

# Etiology Specific Variation in Comprehensive Healing Rate and Time to Heal 2014-2017: Arterial, Diabetic, Pressure and Venous Ulcers

## OBJECTIVE:

The purpose of this analysis is to examine the degree of variation in comprehensive healing rate and median time to heal for diabetic, arterial, pressure and venous ulcers using a modified intent-to-treat framework.

## INTRODUCTION AND BACKGROUND:

The comprehensive healing rate is a standardized and highly transparent methodology for reporting wound outcomes (Ennis et al. 2017) which is used in all Healogics Wound Care Centers®. The comprehensive healing rate is distinct because it utilizes a modified intent-to-treat framework meaning only patients who are consultations, in active treatment at the time the data is analyzed, or those patients who are being seen for non-wound conditions, are excluded from the measure. In prior analysis, the aggregate level comprehensive healing rate was reported across all wound types in order to examine population level trends in patient outcomes. However, while aggregation is useful to illustrate achievable population level outcomes, further attention is needed to address the variability in healing outcomes by wound etiology. In this analysis, we compare comprehensive healing rates and median weeks to heal for four wounds types: arterial, diabetic, pressure and venous ulcers.

## DATA AND METHODS:

Retrospective data on 2.3 million ulcers treated in Healogics clinics from 2014-2017 were analyzed. Etiology specific subsamples for arterial (74,974 ulcers), diabetic (543,790 ulcers), pressure (348,160 ulcers) and venous (413,584 ulcers) ulcers were assessed. We use a modified intent-to-treat framework to calculate the comprehensive healing rate. Descriptive statistics and Kaplan-Meier curves are used to assess time to heal.

COMPREHENSIVE HEALING RATE 2014-2017

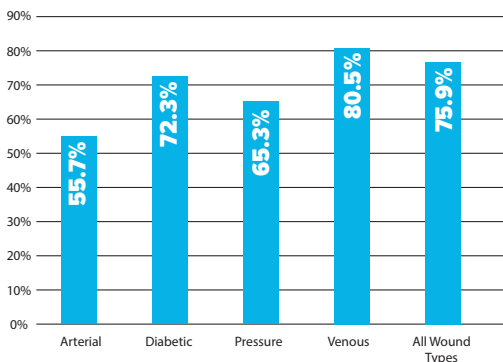


Figure 1. Comprehensive healing rate 2014-2017

KAPLAN-MEIER HEALING ESTIMATES

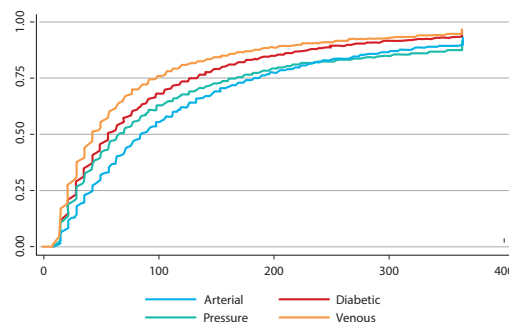


Figure 2. Kaplan-Meier Comprehensive Healing Estimates

KM-Median Weeks to Heal	
Arterial	11.6
Diabetic	8.0
Pressure	8.4
Venous	6.0

## RESULTS:

Figure 1 displays the findings the comprehensive healing rate for arterial, diabetic, pressure, venous and all ulcer types. The comprehensive healing rate from 2014-2017 was 55.7 percent for arterial ulcers, 72.3 percent for diabetic ulcers, 65.3 percent for pressure ulcers and 80.5 percent for venous ulcers. The aggregate comprehensive healing rate, 75.9 percent for all wound types is included as a reference point. Overall, there is considerable variability by etiology in the comprehensive healing rate.

To assess weeks to heal we exclude wounds still in active treatment in order to follow the modified intent-to-treat methodology. However, sensitivity analyses were conducted in which wounds still in active treatment were retained. Retention of wounds still in active treatment at the time of study closure increased median time to heal by one week for all wounds other than diabetic ulcers which did not change. Figure 2 includes the Kaplan-Meier healing estimates and median weeks to heal for the four wound types. Overall, venous ulcers display the most rapid healing with 50 percent of ulcers healing in six weeks or less. Arterial ulcers tend to take the longest to heal with 50 percent of ulcers taking 11.6 weeks or less to heal.

Table 1. Comprehensive healing rate 2014-2017	Arterial	Diabetic	Pressure	Venous	All Wound Types
Total # wounds	74,974	543,790	348,160	413,584	2,259,873
Total # healed wounds	28,411	280,139	147,846	250,265	1,170,162
% Healed at level	37.9	51.5	42.5	60.5	51.8
Exclude- # active treatment at study conclusion	4,256	33,259	23,735	23,940	128,085
% of total	5.7	6.1	6.8	5.8	5.7
# remaining wounds	70,718	510,531	324,425	389,644	2,131,788
% Healed	40.2	54.9	45.6	64.2	54.9
Exclude- # without wound documented	13	250	250	327	4,429
% of total	0.0	0.0	0.1	0.1	0.2
# remaining wounds	70,705	510,281	324,175	389,317	2,127,359
% Healed at level	40.2	54.9	45.6	64.3	55.0
Exclude- # consult and with days first to last assessment <= 7 days	19,672	122,901	97,617	78,542	586,173
% of total	28.0	23.4	29.9	19.5	25.9
Final- # remaining wounds	51,033	387,380	226,558	310,775	1,541,186
Comprehensive Healing Rate	55.7	72.3	65.3	80.5	75.9

## CONCLUSIONS:

This study underscores the importance of using a standardized framework for reporting wound healing outcomes both in aggregate as well as by wound etiology. Further, the analysis confirms the consistency, with current data, of previously reported comprehensive healing rates at a population level which reported 74 percent healing (Ennis et al. 2017). In a four-year retrospective sample of approximately 2.3 million ulcers, we find considerable variability in comprehensive healing rates by wound etiology. In general, diabetic ulcers have the highest comprehensive healing rate and the shortest median time to heal while arterial ulcers have the lowest comprehensive healing rate and the longest median time to heal. Thus, when evaluating clinical performance using the comprehensive healing rate, it is important to account for the distribution of ulcer etiologies along with other clinical risk factors.

## SOURCES:

William J. Ennis, Rachel A. Hoffman, Geoffrey C. Gurtner, Robert S. Kirsner, and Hanna M. Gordon. 2017. "Wound healing outcomes: Using big data and a modified intent-to-treat method as a metric for reporting healing." *Wound Repair and Regeneration* 25: 665-672