

Pressure Ulcer Scale For Healing (Push)- A Tool To Predict Wound Healing In Patient With Leg Ulcers

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Abstract

Background: Over the last few centuries, medicine has seen so many advances, in spite of which, the management of leg ulcer remains a very difficult challenge. In order to tackle this, many modalities of wound dressings and topical applicants have been developed and a lot of research are still going on. It is therefore essential to introduce new techniques in the management of these wounds to make them more accessible and affordable especially to the less privileged economic class of patients. The method of evaluating the wound is of prime importance to develop a good therapeutic plan. In this study, we aimed to describe the course of evolution in the healing of chronic leg ulcers by utilising the Pressure Ulcer Scale for Healing (PUSH) tool.

Materials and methods: In this prospective study, 45 patients who presented with leg ulcers at Coimbatore Medical College Hospital, Coimbatore of Wagner grade less than or equal to 3 were examined and the total PUSH score calculated once every week for 4 weeks. The change in total PUSH score for each patient over a period of 4 weeks was noted and compared between healing and non-healing ulcers.

Results: PUSH scores were modeled using a piecewise linear regression. PUSH values were found to be decreased significantly ($p < .0001$) in healing ulcers. Conversely, in non-healing ulcers, there was little or no change in PUSH values which were clinically correlated.

Conclusion: Our findings indicate that PUSH score declines significantly in healing ulcers and have a converse relationship in case of non-healing ulcers. Hence PUSH score can be used as an effective tool in predicting the nature of wound healing in patients with leg ulcers.

Key Word: Chronic wounds, diabetic ulcer, PUSH score, ulcer complications, observational study

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I. Introduction

Almost 1% of the total populations are affected by chronic wounds. They usually take a longer time for healing and the care needed along with the time to heal are very variable. A large amount of chronic wounds are treated sub-optimally with only general wound care products which are meant to cover & absorb some exudates. The ideal treatment that these wounds require is to have advanced wound management products and adequate care to treat the underlying defect that has led to the chronicity of the wound.¹

Ulcers which are showing features of delayed healing or non-healing are a major problem which give rise to a variety of complications. Ulcers constitute a significant risk factor for hospitalization, psychological burden, sepsis, amputation and even death of the patient. Chronic wounds cause notable functional impairment, reduced quality of life, and huge financial burden^{2,3} for both the patient as well as the health care system. Moreover, diabetic foot ulcers are associated with 14% to 24% resulting in an amputation⁴

The method of evaluating the wound is of prime importance to develop a good therapeutic plan. The evaluation of a wound may have variations in the interpretations because they vary greatly in nature, form, and site along with the variations in perception by each health professional owing to knowledge differences among these professionals. This calls for a standardized tool which will have very minimal variations by the evaluator while enabling the monitoring the wound during the healing process. Monitoring wound progress is essential for evaluating and documenting treatment outcomes.⁵ In 1997, the National Pressure Ulcer Advisory Panel developed the Pressure Ulcer Scale for Healing (PUSH)⁶ to provide a clinically useful tool for monitoring pressure ulcer healing.

In this study, we aimed to describe the course of evolution in the healing of chronic leg ulcers by utilising the Pressure Ulcer Scale for Healing (PUSH) tool

II. Materials And Methods

This prospective study was carried out on patients of Department of General surgery, Govt medical college Coimbatore from June 2018 to May 2019. A total 45 adult subjects (both male and females) of aged ≥ 18 , years were for in this study

Study Design: Prospective open label observational study

Study Location: This was a tertiary care teaching hospital based study done in Department of General surgery, Govt medical college, Coimbatore

Sample size: 45 patients

Subjects & selection method: The study population was drawn from consecutive diabetic patients who presented to Department of General surgery, Govt medical college Coimbatore of Wagner grade less than or equal to 3 were examined and the total PUSH score calculated once every week for 4 weeks. The change in total PUSH score for each patient over a period of 4 weeks was noted and compared between healing and non-healing ulcers.

