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Uncertainty and the Individual Receiving Hyperbaric Oxygen Therapy

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Dedication

This thesis is dedicated to my parents Brian and Anne O'Byrne, my sisters Mary Eileen and Chris, and to my boyfriend Zachary Day who never cease to have faith in me as a student, but more importantly, as a person. Their unconditional love and support constantly reminds me that I can do anything I set mind to, including this project. I am very blessed to have parents who are always telling me how proud they are of me, to have two protective sisters whom I consider to be my best friends and who are always there for me, and to have a boyfriend who is always offering to help me in any way he can so that I can succeed. Thank you all for your unceasing love and dedication.

Abstract

The purpose of this thesis was to examine whether individuals receiving hyperbaric oxygen therapy (HBOT) experienced any statistically significant differences in uncertainty before and after their first session and to explore their feelings regarding HBOT. Participants in this study included 10 prospective HBOT clients, without prior HBOT experience, between the ages of 25 and 53. There were six males, one female, and three who did not identify their gender. Participation was solicited through the use of researcher flyers which were distributed to eligible clients by nursing staff at a hyperbaric facility in the Northwestern United States. A mixed-methods design was used to analyze the participants' feelings regarding HBOT and uncertainty. Data was collected using a pretest and postest survey spanning one session of HBOT. The results of this study indicated there was not a statistically significant difference in uncertainty before and after the first session of HBOT with a p-value of 0.0755. Overall, participants generally reported positive interactions with staff. Only two subjects expressed discomfort during their session and one did not report on experience inside the chamber. The findings of this study indicate a need for knowledgeable and caring nurses who fully educate their clients before treatment begins and who provide comfort and assistance throughout treatment. More research regarding client feelings toward HBOT and uncertainty is needed.

Keywords: hyperbaric oxygen, uncertainty, Mishel

Chapter I

Background

The experience of uncertainty in illness can be perceived as a major psychological stressor, possibly affecting one's attitude toward illness or treatment (Neville, 2003). Neville's conclusion was supported by Eastwood, Doering, Roper, and Hays (2008) in their prospective, longitudinal study which examined high and low levels of anxiety in clients before angiography and which examined the "influence of uncertainty on health-related quality of life 1 year after angiography" (p. 232). One hundred individuals were enrolled but only 93 completed the one-year follow up. The researchers provided evidence that individuals with higher baseline uncertainty tended to be young females who were "more likely to have lower levels of perceived control, higher levels of anxiety, and higher levels of depression at 1 year" compared to those who had lower baseline uncertainty for clients receiving angiography (Eastwood et al., 2008, p. 237-238). The researchers' findings suggested that psychological assessment for any individual receiving angiography is necessary because the possibility of coronary artery disease alone, regardless of diagnosis or prognosis, is enough to affect one's health-related quality of life (Eastwood et al., 2008).

The uniqueness of the individual as well as personal beliefs and feelings may affect client response to treatment. Feelings of uncertainty in individuals, and in their health care providers (HCPs), may influence the quality of the health care decisions made by the individual (Politi & Street. 2011). Ambiguous information, or evidence, impacting possible health care decisions may cause HCPs to pause before discussing this uncertainty with ill individuals or individuals receiving treatment (Politi & Street, 2011).

However, Politi and Street (2011), assert that the discussion of ambiguous health information with the client by the HCP will help the client to manage doubt regarding the information provided and will also lead to better health care decisions. This communication facilitates active participation by the client who is able to express personal feelings, values, and beliefs while the HCP is given the opportunity to individualize care and discuss the client's health and treatment options (Politi & Street, 2011). This communication facilitates active participation of the individual and individualized care and may enhance the management of uncertainty. A decision individuals have to make is whether or not to receive treatment despite potential uncertainty regarding the prescribed procedure. One medical procedure that may cause feelings of uncertainty is hyperbaric oxygen therapy (HBOT), which requires the individual to sit in a small enclosed chamber while receiving oxygen at a pressure greater than sea level. While noninvasive, HBOT is time consuming and not without its risks. The purpose of this thesis was to examine whether individuals receiving HBOT experience statistically significant differences in uncertainty before and after their first treatment and to explore their feelings regarding HBOT.

Approved Uses for HBOT

In the United States, the Undersea and Hyperbaric Medical Society (UHMS) is responsible for determining the indications for use of legal oxygen chambers. The Food and Drug Administration (FDA) is responsible for regulating these chambers and for determining their safety and effectiveness for the approved uses (Hyperbariclink, 2011a). According to the UHMS (2011a), the Hyperbaric Oxygen Committee has approved HBOT for "air or gas embolism, carbon monoxide poisoning (with or without concurrent

cyanide poisoning), clostridial myositis and myonecrosis, crush injury (minor contusions to limb threatening damage), compartment syndrome and other acute traumatic ischemias, decompression sickness, central retinal artery occlusion, select problem wounds, severe anemia, intracranial abscess, necrotizing soft tissue infections, osteomyelitis (refractory), delayed radiation injury (soft tissue and bony necrosis), compromised grafts and flaps, and acute thermal burn injury" (para. 2). Idiopathic sudden sensorineural hearing loss was recently approved by the board of directors of the Undersea and Hyperbaric Medical Society in October 2011 (UHMS, 2011a).

Off-Label Use of HBOT

The use of HBOT for unapproved uses is referred to as "off-label" use. It is legal for a physician to prescribe HBOT for an off-label use if the chamber in use is FDA-approved; however, it is considered illegal to advertise or promote off-label use. It is important for the individual considering HBOT to be aware that the treatment may not be safe and/or effective if it is not being used for an approved condition (Hyperbariclink, 2011a). Some examples of experimental uses of HBOT include treatment for "arthritis, autism, bone grafts or fracture healing, cancer, cerebral palsy, closed head and/or spinal cord injury, Crohn's disease, frostbite, Lyme disease, seizure disorders, and tetanus" (Aetna, 2011, para. 2).

Uncertainty

For some individuals, sitting inside of a chamber for an extended period of time may cause anxiety and uncertainty, especially for those with claustrophobia. Other sources of uncertainty, according to Politi, Han, and Col (2007), include the following:

1) risk, or uncertainty about future outcomes; 2) ambiguity, or uncertainty about the strength or validity of evidence about risks; 3) uncertainty about the personal significance of particular risks (e.g. their severity, timing); 4) uncertainty arising from the complexity of risk information (e.g., the multiplicity of risks and benefits or the instability of risks and benefits over time); and 5) uncertainty resulting from ignorance (p. 682). Neville (2003) also maintained a possible connection between ambiguity, as well as unfamiliarity and unpredictability, to uncertainty. This may explain why some individuals in Chalmers, Mitchell, Rosenthal, and Elliott's (2007) qualitative study of seven individuals receiving HBOT reported feeling unsure of what to expect during HBOT despite being informed about the treatment and the possible side effects. Some of the participants also reported feeling apprehensive about HBOT because "there were no medical assurances for the patients that HBO therapy would be of benefit to them" (Chalmers et al., 2007, p. 1457). The researchers provided evidence indicating that the main causes for concern in these individuals were uncertainty about treatment and their own discomfort during treatment. There is little research regarding client emotional response to HBOT. According to Guo and Bai (2004), understanding client feelings about treatment can help direct nursing care and education so that individuals experience less discomfort and uncertainty about treatment (as cited in Chalmers et al., 2007).

Responding to client needs and concerns is an idea that can be easily applied to any area of nursing (Chalmers et al., 2007). Assessing and responding to clients' specific needs is key because "patients' values and preferences for medical care may also affect how they perceive and respond to uncertainty about health-related risks" (Politi, Han, & Col, 2007, p. 690). According to a concept analysis and refinement of the concept of

uncertainty by Penrod in 2001, uncertainty is further impacted by the individual's perception of past experiences and feelings about the future. The nurse may be able to lessen client concerns through the use of education and enhancement of positive client perception of health (Madar & Bartal, 2009).

For individuals considering or requiring HBOT but who are uncertain about the treatment, communication between the HCP and the individual is helpful. A research study conducted by Politi and Street (2011) indicated that communication between the HCP and the client promotes active participation and expression of feelings on the client's part and allows the HCP to provide individualized care. When lack of knowledge is the cause of uncertainty regarding treatment decisions and outcomes, educating the client may provide the individual with the opportunity to do more research about HBOT and to better understand the costs versus the benefits of treatment. In some cases, lack of knowledge may be a result of health illiteracy. In a literature review conducted by Davis, Williams, Marin, Parker, and Glass (2002), the researchers found that "patients with poor health literacy have a complex array of difficulties with written and oral communication that may limit their understanding of cancer screening and of the symptoms of cancer. . ." (p. 134). Therefore, there is a need for more research into how to effectively educate individuals with low health literacy in order to better communication and the health care decision making process (Davis et al., 2002).

A qualitative study by Madar and Bar-Tal (2009), involving 71 Israeli individuals receiving peritoneal dialysis supported this idea with evidence from their study that level of education "contributed statistically significantly to explaining uncertainty" (p. 1666). Their results indicated a negative relationship between level of education and uncertainty.

However, one limitation of their study was that this negative relationship does not prove causality and this information should, therefore, be interpreted with caution. Care providers may also impact the individual's uncertainty, either exacerbating or reducing these feelings, depending on the individual's trust and confidence in the care provider's authority. Physicians had a greater impact on reducing uncertainty for individuals in regards to thoughts about sickness and health while nurses had a greater impact on uncertainty related to daily symptoms and treatment (Madar & Bar-Tal, 2009). Therefore, a competent, knowledgeable, and trustworthy healthcare team may be valuable to the individual receiving treatment and may contribute to, or reduce, their uncertainty. The researchers' most valuable finding was that uncertainty was the most responsible variable related to stress. The researchers assert that nurses are in the best position to help reduce client uncertainty since they spend the most time with these individuals. Nurses can provide information, hope, and a positive perception of health for the client (Madar & Bar-Tal, 2009).

