaction is the key to comprehending the vast number of applications for HBOT. Primarily, you’ll see why HBOT promotes wound healing throughout the body, from traumatic brain injuries to diabetic foot wounds. With this foundation of practical knowledge (plus the more recent information on HBOT’s effects on the genes of inflammation), you will find the explanations of HBOT for individual conditions quite easy to understand. You’ll also likely begin to ask why HBOT isn’t applied more liberally to the vast majority of conditions dominated by inflammation!.

CHAPTER 1 WHY YOU SHOULD BE AWARE OF HYPERBARIC OXYGEN THERAPY

Oxygen makes life possible. as young children, we all learned this when our first science lessons taught us about oxygen, the “element in air and water needed by every living thing.” In our Western outlook, oxygen is more than just “one element among many.” It is what we view as our “life force.” This fundamental understanding of oxygen is one of the reasons that patients and other lay people I encounter on a daily basis have no trouble with the concept of hyperbaric oxygen therapy (HBOT). They nod their heads, showing their willingness to expand their knowledge of this essential “life force “element. Since these individuals are open to the concept of using oxygen therapeutically, then generally, all they need to convince them of its value is more

information. That's the purpose of this book. In order to consider HBOT for yourself or a family member, you need to educate yourself. You may even need to educate your doctor! Harnessing the Power of Oxygen and Pressure! In the most basic terms, we used to believe that HBOT consisted solely of the use of elevated pressures of oxygen to treat many conditions in which tissues have been damaged by varying degrees of oxygen deprivation. This sounds simple enough, but it's not true. Harnessing the power of oxygen is a more complex proposition, and the oxygen has a partner in HBOT. This oxygen-only understanding of hyperbaric oxygen therapy was naïve and partly responsible for the medical profession's long-standing misunderstanding of this therapy. It also points to another curiosity of science and medicine, which is that basic scientific research sometimes doesn't translate to clinical understanding and implementation.

The revelation of these two facts came to me in a most unusual way, and as you learn more about HBOT, the full meaning of this experience will become clear to you. In the summer of 2008, Bill Duncan and I were preparing a congressional appropriation request for \$ 10 million dollars to perform a research study using HBOT to treat our brain-injured veterans. In conjunction with this request, I submitted a question to the FDA to learn if I needed permission from them to perform the study. I was requesting permission to treat U.S war veterans from Iraq and Afghanistan with 1.5 atmospheres of hyperbaric oxygen (a dose of oxygen over seven times what we are breathing in room air, at a pressure 1.5 times our atmospheric pressure at sea level). Four years later, the answer I received from the FDA stunned me: I was told that it was simply unacceptable for me to study a single dose of HBOT. They viewed HBOT as a drug with two components: increased pressure and increased oxygen.

They said I needed to study multiple doses of pressure, multiple doses of oxygen, and multiple doses of both (to conform to scientific rigor). When I read their response, I immediately thought of all of the lay and commercial drug industry criticisms of the FDA. In my nearly 34 years of exposure to hyperbaric oxygen therapy since medical school, I had never heard of anyone mention that the effects of hyperbaric oxygen therapy were due to anything other than the exposure to increased pressure of oxygen. No physician had ever talked about the pressure itself as an independent factor. At the same time, the FDA had no idea if increased pressure had any biological effect. One can think of increased pressure of a gas more easily when thinking of the equivalent increased pressure of water, or hydrostatic pressure. (To clarify, hydrostatic pressure is the weight of the fluid above any point in the depth of the fluid; in other words, the pressure exerted by the fluid above.

So, the pressure of all of the seawater above you if you are 33 feet under water is 14.7 pounds/ square inch of water. In the case of a gas it is the weight of the gas above whatever measuring point you choose. For example, our atmospheric pressure at sea level is also 14.7 pounds/ square inch. That is the weight of all of the gas in our atmosphere from sea level up to outer space.) The FDA professionals were looking at HBOT with fresh eyes, and said that since you are putting people in a chamber where you turn up the pressure and give them increased oxygen, there are naturally two active components: increased pressure and increased oxygen.