Inclusion criteria:

1. Leg ulcer Wagner grade less than or equal to 3.
2. Largest ulcer in case of multiple ulcers
3. Aged 18 years and above.
4. Inpatients and outpatients between March 2017 to March 2018

Exclusion criteria:

1. Wagner grade 4 & 5

Procedure methodology

After written informed consent was obtained, data required for PUSH tool was collected. The PUSH tool utilizes 3 main parameters to evaluate the healing process of the wound and outcomes after the appropriate interventions. The first main parameter is the Surface area of the wound, which is measured in terms of the longest length against the largest width in square centimeters. The second main parameter used is the amount of exudate which is present over the wound after removal of the dressing but before the application of any topical agent. The third main parameter is the appearance of the floor of the wound, which is characterised by the type of tissue present and is specified as Necrotic tissue (eschar), Slough, Granulation tissue, Epithelial tissue, Closed or covered

LENGTH X WIDTH (in cm ²)	0 0	1 < 0.3	2 0.3 – 0.6	3 0.7 – 1.0	4 1.1 – 2.0	5 2.1 – 3.0	Sub-score
		6 3.1 – 4.0	7 4.1 – 8.0	8 8.1 – 12.0	9 12.1 – 24.0	10 > 24.0	
EXUDATE AMOUNT	0 None	1 Light	2 Moderate	3 Heavy			Sub-score
TISSUE TYPE	0 Closed	1 Epithelial Tissue	2 Granulation Tissue	3 Slough	4 Necrotic Tissue		Sub-score
							TOTAL SCORE

PUSH score was calculated for each of the subjects once a week for 4 consecutive weeks and the variations in the score was analysed

Statistical analysis

The results of the study were analysed and interpreted into the following data tabular columns

Pressure Ulcer Healing Record													
Date													
Length x Width													
Exudate Amount													
Tissue Type													
PUSH Total Score													

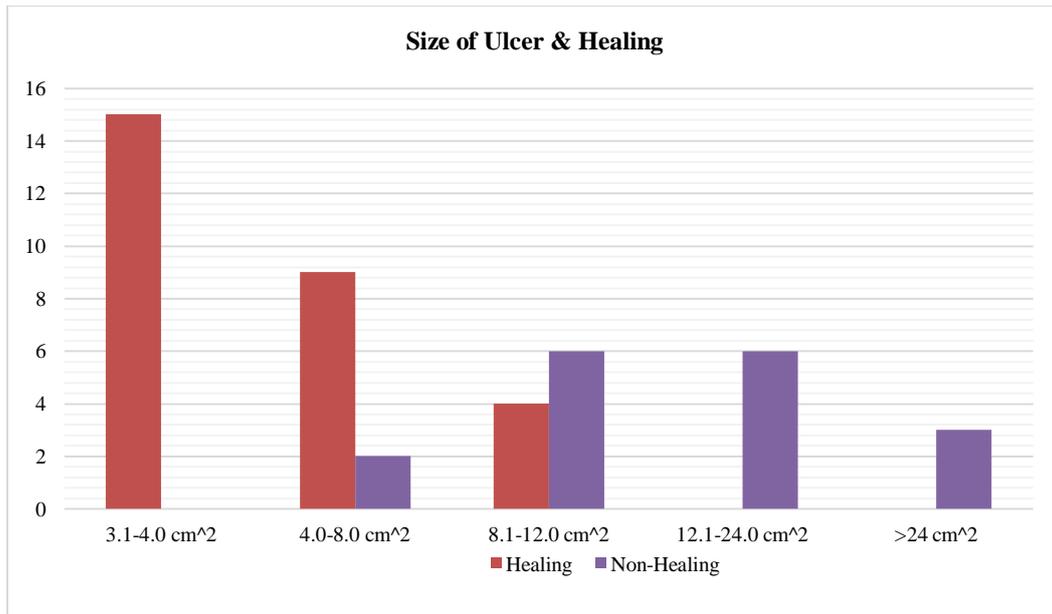
PUSH Total Score	Pressure Ulcer Healing Graph												
17													
16													
15													
14													
13													
12													
11													
10													
9													
8													
7													
6													
5													
4													
3													
2													
1													
Healed = 0													
Date													

The collected data were analysed with IBM.SPSS statistics software 23.0 Version. To describe about the data descriptive statistics frequency analysis, percentage analysis were used for categorical variables and the mean & S.D were used for continuous variables. To find the significance in the multivariate analysis the one way ANOVA with Tukey's Post-Hoc test was used.