Uncertainty in Illness Theory

Uncertainty in Illness is a middle-range nursing theory developed by Merle Mishel. According to Mishel (1988), uncertainty is "defined as the inability to determine the meaning of illness related events" and is "the cognitive state created when the person cannot adequately structure or categorize an event because of lack of sufficient cues" (p. 225). It is a situation where an individual does not feel as if he or she has enough information to make an illness-related decision. There are a multitude of variables that can impact this uncertainty. Cognitive capacity is one of three variables that can affect an individual's perception of uncertainty in illness. The other two variables include stimuli

frame and structure providers. The stimuli frame consists of symptom pattern, event familiarity, and event congruence (Mishel, 1988). Within the stimuli frame, uncertainty can result from an irregular or variable symptom pattern, unfamiliarity with the illness process or treatment, and inconsistency between the expected outcome of illness or situation and the actual experience. Typically, in Western society, the "expectation in medicine, as in the broader society, is that specific actions will lead to desirable, obtainable outcomes" and Mishel further defines desirable outcomes to include certainty, control, and predictability (Mishel, 1990, p. 257). Uncertainty can be reduced when symptoms appear regularly, the situation is recognizable or relatable to the individual, and the actual experience meets one's expectations (Mishel, 1988). When all of these variables are positively resolved, individuals are more likely to feel a sense of control in their situation. It should be noted that consistent symptom pattern plays a role in the client's feeling of control because it allows a baseline for comparison for that individual (Mishel & Braden, 1988).

According to Mishel (1990), uncertainty is seen as "deficient and attempts are made to avoid it or to cast it as a temporary situation" (p. 257). Whether uncertainty is temporary or not, Mishel's theory was pushed even further to include the possibility of shifting one's appraisal of uncertainty over time and the development of a new outlook. Individuals may be able to develop a new sense of order in their lives by accepting uncertainty as "the natural rhythm of life" through probabilistic thinking (Mishel, 1990, p. 260). This belief is thought to increase trust. It can also be used by nurses to help clients adjust to illness or adjust to alternative methods for performing activities (Mishel, 1990).

The lack of cognitive capacity and structure can act on the stimuli frame resulting in uncertainty. Cognitive capacity "refers to information-processing abilities of the person" (Mishel, 1988, p. 225). Impairment of these abilities in the individual may result in a feeling of uncertainty with regards to illness or the situation surrounding the illness. Impaired cognitive capacity can result from information overload. There is a limit to how much information an individual can process at one point in time. According to Warburton (1979), if this limit is exceeded, it can cause the individual to misperceive or misinterpret the stimuli frame. Mandler (1979) asserted that distractions, such as pain or danger, may also disrupt one's cognitive capacity while the individual is processing information thereby affecting one's problem solving and possibly increasing uncertainty (as cited in Mishel, 1988). Structure providers, according to Mishel (1988), are "the resources available to assist the person in the interpretation of the stimuli frame" and include the individual's education level, their social support, and credible authority in their lives (p. 225). Mishel and Braden (1988) define credible authority as "the degree of trust and confidence patient has in health care providers" and assert that this authority has the power to reduce uncertainty in clients who trust their physician enough to assume his or her point of view (p. 99).

Uncertainty of illness may result from complex treatment, lack of information regarding diagnosis and/or severity of an illness, or the unpredictability of the course of an illness or its prognosis (Mishel, 1988). The uncertainty individuals experience can be viewed as dangerous, such as when one is concerned about the potential for detrimental effects or outcomes, or it can be viewed as an opportunity, when the client feels there is potential for positive results (Mishel, 1988). This theory further asserts that client

appraisal can be the result of inference or illusion. Inferences, which are based off of similar situations, may result in positive or negative appraisals of uncertainty, while illusion, a belief created by the client, typically results in positive appraisals (Mishel, 1990). Mishel believes this illusion is created by reshaping the ambiguous information with which clients are confronted (1988).

Mishel's Uncertainty in Illness theory has been tested by many researchers. Guadalupe (2010) applied this theory to the nursing care surrounding individuals diagnosed with meningioma. It has been used to develop a conceptual model of uncertainty experienced in children and adolescents receiving cancer treatment (Stewart, Mishel, Lynn, & Terhorst, 2010). Mishel's theory was applied in a study by Padilla, Mishel, and Grant (1992) to examine how various parts of the adaptation process, triggered by uncertainty in illness, impacted health related quality of life in women receiving treatment for recently diagnosed gynecological cancer. Bailey, Wallace, and Mishel (2007) used Mishel's Reconceptualized Uncertainty in Illness model in a qualitative study of 10 men who underwent watchful waiting for prostate cancer.

The focus of this chapter was to introduce the reader to research about client feelings of uncertainty regarding medical procedures and medical decision making as well as the approved and off label uses of HBOT. The Uncertainty in Illness theory developed by Merle Mishel was also presented as a model for exploring uncertainty and the individual receiving HBOT. The importance of communication between the HCP and the individual considering, or receiving, ambiguous treatment information was described. Communication between the client and the HCP is believed to provide an opportunity for individuals to express their perceptions and feelings and aid them in their medical

decision-making. It was also asserted that educating the client, when there is a lack of knowledge regarding treatment, might also improve one's analysis of the risks versus the benefits of treatment. HBOT was introduced into this discussion as a treatment that may cause hesitancy in individuals. Its potential uses, both on label and off label, were described. Studies and the Uncertainty in Illness theory were both used to relate actual and potential client feelings of uncertainty.

Chapter II

Review of Literature

This chapter provides an overview of research related to the development and risks of HBOT as well as the mechanisms by which HBOT is used as a healing therapy. The impact of HBOT on the individual is also explored including cost and insurance coverage, individual responses to treatment, and the side effects of treatment.

What is Hyperbaric Oxygen Therapy?

The hyperbaric oxygen chamber was first used for clinical purposes by Churchill-Davidson in 1955 (as cited in Kindwall & Whelan, 1999). In this particular case, it was intended to enhance the effects of radiation in cancer patients through the use of hyperbaric oxygen (Kindwall & Whelan, 1999). While hyperbaric oxygen was not used clinically until 1955, the idea of increasing the ambient pressure within a chamber for therapeutic use can be dated as far back as 1662. A British clergyman, Henshaw, built a recompression chamber with the hopes of treating acute diseases by increasing ambient pressure within the chamber (Kindwall &Whelan, 1999). While this use of ambient pressure was not successful in treating the individuals' physical conditions it did contribute to the idea of using increased pressure for treatment. In 1775 the molecular composition of oxygen was discovered by Joseph Priestley. Subsequently its toxic potential was uncovered in 1878 by Paul Bert (as cited in Kindwall & Whelan, 1999). Bert's findings were especially important to the oxygen toxicity studies being conducted by the United States Navy. With growing popularity and favorable studies, clinical chambers began to appear in the United States and, in 1976, an official hyperbaric committee was formed called the Committee on Hyperbaric Oxygenation. This

committee was part of the Undersea Medical Society which, in 1986, became known as the Undersea and Hyperbaric Medical Society.

HBOT aims to heal disease by increasing the amount of oxygen dissolved in plasma (Jagodzinkski, Weerasinghe, & Porter, 2010). This is done by delivering 100 percent oxygen to the individual at varying atmospheric pressures. One atmosphere (ATA) is pressure at sea level. Many treatments occur at a pressure of 2.0 to 3.0 ATA, depending on the particular treatment protocol (Daly, Faul, & Steinberg, 2010). HBOT may be delivered in a monochamber or a multiplace chamber. The monochamber treats only one individual at a time while delivering 100 percent oxygen to the whole chamber. The multiplace chamber may treat multiple people at one time and delivers 100 percent oxygen through masks, hoods, or endotracheal tubes (Hyperbariclink, 2011b). The HBOT treatment schedule is variable. It may require as few as three sessions for treatment or it may require approximately 25 to 30 sessions depending on the individual's health condition (Mayo Clinic, 2011).

By increasing the amount of dissolved oxygen in the blood, HBOT may heal various conditions through different mechanisms. Hyperoxygenation in combination with pressure greater than sea level increases the diffusion distance of oxygen as well as the amount of oxygen dissolved. This allows oxygen to reach underperfused tissue (Buettner & Wolkenhauer, 2007; Strauss, 2004). HBOT can also increase the rate at which fibroplasia, neovascularization, and epithelialization occur (Ladizinsky & Roe, 2010). HBOT can also aid in healing by enhancing antimicrobial activity, reducing intravascular or free gas volume, causing vasoconstriction, and preventing inappropriate activation of leukocytes which can cause reperfusion injury (Baromedical, 2012).

Absolute contraindications to HBOT include untreated pneumothorax, treatment with chemotherapy agents (whose effects may be increased by HBOT), and treatment with bleomycin (which may cause a lifelong susceptibility to oxygen toxicity) (Williams, 2010). Relative contraindications are conditions that are not completely contraindicated but that may require caution when being treated with HBOT (Kindwall & Whelan, 1999). These conditions include sinusitis, inability to equalize pressure within the middle ear, claustrophobia, history of pneumothorax, thoracic surgery, and chronic obstructive airways disease (COPD). Thoracic surgery and COPD may increase one's risk for burst lung and air trapping. According to the American Cancer Society (2011), HBOT should only be used in pregnant women for emergency situations such as carbon monoxide poisoning.

According to a fact sheet compiled by Schub and Cabrera (2012), fire risk is "the most common fatal complication" of HBOT (para. 14). This is due to the presence of highly combustible pure oxygen during treatment. Therefore, individuals receiving this therapy must strictly follow chamber protocol and safety precautions. For instance, materials that are potentially flammable or may cause ignition, such as devices with batteries, must be removed from the chamber before starting therapy (Mayo Clinic, 2011). Safety protocols also include removal of items that can hold static electricity or discharge sparks such as "synthetic rubber, plastic, foam polystyrene, and metal" (Bailey, Jackson, &White, 2004, p. 34). Items such as jewelry, dental appliances, contact lenses, and hearing aids should also be removed (Bailey et al., 2004). Individuals should not use any hair or wound care products containing petroleum in the chamber (Mayo Clinic, 2011). Clients are also asked to refrain from using deodorant, perfume, or makeup before

treatment in the chamber (Goldsmith & Wilcox, 2011). Alcohol-based products should also be removed. Individuals in the chamber must wear gowns made of 100 percent cotton or some kind of anti-static material (Bailey et al., 2004). According to Goldsmith and Wilcox (2011), a grounding wire must also be attached before treatment. Smoking is not permitted in the chamber area. Fire prevention efforts include following stated safety precautions, educating the individual receiving treatment, and careful monitoring of the chamber for potential risks (Wills-Long, Long, & Laybourne, 1989). It is important that individuals clarify with their health care provider what materials are and are not allowed within the chamber before receiving treatment (Mayo Clinic, 2011). Fire safety is an essential responsibility for the hyperbaric nurse (Wills-Long et al., 1989).

