USWR 13: Process: Patient Vital Sign Assessment and Blood Glucose Check Prior to HBOT Treatment

MEASURE STEWARD:
US Wound Registry and the Undersea and Hyperbaric Medical Society (UHMS)

This measure was developed via a consensus process in collaboration with the Undersea and Hyperbarics Medicine Society (UHMS) Quality Measure Committee.

DESCRIPTION:
Percentage of HBOT treatments of patients aged 18 years and older who have their vital signs and blood glucose level assessed prior to undergoing hyperbaric oxygen therapy (HBOT). Three rates are reported for this measure.

1. Percentage of patients undergoing a hyperbaric treatment (HBOT) whose vital signs are taken.
2. Percentage of diabetic patients undergoing a hyperbaric treatment (HBOT) who had a blood glucose check.
3. Percentage of patients undergoing HBOT with vital signs taken and those with diabetes had a blood glucose check.

NUMERATOR:
Rate 1 num: All patients undergoing a hyperbaric treatment whose vital signs are taken
Rate 2 num: All diabetic patients undergoing a hyperbaric treatment who had a blood glucose check
Rate 3 num: Patients undergoing HBOT with vital signs taken and those with diabetes who had a blood glucose check.

Definition:
Vital signs are defined as the measurement of the systolic and diastolic blood pressure, pulse, respiratory rate and body temperature.

DENOMINATOR:
Rate 1 denom: All patients undergoing a hyperbaric treatment
Rate 2 denom: All diabetic patients undergoing a hyperbaric treatment
Rate 3 denom: All patients undergoing a hyperbaric treatment (overall rate)

RATIONALE:
Hyperbaric oxygen therapy is a safe medical therapy with a low risk of side effects and complications. Hyperbaric oxygen therapy involves placing the entire patient in a pressure vessel (hyperbaric chamber) which is then compressed with air or oxygen, and allowing the patient to breathe oxygen at an atmospheric pressure greater than 1.3 times sea level pressure. Due to the mechanical effects of the atmospheric pressure change and the unique physiologic effects of some gases at increased partial pressure, certain side effects are known to occur. These side effects are not due to improper use of HBOT, to equipment malfunction, or to a failure of care. These are known risks associated with HBOT. Certain underlying medical conditions may make patients more likely to experience side effects from

HBOT. The potential for side effects or complications from non-emergency HBOT treatment can be mitigated by ensuring that patients are medically stable prior undergoing therapy.

The incidence of HBOT related central nervous system oxygen toxicity, which can be manifested as a tonic-clonic seizure (previously known as grand mal seizure), varies widely depending on the atmospheric pressure, breathing apparatus, and acuity of the patient. Among stable patients at 2.0 ATA the incidence is likely about 1:30,000. Elevated body temperature is a risk factor for central nervous system oxygen toxicity. Patients who are febrile prior to the initiation of HBOT should undergo an assessment as to the risk benefit profile of HBOT that day, and may benefit from the administration of medication to reduce fever.

A less well understood side effect of HBOT is "flash pulmonary edema". This is presumed to be due to an increase in peripheral vascular resistance from oxygen induced vasoconstriction, causing increased intracardiac pressures which lead to cardiac overload among patients with pre-existing cardiac disease and a significantly decreased ejection fraction (EF). This problem is usually manifested as the sudden onset of shortness of breath during HBOT, however, fulminant congestive heart failure symptoms have been reported. HBOT may result in a transient increase in blood pressure during treatment. No data exist which provide "cut-off" values for vital signs that would be unsafe for HBOT. The decision to provide HBOT to any patient on a given day should be made by the physician or qualified non-physician provider supervising the treatment after a careful patient assessment, taking into consideration the risk vs. benefit profile of HBOT for that particular patient.

For many years, individual hyperbaric centers, management programs, and other groups have attempted to pool data to ascertain the impact of specific patient risk factors on the incidence of HBOT side effects. However, no national database has ever been created to track these data. The UHMS believes that the creation of a clinical quality measure for the reporting of vital signs, combined with the transmission of a Continuity of Care Document (CCD) will allow the USWR and the UHMS to better understand the risk factors associated with HBOT.

CLINICAL RECOMMENDATION STATEMENTS:

Patients undergoing HBOT should have their vital signs assessed prior to the initiation of each hyperbaric treatment.

REFERENCES

1. Davis JC, Dunn JM, Heimbach RD. Hyperbaric medicine: patient selection, treatment procedures, and side effects. In: Davis JC, Hunt TK, eds. Problem wounds: the role of oxygen. New York: Elsevier, 1988:225-235.
2. Davis JC. Hyperbaric oxygen therapy. J Intensive Care Med 1989; 4:55-57.
3. Behnke AR, Forbes HS, Motley EP. Circulatory and visual effects of oxygen at 3 atmospheres pressure. Am J Physiol 1936; 114:436-442.
4. Clark JM, Thom SR. Oxygen under pressure. In: Brubakk AO, Neuman TS, eds. Bennett and Elliott's physiology and medicine of diving, 5th ed. Philadelphia: W.B. Saunders, 2003:358-418.
5. Hart GB, Strauss MB. Central nervous system oxygen toxicity in a clinical setting. In: Bove AA, Bachrach AJ, Greenbaum LJ, eds. Undersea and hyperbaric physiology IX. Proceedings of the

ninth international symposium on underwater and hyper-baric physiology. Bethesda, MD: Undersea and Hyperbaric Medical Society, 1987:695-699.
6. Welslau W, Almeling M. Incidence of oxygen intoxication to the central nervous system in hyperbaric oxygen therapy. In: Marroni A, Oriani G, Wattel F. Proceedings of the International Joint Meeting on Hyperbaric and Underwater Medicine. Milan: EUBS, 1996:211-216.
7. Plafki C, Peters P, Almeling M, Welslau W, Busch R. Complications and side effects of hyperbaric oxygen therapy. Aviat Space Environ Med 2000; 71:1119-1124.