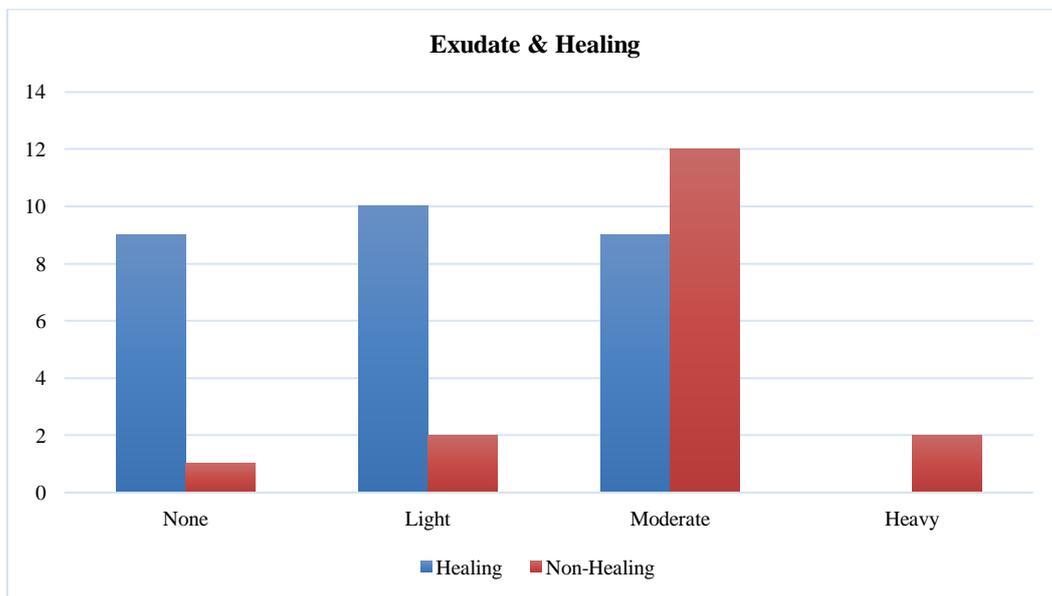
In both the above statistical tools the probability value .05 is considered as significant level.