In HBOT, nurses are present to care for and monitor the individual receiving HBOT. These nurses are licensed RNs who have met the requirements for certification in hyperbaric nursing. In order to become certified, according to the National Board of Diving and Hyperbaric Medical Technology (NBDHMT) (2010), the RN has to meet the following requirements:

1. Registered nurse degree granted from an accredited school of nursing.
2. Current RN license in the state where you practice hyperbaric nursing.
3. A minimum of two years clinical experience in an in-hospital setting, or one year critical care experience.
4. Certification in Basic Life Support.
5. Completion of a NBDHMT approved 40-hour introductory hyperbaric medicine course.

6. Minimum of one-year active hyperbaric medicine experience within the last two years, which includes 480 hours performed after the applicant attends an NBDHMT approved 40-hour introductory course.
7. Letter of recommendation from your employer, including validation of hyperbaric experience (p.1).

Nurses interested in hyperbaric nursing are also required take a hyperbaric nursing certification exam to become certified (NBDHMT, 2010). The standards of practice for hyperbaric nursing are determined by the Baromedical Nurses Association (BNA) (NBDHMT, 2012).

The nursing responsibilities of the hyperbaric nurse include monitoring of the physical environment for hazards as well as client care and safety within the chamber. According to Wills-Long et al. (1989), clients are screened for any potential causes of complication such as COPD, untreated pneumothorax, or severe claustrophobia. Some individuals with claustrophobia may need to receive mild sedation during HBOT (Goldsmith & Wilcox, 2011). To provide safe care and minimize risks within the chamber, the hyperbaric nurse must understand the pressure vessels used during treatment (Wills-Long et al., 1989). The nurse is responsible for educating individuals on equalizing pressure within their ears for when the chamber is compressed and atmospheric changes occur. (Goldsmith & Wilcox, 2011). For individuals receiving intravenous treatment, special pressure-safe tubing can be used within the chamber (Bailey et al., 2004). Nurses are also responsible for assessing any petroleum dressings or medicinal patches that the client may have on his person (Goldsmith & Wilcox, 2011). Wills-Long et al. (1989) also included anxiety reduction, especially for those with

claustrophobia, as a component of client care and asserted that nurses should be able to recognize and to reduce anxiety in individuals receiving HBOT.

Indications for HBOT

HBOT promotes healing in a variety of conditions through the use of oxygen at increased atmospheric pressure. Diabetic chronic ulcers, carbon monoxide poisoning, and decompression sickness are three conditions commonly treated with HBOT. They are serious and may impact one's health significantly if left untreated. Therefore, prompt treatment is key to preventing death and to preventing a decline in one's quality of life resulting from complications of one of these conditions. Research related to these three health states is reviewed in the following sections of this thesis.

Diabetes and foot ulcers. Diabetes is of great concern in the United States today because it affects such a large percentage of the population, approximately 25.8 million individuals, and health care for this illness totaled an estimated 174 billion dollars in 2007. This included medical care costs, disability, and premature death in the United States (CDC, 2011b). There are many complications associated with diabetes including impaired sensation in the feet which affects approximately 30 percent of individuals over the age of 40 (CDC, 2011b). Another complication is peripheral neuropathy, loss of protective sensation, which can prevent wounds, or ulcers, from being discovered and place the individual at increased risk for infection and a chronic, non-healing wound (Daly et al., 2011). Diabetes is also the leading cause of lower limb amputations unrelated to trauma (CDC, 2011b).

Pain can significantly impact various domains of the individual's life. In 2011, Bradbury and Price conducted a qualitative study that examined the effect of specific

diabetic foot ulcer pain on quality of life in three diabetic foot ulcer clients. Information was gathered using semi-structured interviews. The researchers provided evidence for the presence of the following four themes: "Experience of Pain; Physical Effects of Pain; Coping, Support, and Social Impact; and Psychological Impact" (Bradbury & Price, 2011, p. 25). Despite the general belief that pain is not present in peripheral neuropathy, the researchers provided evidence that pain existed in all three individuals. One individual reported decreased mobility was the biggest impact on decreased quality of life (Bradbury & Price, 2011). All of the clients reported being incapable of performing activities of daily living without any assistance. Bradbury and Price (2011) suggested that this loss of independence results in "feelings of loss of control and loss of self, which can leave patients anxious, depressed, and vulnerable" (p. 34). Two individuals in this study also reported impaired sleep resulting from pain (Bradbury and Price, 2011).

Diabetic foot ulcers, while they may or may not cause pain for the individual, significantly impact the person psychosocially. In 2008, Akca and Cinar conducted a quantitative study using a purposeful sample of 200 participants who met the criteria for Type I or Type II diabetes mellitus for at least one year. They used the Psychosocial Adjustment to Illness Scale-Self Report (PAIS-SR) questionnaire to obtain their data. The validity and reliability of this tool was confirmed by Adaylar in 1995 (as cited in Akca & Cinar, 2008). The researchers found evidence to support the idea that clients with diabetes who did not have diabetic foot ulcers experienced less problems with "health care orientation, vocational environment, sexual relationships, social environment and psychological distress" (Akca & Cinar, 2008, p. 94). The results of this study cannot be generalized due to small sample size (Akca & Cinar, 2008). Goodridge, Trepman, Sloan,

Guse, Strain, McIntyre, and Embil (2006) conducted a quantitative study of a cross-sectional sample of 104 individuals over the age of 45 with diabetes-related foot ulcers (57 with unhealed ulcers and 47 with healed ulcers) in which individuals with unhealed ulcers felt more limited in "moderate activity, desired accomplishments, work or other activities, and social life" than those with healed ulcers (p. 276). These data were collected through a phone interview of both groups using the Medical Outcomes Survey Short Form 12 (SF-12) and through the Cardiff Wound Impact Scale for those with unhealed ulcers and was analyzed using database and statistical software (Goodridge et al., 2006). The researchers provided evidence that supported the idea that diabetes-related foot ulcers negatively impact one's quality of life (Goodridge et al, 2006). However, these results cannot be generalized due to the small sample size. The researchers also asserted that the location of the study at a "large urban tertiary care center may have preferentially selected a group of patients who may not be representative of the whole population" (Goodridge et al., 2006, p. 279). They also believed that the ethnicity of their sample may not have represented the population of the clinic where the study was performed (Goodridge et al., 2006).

As mentioned before, HBOT is commonly used as an adjunct to treatment for individuals with diabetes-related ulcers that are slow to heal. However, an updated Cochrane meta-analysis published in January of 2012 reported that there is a strong need for more, and higher quality, research into the benefits of HBOT for the treatment of chronic wounds (Kranke, Bennett, Marytn-St. James, Schnabel, & Debus, 2012). While they found there to be a significant increase in healed diabetes-related foot ulcers in the short term, there was not a significant increase in the long term. The authors of this

review felt that there were "various flaws in design and/or reporting that means we are not confident in the results" (Kranke et al., 2012, p. 2). These researchers completed a comprehensive literature search, including searching for unpublished work, with no restrictions on language, date, and setting. This search resulted in the inclusion of nine studies with a total of 471 participants, 243 receiving HBOT and 228 receiving a control or "comparator treatment" (Kranke et al., 2012, p. 11). The researchers presented tables of the included and excluded studies in the appendices of their work. Data was abstracted by one reviewer and double-checked by two others. Differences were resolved by consensus (Kranke et al., 2012). Cochrane RevMan software was used for statistical pooling and, when appropriate, the authors used a fixed-effect model for studies of similar set up and a random-effects model for studies where a fixed-effect model was inappropriate (Kranke et al., 2012). A sensitivity analysis was used for missing data.

Carbon monoxide poisoning. Carbon monoxide poisoning is responsible for the unintentional death of more than 400 individuals each year and is responsible for approximately 20,000 emergency room visits as well as 4,000 hospitalizations each year (CDC, 2011a). Carbon monoxide is a colorless, odorless, and tasteless gas found in the combustion fumes "produced by cars and trucks, small gasoline engines, stoves, lanterns, burning charcoal and wood, and gas ranges and heating systems" (CDC, 2011a, para. 2). It competes with oxygen to bind to hemoglobin (having a greater affinity for hemoglobin than oxygen) thereby decreasing the amount of oxygen bound to hemoglobin and leading to hypoxemia (Murphy, 2010). Too much carbon monoxide in one's body can lead to tissue damage and possible death of the individual and, therefore, is considered a medical emergency requiring immediate treatment (Mayo Clinic, 2012).

Carbon monoxide poisoning may be misdiagnosed on initial assessment because many of the symptoms are vague and may be indicative of other common illnesses. Mild symptoms of carbon monoxide poisoning include headache, dizziness, blurred vision, vomiting, diarrhea, and lethargy. Moderate symptoms include confusion, loss of consciousness, breathlessness or tachypnea, weakness, and tachycardia. Severe symptoms include palpitations, arrhythmias, hypotension, myocardial ischemia, pulmonary edema, seizures, and coma. Fatal symptoms of carbon monoxide poisoning are cardiac and respiratory arrest. Severity of the symptoms is mainly related to the amount of carbon monoxide inhaled (Murphy, 2010). Some individuals are at greater risk, or more susceptible to, the effect of carbon monoxide and include unborn children, infants, older adults, smokers, and people with heart disease, anemia, or respiratory problems. Increased anxiety and depression have also been noted after acute carbon monoxide exposure (UHMS, 2011b). Undiagnosed and untreated, carbon monoxide poisoning can be fatal to the individual. According to the Mayo Clinic (2012), one who is experiencing nausea, vomiting, dizziness, chest pain, headache, or confusion related to carbon monoxide poisoning needs to be treated with oxygen as soon as possible after exposure in order to replace carbon monoxide with oxygen. Between 1992 and 2002, more than 1500 individuals with carbon monoxide poisoning were treated with HBOT in the United States (UHMS, 2011b). In 2009, 552 individuals with carbon monoxide poisoning (unintentional and unrelated to fire) were treated with HBOT in the United States (Clower, Hampson, Iqbal, & Yip, 2011).

