Healogics
Wound Science Initiative

Treatment Consistency, Hyperbaric Oxygen Therapy and Diabetic Wound of the Lower Extremity Outcomes

OBJECTIVE:

The purpose of this analysis is to identify trends in hyperbaric oxygen therapy (HBOT) patient treatment consistency and wound outcomes with a focus on the diabetic wound of the lower extremity (DWLE) patient.

INTRODUCTION AND BACKGROUND:

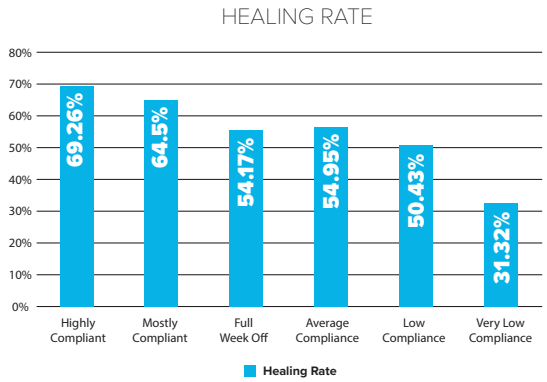
The findings of published research on the association of hyperbaric oxygen therapy and diabetic ulcer healing vary (de Smet et al. 2017). One possible explanation for the variation may be the association of patient adherence, or number of prescribed treatments completed, and patient outcomes. Patient treatment adherence has been associated with a number of health outcomes (Viswanathan et al. 2012). However, to date, the HBOT research literature has not focused on the impact of the number of physician ordered treatments completed by patients. This retrospective observational analysis examines the descriptive association between HBOT treatment consistency, the percentage of ordered treatments completed, and wound outcomes.

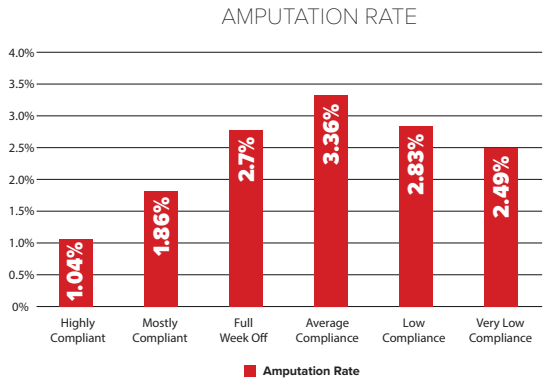
DATA AND METHODS:

The sample for this analysis includes all monowound patients admitted to a Healogics outpatient Wound Care Center® with a diabetic ulcer from 2014-2017 who received at least one HBOT treatment. We exclude patients still in active treatment at the time of study closure and consultation admissions. The final sample size was N=4,133 diabetic ulcer patients.

K-means clustering was used to construct a measure of treatment consistency by identifying patterns in the number of treatments completed on a weekly basis. The clustering variable was the number of weeks in treatment during which a patient completed 5 treatments, 4 treatments, 3 treatments, 1-2 treatments, and 0 treatments. Based on variability in treatment consistency, six patient adherence clusters were created. One cluster defined as Full Week Off indicates a group of patients who, for one reason or another, took an entire week off of treatment. Current guidelines recommend that HBOT treatments be administered on a daily basis throughout the course of care. As such, we define high consistency as a high percentage of weeks in treatment with at least 4-5 completed HBOT treatments.

Once the patient treatment consistency clusters were generated, descriptive statistics were used to identify patient characteristics and wound outcomes based on cluster membership. Clusters were ranked based on treatment consistency from high to low.





RESULTS:

Table 1 provides a summary of the six treatment consistency clusters. The two largest clusters, highly compliant and mostly compliant, contain a combined total of 65 percent of the total DWLE patients. These patients are characterized by high treatment consistency, a high percentage of ordered treatments completed, high healing (Figure 1) and low amputation rates (Figure 2). As treatment consistency declines, so to do healing rates such that patients in least consistent clusters have the lowest healing rates and high amputation rates.

Table 1. Monowound Wagner 2-4 outcomes, treatments, wound characteristics (N=4,133)

	Highly Compliant	Mostly Compliant	Full Week Off	Average Compliance	Low Compliance	Very Low Compliance	Total	Pvalue
Consistency								
No Treatments	0.00%	0.00%	21.45%	0.00%	0.00%	0.00%	4.04%	<0.0001
One or Two Treatments	6.92%	12.16%	19.84%	14.78%	18.87%	93.04%	19.17%	<0.0001
Three Treatments	6.26%	11.17%	16.14%	10.22%	53.90%	2.72%	15.17%	<0.0001
Four Treatments	8.80%	29.12%	19.27%	60.87%	16.15%	3.01%	24.09%	<0.0001
Five Treatments	78.02%	47.55%	23.31%	14.12%	11.09%	1.23%	37.52%	<0.0001
Mean Complete (%)	87%	86%	78%	71%	58%	20%	75%	<0.0001
Weeks in Treatment	6.981 (3.299)	7.503 (3.481)	10.99 (5.538)	5.919 (3.598)	5.328 (3.757)	1.954 (1.78)	7.22	<0.0001
Outcomes								
Comprehensive Healing Rate	69.26%	64.50%	54.17%	54.95%	50.43%	31.32%	58.49%	<0.0001
Amputation Rate	1.04%	1.86%	2.70%	3.36%	2.83%	2.49%	2.19%	0.0278
Days to Heal	101.27 (68.99)	104.08 (72.89)	130.1 (79.34)	91.86 (63.13)	91.31 (74.48)	81.39 (61.24)	104.33 (72.49)	<0.0001
Death Rate	0.79%	0.99%	1.12%	2.24%	1.88%	2.05%	1.32%	0.0967
Quit Rate	12.12%	13.15%	20.47%	17.04%	21.76%	30.48%	17.00%	<0.0001
Medical Discharge	11.78%	15.38%	17.73%	18.59%	20.71%	33.90%	17.38%	<0.0001

CONCLUSIONS:

The findings of this analysis indicate that the majority of monowound DWLE HBOT patients have high treatment consistency and complete a high percentage of the physician prescribed HBOT treatments. Likewise, patients with high treatment consistency have high healing rates and low amputation rates relative to patients who less consistently complete HBOT treatments. As treatment consistency declines, healing rates drop and amputation rates increase. In order to improve the likelihood of HBOT treatment success, interventions aimed at identifying and eliminating barriers to consistent and successful treatment completion are critical.

SOURCES:

Gijs H.J. de Smet, Leonard F. Kroese, Anand G. Menon, Johannes Jeekel, Antoon W.J. van Pelt, Gert-Jan Kleinrensink, and Johan F. Lange. “Oxygen therapies and their effects on wound healing.” Wound Repair and Regeneration 25:591-608.

Viswanathan M, Golin CE, Jones CD, Ashok M, Blalock SJ, Wines RC, Coker-Schwimmer EJ, Rosen DL, Sista P, Lohr KN. Interventions to improve adherence to self-administered medications for chronic diseases in the United States: a systematic review. Ann Intern Med. 2012 Dec 4;157(11):785–95.