III. Result

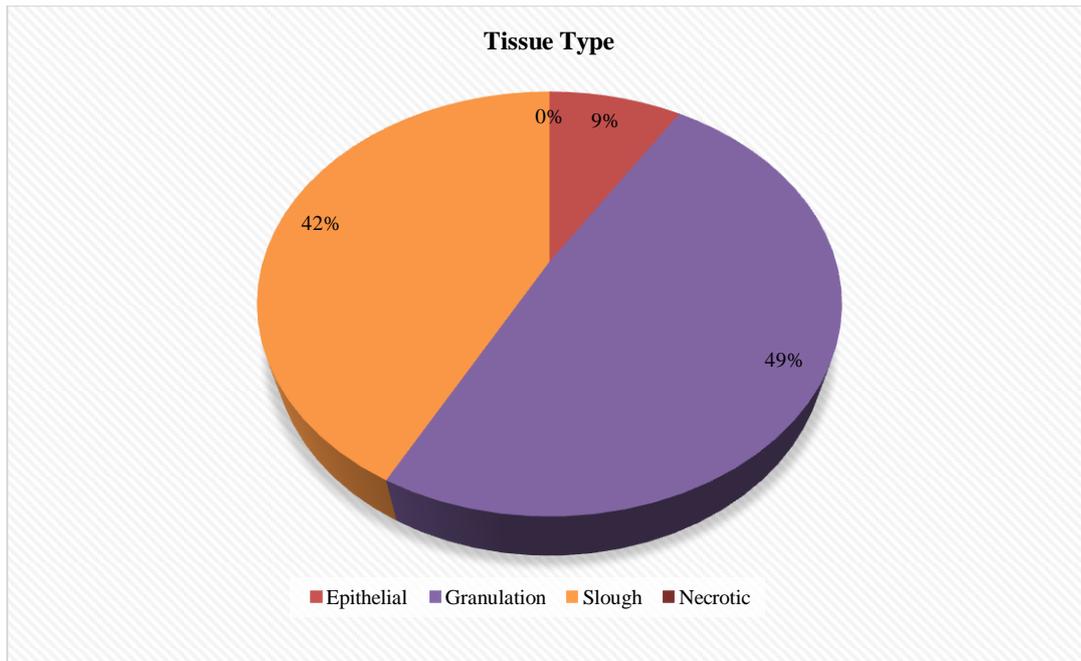
After observing the patients once every week for 4 weeks, the change in size of the ulcers were examined. The ulcers which progressed towards healing were found to have a significant reduction in the ulcer size, whereas the ulcers which didn't heal showed little or no change in the size of ulcer



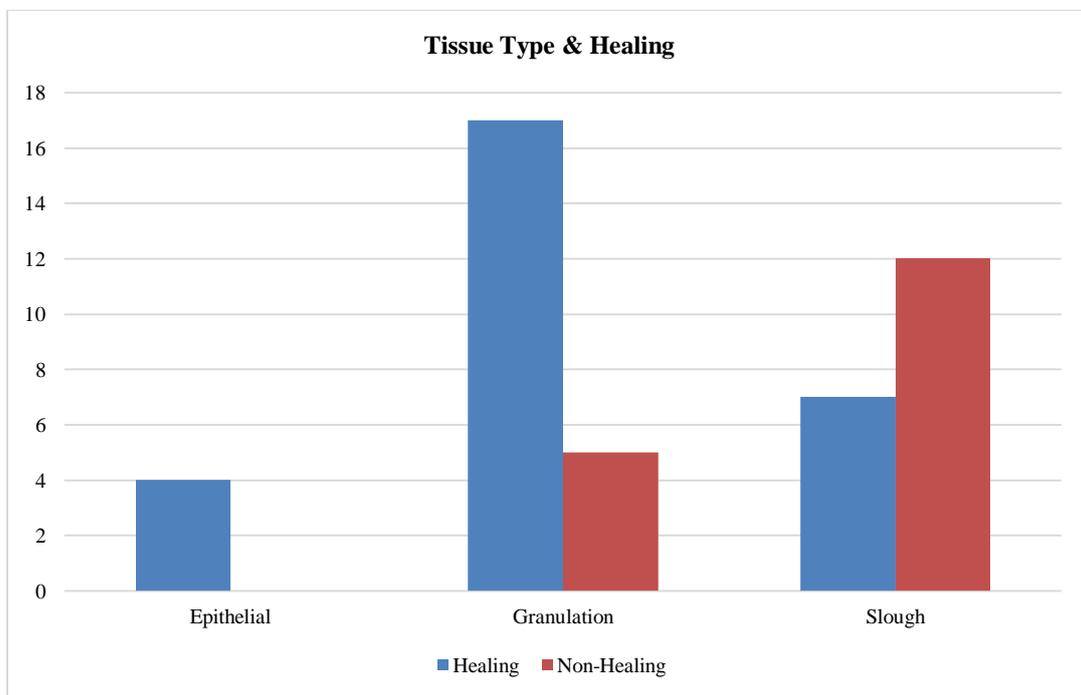
A strong correlation was seen between the size of the ulcer at initial presentation and the tendency of the ulcer towards healing. This shows the impact of wound size on wound healing. At the end of 4 weeks, the healing ulcers showed a significant reduction in the exudate amount whereas the non-healing ulcer showed no significant change in the amount of exudate.