Though HBOT is indicated for use in carbon monoxide poisoning by the UHMS, a Cochrane meta-analysis conducted in 2011 by Buckley, Juurlink, Isbister, Bennett, and

Lavonas reported that HBOT "cannot be routinely recommended for the treatment of CO poisoning" but suggested that "it is possible that some patients, particularly those with more severe poisoning, may derive benefit from treatment, but this remains unproven" (Buckley et al., 2011, p. 10). The purpose of this meta-analysis was to examine the ability of HBOT to reduce the presence of neurological effects of carbon monoxide poisoning four to six weeks after treatment (Buckley et al., 2011). The reviewers' objective was clearly stated, specific, and relevant. A thorough literature search was conducted that included a list of search sources and search terms and that was "not restricted by date, language or publication status" (Buckley et al., 2011, p. 6). Two reviewers were responsible for data abstraction. The risk of bias in the included studies was assessed independently by two, unblinded, authors and any disagreements were to be resolved through consensus or by a third party if a consensus could not be met (Buckley et al., 2011). Descriptions of studies that were included and studies that were excluded were provided in tables in the appendices. Despite statistical heterogeneity and differences in methodology, a pooled analysis of the data was performed and a random-effects model applied. The reviewers' pooled analysis suggested that there was no statistically significant difference between hyperbaric oxygen treatment and normobaric oxygen treatment (Buckley et al., 2011). However, the reviewers do believe there is an "ethical, warranted, and necessary" need for "additional placebo-controlled clinical trials of HBO for the treatment of CO poisoning" (Buckley et al., 2011, p. 10). Four of the reviewers declared no known conflict of interests in this review. One reviewer was a medical director of a hyperbaric facility in Charlotte, North Carolina and after leaving there in

2008, the emergency hyperbaric facility was closed in 2009. He reported no conflict of interest regarding this review (Buckley et al., 2011).

Decompression sickness. Sickness from decompression is a condition, commonly occurring in scuba diving, in which gas bubbles form in body tissues due to rapid ascension, inadequate exhaling while ascending, breath holding, or as a result of trapped air in the lungs (Emedicinehealth, 2005). Decompression sickness can also occur in space, in a hyperbaric oxygen chamber, or as a result of rapid altitude excursion. Most symptoms of decompression sickness occur within 24 hours. Severe symptoms can occur as early as one to three hours after decompression (UHMS, 2011c). Known risk factors for decompression sickness include reduced ambient pressure, "deep/long dives, cold water, hard exercise at depth, and rapid ascents" (Thalmann, 2004, Who Gets DCI section, para. 1). Other factors that are believed to play a role but are not conclusively supported by evidence as risk factors include "obesity, dehydration, hard exercise immediately after surfacing, and pulmonary disease" (Thalmann, 2004, Who Gets DCI section, para. 2).

According to the UHMS (2011c), decompression sickness can manifest itself as joint pain, skin rashes, neurological dysfunction, cardiac or respiratory symptoms, or death. Common signs include rash, muscle weakness, difficulty urinating, amnesia, tremors, bloody or frothy sputum, or unconsciousness. Additional symptoms can include fatigue, itching, joint or muscle pain in the arms, legs, or torso, numbness, tingling, paralysis, and shortness of breath. The most common symptoms are joint pain and numbness or tingling in extremities. While physical manifestations usually occur within 24 hours after decompression, some symptoms can be delayed due to air travel right after

diving (Thalmann, 2004). Diagnosis of decompression sickness depends on the individual's signs and symptoms after their dive or exposure (UHMS, 2011c). Early diagnosis results in earlier relief of symptoms. There is a higher risk of residual symptoms with delayed treatment and the possibility of reversible damage becoming permanent (Thalmann, 2004). The efficacy of HBOT in treatment of decompression sickness is "widely accepted" and it is considered the "mainstay of treatment for this disease" (UHMS, 2011c, para. 4).

Financial Impact of HBOT

One 90-minute HBOT treatment is estimated to be 1000 dollars or more in the hospital or outpatient setting (Hyperbariclink, 2011c). According to M. Fullmer (personal communication, February 12, 2013), nurse manager of a hyperbaric facility in Idaho, the cost of a standard treatment of 90 minutes (including compression and decompression time) is 1884 dollars without insurance and does not include the physician's charge for overseeing the HBOT session. The Centers for Medicare and Medicaid Services (CMS), as well as private insurers, tend to reimburse the cost of HBOT when it is used for one of the conditions approved by the UHMS and as long as the therapy is performed in FDA approved chambers (Hyperbariclink, 2011a). For example, Medicare specifies it will cover HBOT for primary treatment for conditions such as carbon monoxide poisoning, decompression sickness, gas embolism, and gas gangrene. It will only cover HBOT costs adjunctively in conditions such as acute traumatic peripheral ischemia, crush injury, osteoradionecrosis, and lower extremity diabetes-related foot wounds that meet certain wound criteria. To be covered, diabetic foot wounds must be caused by type I or type II diabetes, must be classified as a grade III or higher on the Wagner scale, and must not be

responding to standard treatment. These conditions are only a few examples of what is covered by this company. Medicare also specifies conditions that it will not cover such as tetanus, myocardial infarction, sickle cell anemia, organ transplantation, and arthritic diseases (CMS, 2006).

Insurance coverage. The cost of HBOT may be considered a barrier to treatment. However, insurance companies such as Centers for Medicare and Medicaid Services as well as private insurers will usually provide coverage for the health conditions specified by the company (Hyperbariclink, 2011a). Aetna is an example of an insurance company that will also cover the cost of HBOT as long as the individual receiving the therapy has one of the conditions the insurance company deems medically necessary. It specifies which conditions are considered experimental and which conditions will not be covered due to lack of evidence showing HBOT to be more effective than standard treatments. Aetna also views treatment of individuals with untreated pneumothorax, simultaneous use of doxorubicin, cisplatin, or disulfiram, or treatment of premature infants as experimental because they are contraindicated in HBOT (Aetna, 2011).

Individual Response to HBOT

HBOT is a treatment in which the individual must sit inside of a chamber for a specific period of time while receiving oxygen therapy. One HBOT session typically lasts 90 to 120 minutes, not including the 10 to 15 minute it takes to compress and decompress the chamber (Goldsmith & Wilcox, 2011). While HBOT is a noninvasive treatment, it is time consuming and it is not without its risks. This section discusses the side effect profile of HBOT along with some client responses to treatment. It also provides

information on how one facility introduces clients to HBOT and handles claustrophobia, a potential barrier to treatment.

Introducing HBOT and handling claustrophobia. According to M. Fullmer (personal communication, February 21, 2012), nurse manager of a hyperbaric facility in Idaho, introducing individuals to HBOT is a process. At this particular facility, a pre-treatment evaluation is scheduled where individuals are assessed regarding their knowledge of the procedure and their level of education is determined. The clients are given an overview of HBOT through the use of a "Confirmation of Instruction" tool (see appendix A). This tool explores what to expect with treatment (i.e. how the chamber will make them feel, which assessments will be completed before and after treatment, and glucose checks for those with diabetes), what signs and symptoms to report (i.e. symptoms of hypoglycemia, high fevers, and ear or sinus pain), and the possible side effects (including barotrauma, seizures, and vision changes) associated with HBOT. It also includes what items are allowed in the chamber (i.e. what the client can or cannot consume, makeup, hearing aids, newspapers, cell phones, etc.) and instructs the client how to prevent barotrauma. Barotrauma is defined by PubMed Health (2011) as "discomfort and possible damage in the ear due to pressure differences between the inside and the outside of the eardrum" (para. 1). Clients are also provided materials such as brochures and are encouraged to do more research if they still feel uncertain about treatment. A part of the client's research might include weighing the risks versus the benefits of HBOT both financially and medically. Individuals must sign the "Confirmation of Instruction" tool along with their informed consent prior to treatment.

Fullmer recommended determining if the client has claustrophobia prior to beginning HBOT treatment. Clients are asked if they experience claustrophobia. If so, Fuller states the nurses will offer tours of the facility and will discuss the possible use of anti-anxiety medications. At this facility, the HBOT practitioners are aware of claustrophobia as a barrier to learning. Once individuals decide to receive HBOT, they sign to indicate informed consent. The process of introducing individuals to HBOT as described here only references one hyperbaric facility and is not meant to indicate how this process works at other facilities.

Discomfort and anxiety. Uncertainty about treatment, noise and cold temperature, discomfort related to oxygen mask or hood, boredom, and previous experience affected the individuals' feelings about HBOT in the study by Chalmers et al (2007). Seven individuals were included in this qualitative study. Findings from this study indicated that individuals were anxious because "there were no medical assurances for patients that HBO therapy would be of benefit to them" (Chalmers et al., 2007, p. 1457). The chamber was loud and made it difficult for the individuals to communicate with each other, adding to their discomfort. Oxygen masks and hoods were also responsible for impaired communication. The masks were heavy and physically uncomfortable. The hoods prevented individuals from being able to touch or scratch their face and even made one individual feel claustrophobic (Chalmers et al., 2007). Boredom appeared to be the result of the inability to communicate easily due to oxygen masks, hoods, and noise. This study only included individuals who had completed their full treatment regimen not those who stopped therapy before completion of treatment. These researchers indicated that clinical practice changes (i.e. noise reduction, an air break, safety checks, and the use of oxygen

hoods instead of masks) were made immediately following these interviews and prompt improvement in client comfort was noted (Chalmers et al., 2007).