On initial examination, half of the leg ulcers (49%) presented with granulation tissue. 42% of the ulcers presented with unhealthy slough. Accordingly, the ulcers were treated with appropriate wound dressing, topical applicants and in required cases adequate wound debridement was done during each visit. The progression of healing with adequate intervention was examined and the results at the end of one month were analyzed.

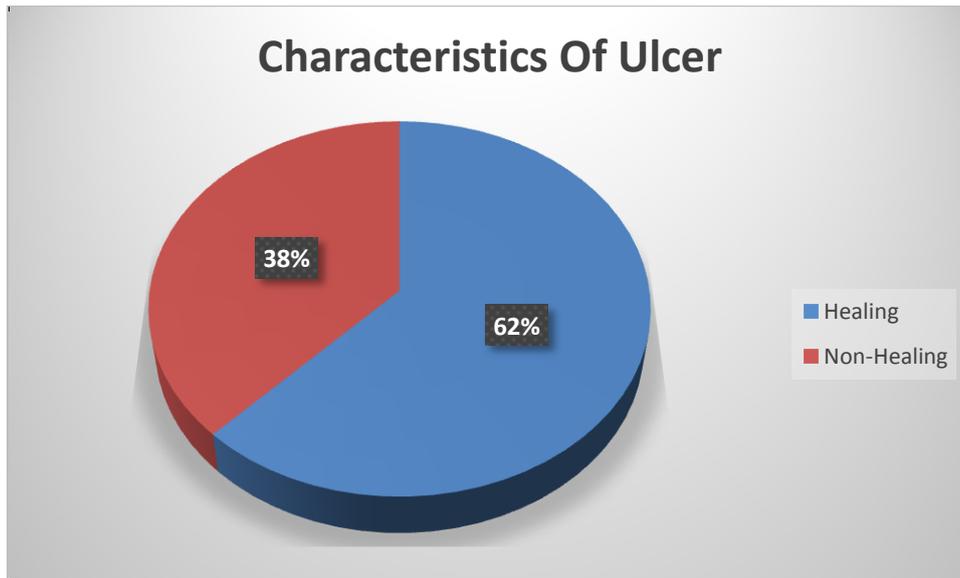


During the final examination after 4 weeks, majority of the healing ulcers were found to have healthy granulation tissue with epithelialization

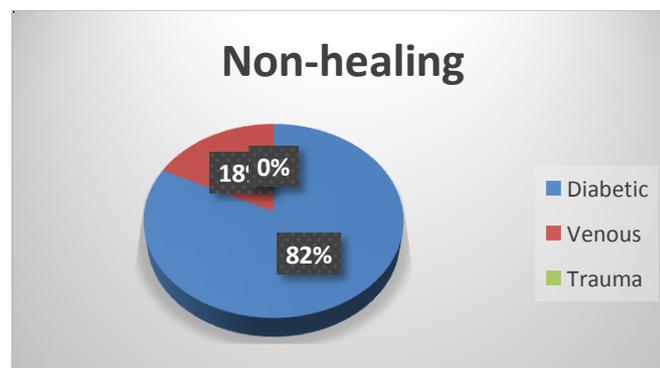
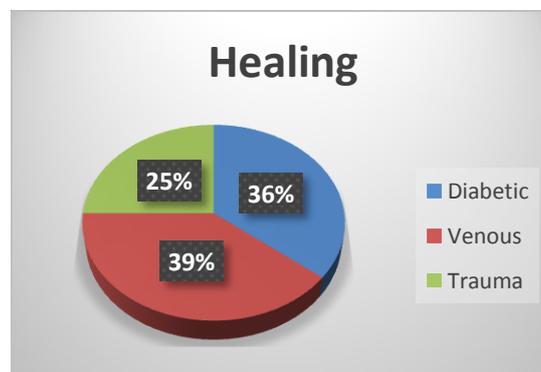


Comparison between healing & non-healing ulcers:

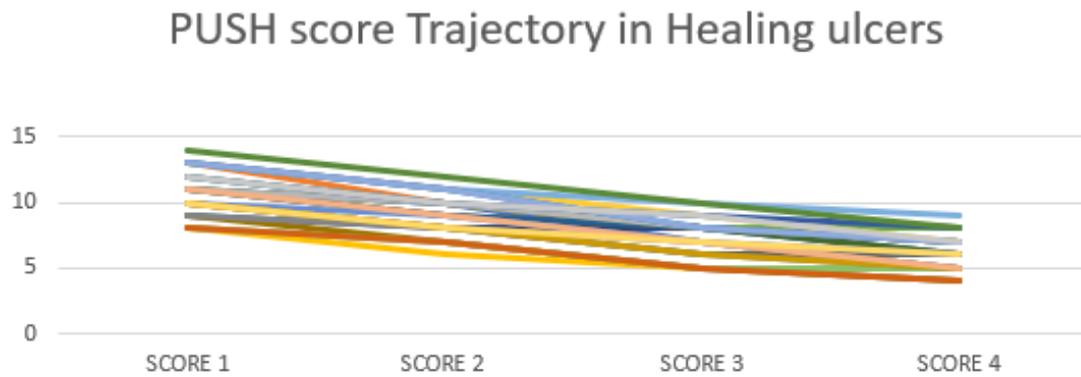
Out of the 45 patients with leg ulcers, 28 patients were found to have healing ulcers at the end of 4 weeks and 17 patients had non-healing ulcers



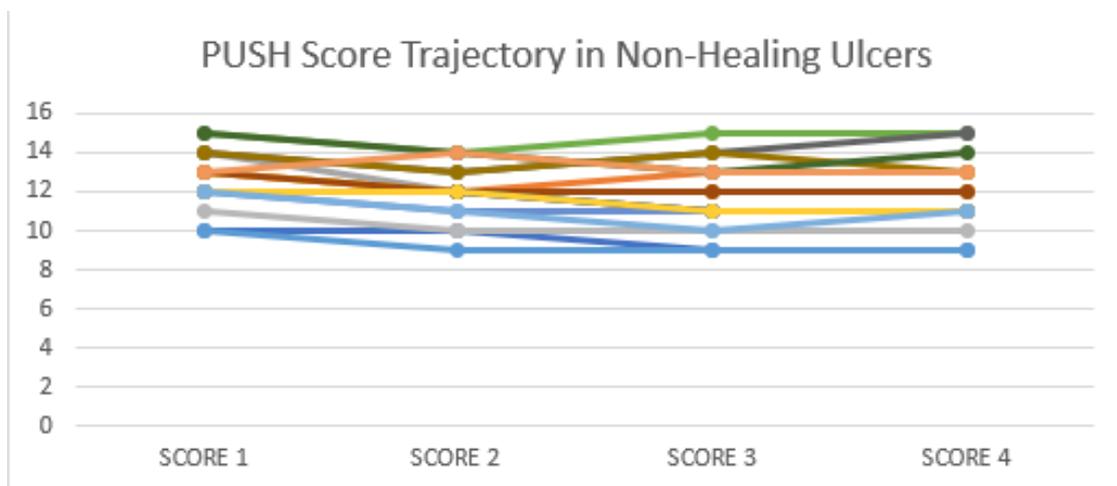
The comparison between different etiology of leg ulcers and wound healing revealed that majority of the Non-healing ulcers were seen in patients with Diabetic ulcers.



All the healing ulcers showed a uniform trajectory of decrease in the PUSH score during the course of the study. This decrease in PUSH score was found to be statistically significant.