Relaxing or monotonous. In a qualitative study by Katarina, Magnus, Per, and Jan (2009) where focus group interviews consisting of a "thematized interview guide with open-ended questions" were used, findings suggested a positive HBOT experience (p. 1978). All of the 19 individuals, except one, described their HBOT session "as a pleasant experience where they were given the opportunity to sit down, relax, read or listen to music and also where they got to know other people in the sessions" (Katarina et al., 2009, p. 1978). Additionally, some reported the treatment was monotonous and one person felt sick afterwards. Improved social relations with other individuals receiving HBOT were also reported. Individuals in this study felt that their expectations of the chamber had been met and they were satisfied with the staff. They reported the staff to be "positive" and "understanding" and reported that there was good communication between themselves and the staff (Katarina et al., 2009, p. 1979). The researchers concluded that it is pivotal for clients and all of their care providers to have clear and consistent communication regarding their care and that clear communication also defines who is responsible for the client's care wherever they may be receiving treatment (Katarina et al., 2009). Though some individuals had positive experiences in the chamber, HBOT was still perceived as time consuming and was even compared to a full time job (Katarina et al., 2009). The researchers admitted the possibility of selection bias in their study as well as possible sample bias as 13 of the participants were male and six were female.

HBOT side effects. As with medications and other forms of medical treatment, there are possible side effects and complications that can occur with HBOT. Many of these side effects, however, are considered "benign" (Williams, 2010, p. 18). According to Williams (2010), the most common complication is middle ear barotrauma. Sinus squeeze is the second most common complication related to HBOT and generally occurs more frequently in individuals with an upper respiratory tract infection or allergic rhinitis (UHMS, 2011d). Complications of HBOT may include claustrophobia, fatigue, headaches, myopia (for weeks to months), lung damage, or oxygen toxicity. Manifestations of oxygen toxicity include seizures, fluid filled lungs, or respiratory failure. To decrease risk for oxygen toxicity, individuals may be allowed breaks during treatment where they breathe normal air instead of oxygen (American Cancer Society, 2011).

The Impact of Uncertainty on Client-Health Care Provider Interactions

Eddy (1984) speculated that the practice of medicine is replete with uncertainty. In his 1984 article he describes the art and science of medicine in the following way: "Uncertainty creeps into medical practice through every pore" (p. 75). He further reports that there are a wide variety of medical procedures and assessment strategies used in the field of medicine. This ambiguity in medical practice can lead to uncertainty in client-health care provider interactions.

Though there is no determined best practice for physician-client interaction regarding uncertainty, Parascandola, Hawkins, and Danis (2002) explored the bioethical perspective involved in patient autonomy and decision-making. They concluded that individuals may be more trusting of their physician if he or she handles and

communicates uncertainty well, promotes shared decision-making, and aids the client in coping with the emotional effects of uncertainty (Parascandola, Hawkins, & Danis, 2002).

A population-based survey was conducted by Levinson, Kao, Kuby, and Thisted (2005) that involved 2,765 participants. The results suggested that some individuals look to their physician to make decisions for them in the presence of uncertainty because the physician is considered an expert. In a scholarly review conducted by Politi, Han, and Col (2007), the reviewers asserted that client perception is influenced by the relationship and experience he or she has with their physician. Additionally, they concluded that it is yet unknown what is best practice for communicating uncertainty to clients.

On the contrary, in a quantitative study conducted in 2008 involving 75 women and 5 breast surgeons presented with breast health decisions, Politi, Clark, Ombao, and Legare (2011) reported the possible impact of physician anxiety on client decision satisfaction. After their first appointment, women were provided with a survey that included "a trait measure of their reactions to uncertainty" (Politi et al., 2011, p. 576). One to two weeks later, they were given a follow-up survey via phone regarding their decision and decision satisfaction. The Physician's Reactions to Uncertainty Scale was used in both groups but was adjusted before being used for the client group (Politi et al., 2011). The researchers' findings demonstrated higher levels of client decision satisfaction correlated to physician anxiety about uncertainty suggesting "the importance of physicians' attitudes towards uncertainty on patients' decision outcome" (Politi et al., 2011, p. 577). One possible factor for increased physician anxiety considered by the researchers was the shared decision making that may result from the acknowledgement of

the impact of uncertainty on health care decisions (Politi et al., 2011). The researchers used a mixed-effects logistic regression model "to assess associations between patients' and providers' anxiety from uncertainty and patients' decision satisfaction" (Politi et al., 2011, p. 575). It should be noted that this study was small in sample size and the researchers made adjustments to the scale that was used for clients. This study suggests the need for the physician, or other health care provider, to be aware of the effect of their own attitudes toward uncertainty on the client's healthcare decision-making satisfaction.

Another study, by Gleason, Harper, Eggly, Ruckdeschel, and Albrecht (2009) examined whether clients' expectations for cure prior to their oncologist visit had any effect on their decision to follow recommended treatment. It also examined "whether patients' expectations for cure are affected by the strength of the oncologist-patient alliance or the extent to which companions (if present) share patients' expectations for cure" (Gleason et al., 2009, p. 263). There were 101 participants in this study. The researchers did not find expectations of cure prior to visit to influence treatment decisions except for individuals who did not have a close relationship with their oncologist. The researchers believed that this might be because these individuals felt they did not need assistance with their decision making and may have felt the psychosocial aspects of the interaction to be "less important, and perhaps even distracting, to patients who feel confident about a positive prognosis" (Gleason et al., 2009, p. 267). A close relationship with the physician, though, may have been needed or sought out in individuals who were less certain about their chance for cure (Gleason et al., 2009). In fact, they may have relied on their physician more for answers and help in decision-making. This study was limited in that it did not continue to examine expectations for cure over time, it did not

consider the oncologist's expectation for cure for the individual, and it only sampled individuals of various types of cancer rather than focusing on just one (Gleason et al., 2009). The researchers concluded that client decisions are influenced by many different factors, not just those examined in this study. HCPs, including nurses, may be able to better communicate with clients if they understand the client's expectations.

When aiding the individual in decision-making, especially in regards to uncertainty, the physician should individualize the care of the individual by taking into consideration the individual's values and pushing aside his or her own beliefs (Eddy, 1984). By encouraging the expression of the individual's values, preferences, and concerns, the physician is facilitating active participation by the individual and opening the door for collaborative decision-making. This open communication between the physician and the individual may also allow for the discussion and management of uncertainty related to medical decisions (Politi & Street, 2011).

While the amount of information presented to individuals may be overpowering for some, others may choose to seek more information in order to decrease their feelings of uncertainty or may facilitate a discussion with their physician or health care provider. Discussing what they find can help the individual actively participate in their care and decision-making. Individuals who do not seek more information may be choosing to avoid it in order to cope or because they may not be able to interpret it (Politi et al., 2007). For individuals who struggle to understand the information, or for whom the information is too complex, confusion may result (Politi & Street, 2011). Politi et al. suggested consideration of the individual's personal characteristics as well as his or her cognitive capacity as a way to lessen these negative responses to information.

Johnson, Levenkron, Suchman, and Manchester (1988) provided evidence that the way in which a physician relates and handles uncertainty, regarding clients, influences client satisfaction. A quantitative study of 304 individuals was conducted. Participants watched five videos of the same scenario; however, the way the doctor communicates and deals with uncertainty is different in each video. Participants were found to be the "most satisfied when no uncertainty was disclosed, as in Videotapes 1 and 2, and least satisfied when the physician consulted a textbook (Videotape 4) or prescribed therapy without a clear resolution of his uncertainty" (Johnson et al., 1988, p. 147-148). According to these researchers, participant satisfaction was mainly influenced as a result of the participant's perception of varying levels of uncertainty between videos because of the differing physician behaviors. Though this study refers only to physicians, nurses, too, should be aware of how they respond to and present uncertainty to their clients. Parascandola, Hawkins, and Danis (2002) asserted that individuals experience higher trust and satisfaction when they feel that their physician is comfortable with uncertainty and promotes active participation of the client in their care.

While it may not always be possible to eliminate uncertainty, Penrod (2007), in a concept analysis of the advancement of the concept of uncertainty, reported that it is possible to transition "into more manageable types of uncertainty" (p. 661). The author theorized that when intervention directed at increasing one's experience of control and/or confidence are utilized, "a new sense of normal" may result (Penrod, 2007, p. 661). For some, personal growth may even be generated from their ambiguous situations (Penrod, 2007).

Treatment decision-making may be another cause of uncertainty in the client-health care provider interaction. Weinstein, Clay, and Morgan (2007), suggested that shared decision processes should be used to address the risks and benefits of treatment (specifically, surgical decisions) especially in cases when "there is no clear 'best' treatment option" (p. 727). This indicates there should be a discussion between the client and the HCP regarding the perspectives of the HCP and the use of a decision aid, which provides objective information to the individual regarding the risks, benefits, and likelihood of either occurring. This helps individuals to include their values and preferences in their treatment decisions (Weinstein et al., 2007).

A literature review of 15 qualitative studies was performed in 2012 by Hansen, Rortveit, Leiknes, Morken, Testad, Joa, and Severinsson. The researchers concluded that individuals prefer nurses who are knowledgeable about uncertainty and the possible interventions to manage it, who can provide information about various support services, and who are well-informed about treatments and diagnoses specific to the individual. Individuals were interested in being able to discuss the meaning of their feelings of uncertainty as well as reducing these feelings. Support and encouragement were also important to individuals. Clients expressed a need to be heard and believed when talking about their experiences with health care workers. A positive relationship between the nurse and the individual may help in reducing uncertainty because it provides an opportunity for developing an alliance, communication, coping, and acceptance. It is believed that when the nurse listens actively, makes eye contact, and communicates support, feelings of uncertainty decrease (Hansen et al., 2012).

Nursing Implications

This literature review indicated a need for knowledgeable, caring, and supportive HCPs including nurses. Individuals receiving HBOT may already be experiencing pain and anxiety related to their health condition before they even enter the chamber for treatment. They may also be experiencing uncertainty about treatment, as evidenced by the research conclusions of Chalmers et al, 2007; Weinstein et al, 2007; Gleason et al., 2009; Politi et al., 2011. Furthermore, Wills-Long et al. (1989) asserted that the nurse is responsible for recognizing and reducing anxiety in HBOT recipients, especially those with claustrophobia. Nursing staff should also be aware of the cost and eligibility for insurance coverage of HBOT as this procedure can be expensive to the client and a potential barrier to treatment. According to Hansen et al. (2012), nurses can reduce uncertainty by facilitating a positive relationship in which the nurse provides emotional support along with clear and accurate information allowing the client to express his or her feelings and to feel heard.