In the graph shown above, we can see that in all cases of healing ulcers, there is a pattern of linear deceleration of the PUSH score from the initial to the final score after 4 weeks of observation. All healing ulcers though started with an initial high PUSH score, steadily declined in the score after 4 weeks to a minimal score. This is in correlation that PUSH score is effective in indicating whether the ulcer is progressing towards healing or regressing towards chronicity or complication. On the other hand, all the non-healing ulcers showed minimal or no change in the PUSH score during the course of the study. This was also found to be statistically significant.



From the above linear graph, we can appreciate that after examination during each visit, certain ulcers did not heal and progressed towards chronicity or complications.

By observing this graph, we can be alerted at an early stage that these ulcers require additional care and more advanced management of the ulcers. The clinician can make use of this advantage of the PUSH score and apply early intervention which can interrupt the disease process and change the direction of trajectory towards the healing path.

ANOVA						
		Sum of Squares	df	Mean Square	F	Sig.
SCORE 1	Between Groups	30.224	2	15.112	4.925	.012
	Within Groups	128.887	42	3.069		
	Total	159.111	44			
SCORE 2	Between Groups	53.462	2	26.731	8.317	.001
	Within Groups	134.982	42	3.214		
	Total	188.444	44			
SCORE 3	Between Groups	94.877	2	47.438	8.812	.001
	Within Groups	226.101	42	5.383		
	Total	320.978	44			
SCORE 4	Between Groups	144.262	2	72.131	9.805	.0005
	Within Groups	308.982	42	7.357		
	Total	453.244	44			

The above table shows the correlation between the initial PUSH score and the final score. The correlation is statistically significant with p values less than 0.05.

Independent Samples Test										
		Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Interval of the	
								Lower	Upper	
SCORE 1	Equal variances assumed	.791	.379	-3.769	43	.0005	-1.93277	.51278	-2.96689	-.89866
	Equal variances not assumed			-3.924	38.189	.000	-1.93277	.49260	-2.92983	-.93572
SCORE 2	Equal variances assumed	.948	.336	-6.371	43	.0005	-2.94118	.46166	-3.87220	-2.01015
	Equal variances not assumed			-6.484	35.816	.000	-2.94118	.45361	-3.86131	-2.02105
SCORE 3	Equal variances assumed	.617	.437	-9.159	43	.0005	-4.47899	.48902	-5.46520	-3.49278
	Equal variances not assumed			-8.795	29.706	.000	-4.47899	.50926	-5.51948	-3.43850
SCORE 4	Equal variances assumed	1.290	.262	-12.290	43	.0005	-5.77521	.46993	-6.72291	-4.82752
	Equal variances not assumed			-11.443	26.838	.000	-5.77521	.50468	-6.81102	-4.73940

In the above table, the change in PUSH score during the course of study were found to be statistically significant with a p-value of 0.005. The change in PUSH score can reliably predict whether the ulcer is on a healing course or non-healing course

IV. Discussion

The findings of this study indicate that PUSH scores decrease significantly over time in healing ulcers . This finding is consistent with PUSH scores in healing pressure ulcers ^{7,8}. Moreover, the PUSH tool is more straightforward than other methods such as plotting healing progress using wound planimetry from wound tracings or digital images, or mathematical computations of the percent change in wound area.⁹ The PUSH has demonstrated excellent interrater reliability in patients with pressure ulcers ¹⁰as well as patients with chronic leg ulcers ¹¹

The PUSH tool was originally developed as a simple tool to monitor Pressure Ulcer progress¹². In addition, the change in mean PUSH tool score was significantly different between healing wounds and nonhealing wounds in this study sample. In this study, we found a strong and significant correlation between baseline total PUSH score and wound area measurements¹³. These findings suggest that PUSH tool is a valid and responsive tool in evaluating healing ulcers of various etiology. It was also found that the PUSH tool was sensitive to detect change in their healed participants and could accurately differentiate a healing from a

nonhealing ulcer. The PUSH tool represents an excellent starting point to validate healing of leg ulcers, fulfilling a need for a simple, valid, reliable, and practical tool for monitoring the process of ulcer healing

V. Conclusion

PUSH tool is a simple, reliable and standardized tool in monitoring and evaluating the progression of chronic ulcers of various etiology

References

- [1]. Stotts, N.A., Rodeheaver, G.T., Thomas, D.R., Frantz, R.A., Bartolucci, A.A., Sussman, C., ... Maklebust, J. (2001). An instrument to measure healing in pressure ulcers development and validation of the pressure ulcer scale for healing (PUSH). *The Journals of Gerontology Series A: Biological Sciences and Medical Sciences*, **56**(12), M795– M799.
- [2]. Proposed Fiscal Year 2009 Payment, Policy Changes for Inpatient Stays in General Acute Care Hospitals. Available at: <http://www.cms.hhs.gov/apps/media/press/factsheet.asp?COUNTER3045&intNumPerPage10&checkDate&checkKey&srchType1&numDays3500&srchOpt0&srchData& keywordTwpwpeAll&chkNewsType6&entPage&showAll&pYear&yeardesc&cboOrderdate>. Accessed May 13, 2008.
- [3]. Günes UY. A prospective study evaluating the Pressure Ulcer Scale for Healing (PUSH Tool) to assess stage II, stage III, and stage IV pressure ulcers. *Ostomy Wound Manage*. 2009 May 1;55(5):48-52. PMID: 19471048.
- [4]. Thomas DR, Rodeheaver GT, Bartolucci AA, et al. Pressure ulcer scale for healing: derivation and validation of the PUSH tool. *Adv Wound Care*. 1997;10:96-101.
- [5]. Berlowitz DR, Brandeis GH, Anderson J, et al. Effect of pressure ulcers on the survival of long-term care residents. *J Gerontol A Biol Sci Med Sci* 1997;52A:106–110. 8. Centers for Medicare and Medicaid Services.
- [6]. Gardner SE, Frantz RA, Bergquist S, Shin CD. A prospective study of the Pressure Ulcer Scale for Healing (PUSH). *J Gerontol Ser A Biol Sci Med Sci*. 2005;60A:93-97.
- [7]. Gunes UY. A prospective study evaluating the Pressure Ulcer Scale for Healing (PUSH tool) to assess stage II, stage III, and stage IV pressure ulcers *Ostomy Wound Manag*. 2009;55:48-
- [8]. Berlowitz DR, Ratliff C, Cuddigan J, Rodeheaver GT. The PUSH tool: a survey to determine its perceived usefulness. *Adv Skin Wound Care*. 2005;18:480-483.
- [9]. Hon J, Lagden K, McLaren AM, O'Sullivan D, Orr L, Houghton PE, Woodbury MG. A prospective, multicenter study to validate use of the PUSH in patients with diabetic, venous, and pressure ulcers. *Ostomy Wound Manage*. 2010 Feb 1;56(2):26-36. PMID: 20200443.
- [10]. de Gouveia Santos, V.L., Sellmer, D., & Massulo, M.M. (2007). Inter rater reliability of pressure ulcer scale for healing (PUSH) in patients with chronic leg ulcers. *Revista Latino-Americana de Enfermagem*, **15**(3), 391– 396.
- [11]. Stotts, N.A., Rodeheaver, G.T., Thomas, D.R., Frantz, R.A., Bartolucci, A.A., Sussman, C., ... Maklebust, J. (2001). An instrument to measure healing in pressure ulcers development and validation of the pressure ulcer scale for healing (PUSH). *The Journals of Gerontology Series A: Biological Sciences and Medical Sciences*, **56**(12), M795– M799.
- [12]. Ratliff CR, Rodeheaver GT. Use of the PUSH tool to measure venous ulcer healing. *Ostomy Wound Manage*. 2005 May;51(5):58-60, 62-3. PMID: 16014985.
- [13]. American Diabetes Association. Consensus development conference on diabetic foot wound care. *Diabetes Care*. 1999;22: 1354-1360

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