Summary

The literature reviewed in this chapter was collected from an array of sources including personal communication, peer reviewed journal articles, published texts, electronic resources, and the Hyperbaric Medicine Practice textbook (Kindwall & Whelan, 1999). This literature review was strengthened by its coverage of a variety of topics. It introduced the reader to HBOT, the mechanisms by which it heals, the common conditions it treats, contraindications to treatment, and the dangers of HBOT including side effects and fire risk. It examined the financial impact of HBOT as well as the impact of the treatment itself on the individual. It discussed how individuals are introduced to

HBOT and how claustrophobia is handled by one hyperbaric facility. Physician and nurses' roles in uncertainty and the response of the individual to uncertainty were also included. There were some weaknesses to this review of literature. One weakness evident by the researcher's review of literature is the lack of qualitative research regarding how individuals feel and experience HBOT. Also, some of the research studies included in this section examined more than what the researcher was critiquing for but only the variables pertaining specifically to feelings regarding HBOT and uncertainty were included. Another weakness was that some of the research used dates back prior to 2000. Also, there was occasional use of secondary sources. As a result of the researcher's literature review, the researcher believes there is a need for more research regarding client feelings of anxiety and uncertainty regarding the HBOT procedure.

Chapter III

Methodology

The purpose of this thesis was to examine whether individuals receiving HBOT experience any statistically significant differences in uncertainty before and after their first treatment and to explore their feelings regarding HBOT through the framework of the Uncertainty in Illness theory. A mixed-methods design was utilized to enhance understanding of the feelings of individuals undergoing HBOT. According to Hesser-Biber (2010) and Creswell and Piano Clark (2007), the mixed-methods approach is believed to better aid in the understanding of research problems and often results in a synergistic effect. The Mishel Uncertainty in Illness Scale was used to compare feelings of uncertainty before the first session to feelings of uncertainty after the first session and provided the quantitative data for this study (Mishel, n.d.). In addition, qualitative, descriptive open-ended questions were used to capture the meaning of these feelings of uncertainty for the individuals being treated (Fain, 2009). Examining an individual's life experiences in order to determine what those experiences ultimately mean to that individual is called phenomenology and was the basis for analysis of the qualitative data acquired (Polit & Beck, 2012). The researcher felt that a mixed-methods approach was the best strategy to answer the question of how clients' feelings of uncertainty do, or do not, change before and after their first session of HBOT seeing as it would provide quantitative, statistical data as well as allow the researcher to examine the participants' unique responses for any common themes that may impact how uncertainty about HBOT is handled in hyperbaric facilities in the future.

Setting

Subjects were recruited from two hyperbaric facilities located in the Northwestern United States. One facility operates two hyperbaric chambers, one monochamber and one multiplace chamber. The monochamber is a long tube in which one individual is treated at a time. The individual must lie flat because there is not room to sit up. It is a similar setting to an MRI. The multiplace chamber is bigger and can be used to treat roughly nine individuals at one time if necessary. When only two or three individuals are treated at a time, there is room for people to lie down if they choose. Nurses are inside with the clients and individuals are able to walk around. At this facility, subjects received a pre-treatment appointment and were required to sign a confirmation of learning and informed consent form before starting their HBOT sessions. Participants could receive treatment in either chamber. Participants were monitored by nursing staff throughout the duration of their session. Those who received treatment in the multiplace chamber were accompanied into the chamber by one of the nursing staff who was responsible for assistance with oxygen masks or hoods. Those who received treatment in the monochamber were required to lie inside the chamber while they were monitored from outside of the chamber. Both chambers are located in the same room. This room has concrete floors and is connected to the wound care clinic next door.

Currently, there are only two monochambers available for treatment at the second site. When the study began at the second facility, the safety director informed the researcher that he was to receive two new monochambers. The new, and bigger, monochambers arrived in December, prior to the closure of this study. The safety director also explained to the researcher that his hyperbaric facility has faux wooden flooring and

painted walls to create a warmer atmosphere. The researcher was unable to visit this site and describe this setting firsthand.

Sample

To be eligible to participate in this study, individuals (male or female) were required to be over the age of 18, were able to speak and write in English, were being treated for a condition for which HBOT is considered a standard procedure, and had no previous experience with HBOT. Any individuals receiving experimental HBOT were excluded from this study. Sample size was dependent on client flow at the hyperbaric facilities where this study was conducted and on the time constraints of the researcher. Twelve individuals participated in this study but only 10 were included in the results. Though the sample size was small, Fain (2009) reported that a larger sample size does not necessarily indicate a more valid study than a study of small sample size.

The 10 individuals who were included in the results of this study were all recruited from the first study site. There were six males, one female, and three participants who did not provide this data. The youngest participant was 25 years old and the oldest participant was 53 years old. No other demographic question was asked of the individuals. Three individuals had skin grafts, three individuals had wounds (two of which were specified as being related to diabetes), one participant had a crushed finger, another had a sore foot, and the remaining two had some type of infection (one stomach and one bone). None of the participants reported previous experience with HBOT.

Measures

The pretest survey consisted of three parts. The first part solicited demographic data such as age and gender. It also asked what condition the individuals were being

treated for, how many sessions of treatment they expected to have, and if they had previous experience with HBOT. The second part contained five questions taken from the Mishel Uncertainty in Illness Scale addressing unanswered questions, understanding of information provided, ambiguity of information received, staff responsibility, and purpose of treatment. These pretest questions were measured using a five point Likert scale. An attempt was made to contact Merle Mishel in order to receive permission to use this tool. There was never a response. The tool was downloaded from the Internet. The third part of the survey consisted of five qualitative descriptive questions inquiring about the personal experiences and feelings of the individuals prior to HBOT such as their fears and expectations. The posttest survey consisted only of the five questions from the Mishel Uncertainty in Illness Scale and the qualitative, open-ended questions about the participants' experiences and feelings after treatment. These surveys were used to compare feelings before treatment to feelings after treatment, looking for any changes that occurred before and after HBOT. It also addresses the individuals' feelings about the facility and staff. (See *Appendix* B).

Data Collection

To ensure the protection of human subjects, data collection began following IRB approval from Carroll College and both of the facilities where the study was conducted. The researcher met with the hyperbaric department manager of one of the facilities to discuss how the study was to be implemented. The researcher was unable to meet with the safety director of the hyperbaric facility at the second location but maintained phone and email contact with him. Study materials were emailed to the safety director. He was instructed via phone about how to conduct the survey. He was told to call or email if any

questions arose. Data from the site were transferred via the postal service. Individuals receiving HBOT were invited to participate in this study during their pre-treatment appointment. A flyer was included with their instruction materials prior to their session (see *Appendix* C). On the day of their first session, the individuals were asked by the nursing staff if they were going to participate in this student nurse research study. A script was provided for the nursing staff (see *Appendix* D). Those who were interested in participating were asked to complete an informed consent form (see *Appendix* E), in order to ensure the protection of human subjects, before filling out the pretest survey. Immediately after treatment they were given the second survey. Both surveys (including the completed informed consent form) were placed in envelopes, sealed, and put into a locked box by the individual. Ten individuals were included in this study. Exclusion criteria included the following: prisoners, minors, pregnant women, mentally disabled or decisionally impaired, economically or educationally disadvantaged, non-English speaking, and persons with HIV+ or AIDS.

Confidentiality

This study did not begin until Institutional Review Board approval was received from the Carroll College IRB and the hospital IRBs. Informed consent was obtained in addition to the surveys (See *Appendix* E). It clarified that participation in the study would not impact the treatment and care they received. If the individual was not interested in participation they were not to complete the survey. To maintain confidentiality, the surveys did not ask for any personal, identifying information such as name or contact information. The surveys were placed in envelopes, sealed, and put in a locked box by the individuals being surveyed. The nursing staff did not collect the surveys from the

individuals. Throughout the course of the study, the researcher would periodically return to the first site to retrieve the completed surveys from the box. The surveys from the second site were mailed to the researcher. They were contained inside of an envelope that was inside a second envelope.

Data Analysis

The pre and posttest analysis of the Mishel Uncertainty in Illness Scale were performed using a paired t-test to identify if there was a statistically significant difference between pre-and-post treatment feelings of uncertainty. A null hypothesis of no difference in uncertainty after treatment was used to analyze these data. Averages for the pretest scores and the posttest scores were also obtained. The qualitative descriptive data were analyzed using the Giorgi's phenomenological approach. This method was used to ensure rigor throughout analysis. The first step was to read through the data in order to "get a sense of the whole" (Polit & Beck, 2012, p. 566). The second step was then to reread the data, more slowly, and to divide the data into themes. Themes of "similar focus or content are integrated in order to clarify the sense" (Kleiman, 2004, p. 14). The third step, according to Polit and Beck (2012), was to describe the "psychological insight in each of the meaning units" (p. 566). The fourth and final step was to formulate a general framework of the individuals' experiences through the synthesis of all of the themes that were generated (Polit & Beck, 2012). Kleiman (2004) reported that once the themes have been analyzed, the themes must be filtered according to relevancy to the phenomenon being studied. Once this has been done, the researcher must describe his or her findings and formulate a structure (Kleiman, 2004). Kleiman also suggested that one should "return to the raw data descriptions to justify the articulations of both the essential

meanings and the general structure" (Kleiman, 2004, p. 17). Using Giorgi's method, and referring to Kleiman's research, the researcher analyzed client feelings of uncertainty toward HBOT for themes consistent with Mishel's Uncertainty in Illness theory such as uncertainty resulting from event unfamiliarity, inconsistency of the expected outcome compared to the actual situation, education, relationships with HCP, and client response to uncertainty.

The pretest data included the following questions: what condition are you being treated for, what are your expectations for treatment in the hyperbaric chamber, and do you have any concerns, fears, or feelings of uncertainty regarding the treatment itself? The posttest was analyzed for client experience inside the chamber, the impact of staff on client's experience, whether or not the client's expectations of treatment were met, and whether or not the client's concerns, fears, or feelings of uncertainty before treatment were alleviated or worsened during treatment.

Study Limitations

The nature of this honors thesis research study was limited by its small sample size. The sample was dependent on patient flow at both facilities during the time of this study. The study was conducted over a six month time period. The hyperbaric department manager at one hospital reported they were having an unusually low census during this time and also reported there is another hospital located across the street from her hospital that also has a hyperbaric facility. Another limitation of this study is that the researcher was unable to be on-site and was unable to meet with the director of the second facility in person before the study was conducted; therefore, there may be discrepancies in how the data were collected. Additional variables that may have impacted participation was pain

and sedation of individuals receiving HBOT. The study was further limited by the unclear wording of the surveys and by surveys that were incomplete or that provided minimal data. This study is limited in that it only examined individuals who had received one session of HBOT. In the future, the researcher suggests that the word “treatment” in both the pretest and the posttest surveys should be changed to “procedure” or “session” when asking the participant to describe their expectations and concerns about HBOT. This will ensure that participants’ responses are about HBOT rather than overall treatment outcome. The researcher also believes that this study should be performed in a longitudinal, rather than prospective, manner. It is also suggested the surveys be simplified and shortened to decrease the time it would take to fill out the surveys and encourage participation.

Chapter IV

Results

The purpose of this study was to examine whether individuals experienced any statistically significant differences in uncertainty before their first session of HBOT compared to after their first session of HBOT and to explore their feelings regarding HBOT using the framework of Mishel's Uncertainty in Illness theory. Using a paired t-test with a significance of $p<0.05$ to analyze the quantitative data, the researcher found that there was not a statistically significant difference in participant uncertainty before and after the first session of HBOT. See Table 1 below.

Table 1: Results of Pre and Posttest (n=10)

	Pretest	Posttest
Mean	19.9	22.4
Variance	20.9888889	11.6
df	9	
P (T<=t) one-tail	0.07554878	
t Stat	-1.5689827	

The null hypothesis was that there would be no difference in uncertainty after treatment. This null hypothesis was not rejected because the analyzed data resulted in a p-value of 0.0755, which is greater than the set p-value of 0.05. The data analyzed in this table was collected using the Mishel Uncertainty in Illness Scale. Mishel's Uncertainty in Illness Theory provides a basis for understanding client uncertainty in illness and/or treatment through the discussion of possible contributing factors such as uncertainty resulting from event unfamiliarity, inconsistency of the expected outcome compared to the actual situation, education, relationships with HCP, and client response to uncertainty.

Regarding the qualitative data, the researcher found that participants' generally reported positive interactions with staff and neutral to positive experiences inside of the chamber. Only two individuals expressed discomfort during their session and one individual did not provide data about experience inside the chamber.

Conditions Being Treated

Infection and skin grafts were frequently cited reasons why individuals in this sample were receiving HBOT. There were three individuals with skin grafts, two of which had skin grafts on their legs. Two individuals reported infections, one was a bone infection and the other was a stomach infection. Another three participants were less specific about their conditions and only reported a "crushed finger," "sore foot," and "wound care." The two remaining participants reported ulcers/wounds related to diabetes.

Expectations for Treatment

Faster healing time. Six individuals in this study reported that their expectation, and hope, for treatment was "faster", or "increased" healing time. Participant 125, the participant with a bone infection, reported his expectation was "to heal much faster." Participant 142, being seen for "wound care" reported being "hopeful that this will increase the healing process." Participant 249, one of the individuals with a skin graft, reported that his expectation was that HBOT would "help the healing process." The other three participants merely reported they expected faster healing.

Complete healing. Four participants reported they expected to be healed. Participant 104, the second individual with a skin graft, expected "full recovery." Participant 262 reported "I would like my wound to heal." Participant 233 had a "crushed

finger" and reported that he expected HBOT to "heal my finger." Participant 278, the individual with the stomach infection, expected "to get better."

Concerns, Fears, and Uncertainty About Treatment

No concerns. Six of the 10 participants in this study reported they did not have any concerns about the treatment. Five of these individuals responded "no" to this question without further elaboration. However, participant 233 explained that he had no concerns because "they told me what to expect."

Uncertainty. Three participants reported being uncertain about the procedure. Participant 253 stated, "not knowing and something different always brings apprehensive feeling [*sic*], but I'm trying to keep positive attitude [*sic*]." Participant 262 was unsure about receiving treatment with other people and "not sure how it will be with the helmet on." Participant 249 was specifically concerned about his "ears." Participant 142 did not respond to this question.

HBOT Experience

Positive distraction. Participant 104 stated, "lately weve [*sic*] been watshing [*sic*] movies during each session." He reported that watching movies helps prevent boredom and that "after your ears pop it [*sic*] quite enjoyable." Participant 249 also reported having watched a movie and commented on the attractive HBOT staff. Participant 278 reported she got to "look at tv [*sic*] fall to sleep [*sic*] and go home." Thought participant 233 stated that the session was "boreing [*sic*]," he also reported that it was "nice."

Discomfort versus comfort. Two participants openly reported experiencing discomfort during their session while two other participants actually reported feeling comfortable. Participant 253 reported that while there was some discomfort that it was

"ok. " Participant 262 specified his discomfort and stated, "my seat was a little hard so my back started hurting." He also reported being able to see the clock and stated, "the time seemed long." On the contrary, participant 142 reported that his experience was "very comfortable." Participant 125 reported, "I was comfortible [*sic*]" and "it felt like I was on my way to the moon."

Temperature. Five participants remarked on the temperature inside of the chamber. Participant 138 reported that it was "warm inside chamber." Participant 262 also found the chamber to be "pretty warm." Participant 253 reported that the chamber was warm when it was "pressuring up." On the contrary, participant 125 stated that "it did get a little cold." Participant 142 reported that the "temp was fine, not to [*sic*] cold or hot."

Impact of Staff on HBOT Experience

Attentive staff. Five participants indicated that they found the staff to be "attentive." Participant 286 felt that the staff "showed care for my well bein [*sic*]" while participant 262 stated that the staff "made adjustments for my comfort" and "offered extra cushions for my seat." Participant 138 thought that the "staff member went out of her way to make me comfortable." Participant 253 reported that they were telling him "what was going on and making sure I was ok." Participant 104 stated, "the nurses make sure your very comfortable while your [*sic*] there.

Helpful. Participant 125 reported that the staff "were very helpful." Participant 249 felt that they "explained everything well." Participant 142 reported that staff presence "put me at ease." Participant 104 stated, "It's nice to have staff in there to help" which participant 278 appreciated because "without them I couldn't do anything."

Treatment Expectation Outcomes

Expectations were met. Seven participants responded, "yes" to this question. Participant 125 knew "what I was getting into" because my grandpa has had this done before." Participant 142 reported that "everything happened as described by staff" and participant 233 agreed with this by stating, "yes, it does what they say." Participant 278 also felt that "they explained everything to me" and felt that her expectations were met because "I got the oxygen that I need. . ."

Unknown. Participant 253 responded, "don't know yet" to this question because he has only had one treatment. Participant 262 reported that HBOT "I was nervous going in but would like to see how things go in the long run." Participant 249 responded similarly that he thought his expectations had been met but that "only time will tell." Participant 104 did not respond to this question.

Impact of Treatment on Concerns, Fears, and Uncertainty

No concerns. Six participants indicated that their concerns before treatment, if they reported any, were not alleviated or worsened during treatment. Four of these participants responded to this question with "no." Participant 233 stated, "don't have fears," while participant 138 "wasn't worried about treatment."

Alleviated. Three participants reported that their concerns had been "alleviated." Participant 262 felt better because "I thought my ears would hurt but they didn't and I thought it would be hotter." Participant 278 circled "alleviated" and said, "I expected everything." Participant 104 merely responded, "reliefed [*sic*]." Participant 142 did not respond to this question.

Chapter V

Discussion

The purpose of this thesis was to examine whether individuals receiving HBOT experience any statistically significant differences in uncertainty before and after their first HBOT session and to explore their feelings regarding HBOT through the framework of the Uncertainty in Illness theory. The results of this study indicated that there was not a statistical difference in uncertainty before and after the first treatment of HBOT as indicated by a p-value of 0.0755 which falls above the significance value of 0.05. Overall, participants reported to have had a positive experience inside the chamber and with the staff caring for them during their HBOT session. Many participants did not have any concerns or fears going into their first session and did not find any concerns or fears to be worsened or alleviated during their session. Only two participants specifically reported discomfort.

The most satisfying result of this research was finding that all the participants had positive experiences with the HBOT staff during their session of treatment. The participants seemed to be genuinely grateful and appreciative of the care they received. It is likely that participants felt well-informed on the HBOT process and felt that the staff were attentive to their needs during the session. Also, there were only two participants who specifically reported experiencing discomfort during their HBOT session. Warm temperature was noted by three participants (cold temperature by one) and seemed to be a cause of discomfort for at least two of the participants. This finding is not unsurprising as there are temperature changes that occur when the chamber is pressurized and decompressed. Others discussed being able to watch movies, which one participant

reported as preventing boredom, and another participant napped. Two participants openly reported feeling comfortable during their session. One thought it was boring but "nice" while another reported, "after your ears pop it [*sic*] quite enjoyable. These individuals may have found watching television and napping to be positive distractions during their treatment.

When asked about their expectations for treatment, many of the participants in this study reported they expected faster healing and three expected complete recovery. When asked if their expectations had been met, seven participants reported that their expectations had been met. However, when a few participants responded how the treatment had met their expectations, participants responded to expectations for the HBOT session, not their previous expectations for healing. The individuals who were unsure whether or not their expectations were met, though, did respond to this question from the healing perspective. The likely reason for this question being answered in two different ways is likely due to the context in which the question was read (before and after HBOT) as well as ambiguous wording of the questions by the researcher.

Another interesting finding was that six of the 10 participants reported they did not have any concerns going into their first HBOT session. One participant explained he had no concerns because he had already been told what to expect. It is likely that the other five participants who merely wrote "no" in response to this question had similar feelings as this participant. All these responses were received from the first site. This site's nurse manager explained earlier how HBOT clients are introduced to HBOT at her facility and how they are educated beforehand. It is likely that this pre-treatment teaching influenced individuals' concerns, or lack thereof, about treatment. However, there were

three participants who did report uncertainty about their first HBOT session. Two were concerned about the procedure and what it would be like. This is most likely due to unfamiliarity with HBOT. One participant was concerned about the potential for barotrauma of the ear. This is likely due to client teaching about HBOT adverse effects and how to prevent barotrauma. While three participants felt that their concerns had been alleviated during treatment, six participants did not feel that their concerns had been worsened or alleviated by treatment, but then again, there were many individuals before the procedure who had not reported concerns.

An exhaustive literature review of current research regarding client expectations for HBOT treatment, client feelings about HBOT treatment, client concerns regarding HBOT, and the nursing role in treatment provided little new evidence to enhance the findings of this study. However, research by Hansen et al. (2012), mentioned previously in chapter two of this paper supports the researchers' findings that nursing staff can have a powerful impact on an individual's experience with treatment, specifically HBOT. Hansen et al. (2012) concluded that feelings of uncertainty can be reduced when the nurse actively listens and communicates support. They also believed that a positive relationship between the nurse and the individual may help in reducing uncertainty because it provides an opportunity for developing an alliance, communication, coping, and acceptance (Hansen et al., 2012). There was also a research article by Kristen Guadalupe in 2010 that applied Mishel's Uncertainty in Illness theory to a meningioma diagnosis. She concluded that "patients need information about what is happening and what to expect before and after, advice, encouragement, and most of all reassurance that varying degrees of uncertainty are normal and part of the illness continuum" (Guadalupe,

2010, p. 82). This supports the researcher's findings that expectations for treatment were met because participants were told what to expect as well as the findings that one participant felt that her concerns were alleviated because she expected everything.

The most significant finding in this study was that all the participants had positive experiences, including their interactions with the staff, while receiving treatment in the HBOT chamber. Many of the participants in this study also reported relatively positive experiences inside the chamber with the exception of two participants who reported some discomfort. There also were many participants who reported no concerns prior to treatment and who did not feel that their concerns were alleviated or worsened after treatment. The findings of this study seem to reflect the actions of knowledgeable and caring nursing staff. These findings indicate the importance of knowledgeable nurses who fully educate their clients before treatment begins. It also indicates the importance of caring staff who provide comfort and assistance to their clients during treatment. In Mishel's Uncertainty in Illness theory, Mishel discusses credible authority, "the degree of trust and confidence patient has in health care providers" (Mishel & Braden 1988, p. 99). This credible authority is believed to have the ability to reduce uncertainty in individuals when the individual trusts their HCPs. As all the individuals responded positively to their experiences with the nursing staff, it would appear that the participants in this study experienced high credible authority in this clinical setting.

It is clear from this research that participants at this particular facility mostly had positive experiences with their first HBOT treatment. The researcher expected there to be more reports of concern or uncertainty regarding treatment but most of the participants did not report concerns. Those who did report concerns responded that their concerns had

been alleviated during treatment. The researcher was also surprised that some participants responded that their experience inside of the chamber was comfortable. Most responses were neutral or positive, except for one.

A positive experience inside the chamber and with HBOT staff is significant because HBOT treatment is time-consuming. The sessions are long and they often require multiple treatments per week. They also require individuals to sit, or lie, in a small chamber, which may be a challenge for clients with claustrophobia. Being aware of clients' feelings of anxiety, uncertainty, or fear, and knowing how to reduce these feelings will make the clients' experience of treatment better.

Recommendations for future research

It appears to the researcher, after conducting this study, that this particular facility educates and prepares its clients for HBOT very well. However it is one facility and it is found in a small town in the Northwestern United States. The way this facility is run and how clients are cared for most likely differs from other facilities. The researcher suggests that studies in this area should occur at multiple hyperbaric facilities across the United States both in small areas and areas of larger, more diverse, populations. It is also suggested that these studies be conducted in a longitudinal rather than prospective manner, allowing for post-treatment surveys to be completed after all of the clients' HBOT sessions. This would aid the researcher in distinguishing if whether or not a wound heals affects the client's perception of HBOT and his or her feelings of uncertainty. In general, the researcher believes there needs to be more qualitative research regarding how clients feel about HBOT in order to gain understanding of their personal,

unique experiences and to develop interventions aimed at reducing uncertainty in individuals receiving HBOT.

Appendix A

Eastern Idaho Regional Medical Center
Hyperbaric Medicine & Wound Center

Confirmation of Instruction

Learning Objectives (Patient, Family, Significant Other)	Met	Not Met	Learning Objectives (Patient, Family, Significant Other)	Met	Not Met
1. Given information on HBOT and department requirements: -Copy of Confirmation of Instruction -Patient placement in Chamber -Pre-treatment VS and Blood Sugars			5. Demonstrates ear clearing techniques: -valsalva -swallowing -yawning		
2. Verbalizes understanding of HBOT -100% oxygen at a pressure greater than sea level: -Effects of oxygen on wound healing -Increase in oxygen levels in affected areas			6. Verbalizes understanding of PE tube placement and emergency myringotomy, when applicable		
3. Verbalizes understanding of Safety precautions and risks: -100% cotton garments to decrease static, supplied by HBO department -NO petroleum products i.e. hair oils, ointments, face creams, makeup, body lotions -No alcohol based products i.e. hair sprays, hair gels/mousse, lotions, after shave -No hearing aids or watches, jewelry, hair clips -NO contact lenses -No loose leaf papers or newspapers -NO matches, lighters, cigarettes, or hand/feet warmers -No cell phones or any electronic equipment such as radios/walkmans			7. Verbalizes understanding of environmental conditions during HBOT -Temperature changes -Voice changes -Hood or mask application and use		
4. Verbalizes understanding of factors influencing outcome of HBOT -Diet -Wound care -Medications -Diabetic care, other disease processes -Daily attendance -Smoking, nicotine use and Caffeine -Off loading			8. Verbalizes understanding of possible side effects of HBOT -Barotrauma: sinus/ears -Anxiety -Seizures -Vision changes -Early maturation of cataracts -Contraindication in pregnancy		
			9. Verbalizes understanding of reporting signs and/or symptoms to provider -Chills and fever -Nausea, vomiting, diarrhea -Cold or flu symptoms -Ear or sinus pain -Hypo/hyperglycemia		
			10. Verbalizes understanding of wound care and techniques when applicable		
			11. Verbalizes need to inform HBOT staff prior to discontinuation of PICC Line.		
			12. Verbalizes understanding about available 24 hour HBO resources: Telephone #'s: During hours: 529-7955 After hours: 529-6111; ask operator to page Hyperbaric On Call Staff.		

Nurse Signature:_____
Patient Signature:_____
Date:_____

Patient Label

6/2006
Form # 755002

Appendix B

Pretest Survey:

Age:_____

Gender (circle one): Male Female

For the following five questions, please circle your answer.

1. I have a lot of questions without answers.
   Strongly Agree Agree Undecided Disagree Strongly Disagree

2. I understand everything explained to me.
   Strongly Agree Agree Undecided Disagree Strongly Disagree

3. The doctors say things to me that could have many meanings.
   Strongly Agree Agree Undecided Disagree Strongly Disagree

4. There are so many different types of staff, it's unclear who is responsible for what.
   Strongly Agree Agree Undecided Disagree Strongly Disagree

5. The purpose of each treatment is clear to me.
   Strongly Agree Agree Undecided Disagree Strongly Disagree

6. How many total treatments do you expect to receive?_____

7. Have you ever been treated with hyperbaric oxygen before? (circle one) Yes No

8. What condition are you being treated for?_____

9. What are your expectations for treatment in the hyperbaric chamber?

10. Do you have any concerns, fears, or feelings of uncertainty regarding the treatment itself? Please explain.

Posttest Survey:

1. I have a lot of questions without answers.
   Strongly Agree Agree Undecided Disagree Strongly Disagree

2. I understand everything explained to me.
   Strongly Agree Agree Undecided Disagree Strongly Disagree

3. The doctors say things to me that could have many meanings.
   Strongly Agree Agree Undecided Disagree Strongly Disagree

4. There are so many different types of staff, it's unclear who is responsible for what.
   Strongly Agree Agree Undecided Disagree Strongly Disagree

5. The purpose of each treatment is clear to me.
   Strongly Agree Agree Undecided Disagree Strongly Disagree

6. Describe your experience inside of the hyperbaric oxygen chamber (i.e. comfort level, temperature, staff availability and attitude, boredom, noise, time, etc).

7. Do you feel that your experience in the chamber was impacted by the staff caring for you? If yes, please explain.

8. Do you feel like your expectations about treatment were met? Please explain how they were or were not met.

9. Were any of your concerns, fears, or feelings of uncertainty before treatment alleviated or worsened during treatment? If yes, how so? Please explain.

Appendix C

Hi, my name is Karen O'Byrne and I am a nursing student at Carroll College. I am currently completing my honors thesis study regarding patient feelings about hyperbaric oxygen treatment.

I am providing a pre and post treatment survey. No identifiable information will be requested and you are free to remove yourself from the study at any point in time.

I would love to hear about your thoughts and feelings regarding treatment and I truly appreciate the time it would take for you to fill out these surveys.

Thank you for all your help!

Sincerely,

Karen O'Byrne
Carroll College Nursing Student

Appendix D

Nurse's Script:

"Are you interested in participating in the student nurse research study?"

- This will be asked when the individual comes in for his first treatment.
- If he does not recall the flyer, a flyer will be provided by the nurse and the individual will be asked:
    - "Are you interested in participating in this student nurse research study?"

"When you are finished filling out your survey, please put it in the envelope, seal it, and place it in the locked box."

- These are the instructions for returning the surveys once they are completed.

Appendix E

INFORMED CONSENT: EXPLORING FEELINGS OF UNCERTAINTY

Please check next to each statement.

____ I understand that this is a student research project and that I will be completing two surveys regarding my feelings about hyperbaric oxygen treatment. One will be completed before treatment and one after.

____ I understand that participating in this study will in no way impact the treatment and care I receive.

_____ I understand that my contribution to this research project will be CONFIDENTIAL and that there will be no information that can be identified to me personally including my name.

____ I understand there are no risks with completing these surveys and that there may be benefits to helping nurses' understanding.

____YES, I WILLINGLY PARTICIPATE IN THIS RESEARCH STUDY, and I understand that I may withdraw my consent to be a part of this study at any time.

FOR QUESTIONS OR COMMENTS ABOUT THIS RESEARCH, CONTACT
Karen O'Byrne with questions at (208) 521-3412 or by email kobyrne@carroll.edu
Jamie Dolan (Carroll College IRB Chair) at (406) 447-4969 or by email jdolan@carroll.edu

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