FEATURE

A Prospective Study Evaluating the Pressure Ulcer Scale for Healing (PUSH Tool) to Assess Stage II, Stage III, and Stage IV Pressure Ulcers

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Abstract
Many valid and reliable tools and techniques are available for wound measurement. However, few prospective clinical studies assessing these instruments have been conducted. A prospective, methodological study was conducted between September 2006 and November 2007 to evaluate use of the Pressure Ulcer Scale for Healing (PUSH) version 3 in patients with one or more pressure ulcer. A convenience sample of 72 persons (mean age 66.9 ± 12.8 years) with 86 pressure ulcers (49% Stage II, 47% Stage III, and 4% Stage IV) was recruited and assessed weekly until healing, transfer, patient death, or end of study for a maximum of 8 weeks. Most ulcers (77%) were in the sacral area and 56% had been present for 1 month or longer. Repeated measures analysis revealed that PUSH total scores decreased significantly \( P < 0.001 \) over the 8-week study, with significant differences in PUSH total scores between healed and unhealed ulcers each week, starting on week 1. The total PUSH score as well as the length x width item in the tool accurately differentiated between healed and nonhealed ulcers. Although the PUSH tool is practical, easy-to-use, and generally sensitive to change, some modifications would improve its value — ie, a wound size/depth subscale. Additional studies to help clinicians more accurately evaluate the effectiveness of their interventions, including studies to determine whether wound measurements alone may suffice to monitor healing, are needed.

Key Words: Pressure Ulcer Scale for Healing, PUSH tool, pressure ulcer, wound assessment, wound assessment tool


Potential Conflicts of Interest: none to disclose

M any tools and techniques are available to help health-care practitioners measure patients’ wounds.\(^1\) Wound assessment methods, including several scales, include the Pressure Sore Status Tool (PSST), The National Pressure Ulcer Advisory Panel (NPUAP) Pressure Ulcer Scale for Healing (PUSH), the Wound Healing Scale (WHS), and the Sussman Wound Healing Tool (SWHT).

Wound healing scales and risk assessment tools have been used in various cultures. The tools inevitably reflect the population characteristics and the medical culture of the country in which they were developed and have demonstrated potential limitations arising from the application of the tools to a population for which they have not been validated, making it essential to test the validity of the tools before applying them to the patients. The risk assessment tools most used in Turkey are the Braden and Norton scales.

The two most universally used tools are the PSST (also called the Bates-Jensen Wound Assessment Tool — BWAT) and the PUSH tool.\(^2,3\) Although these tools have been shown to be valid and reliable,\(^4,6\) prospective clinical study data validating the tools are limited. Therefore, further evaluation of the assessment tools in wound care is necessary to enable wound care clinicians to accurately evaluate the effectiveness of their interventions. The aim of this study was to prospectively evaluate use of the PUSH tool. The specific research questions addressed were: 1) Do the total PUSH scores change significantly with time? 2) Are the PUSH total scores significantly different for pressure ulcers that heal and those that do not heal?

Literature Review
Few studies have addressed the feasibility of the PUSH tool in clinical practice. In a prospective study conducted by Pompeo,\(^7\) admission and discharge PUSH scores from 374 patients (989 wounds) were obtained and recorded to document overall progression of healing and calculate healing as a function of

\( \)
time. For patients with multiple wounds, the admission PUSH scores of each of the wounds were added together to get a total score. These patients had an average PUSH score of 26 on admission and 16 on discharge. The author used the data to benchmark and gauge the effectiveness of the treatment and concluded the PUSH tool is best suited for measuring overall patient and facility outcomes.

Stotts et al. conducted two retrospective studies on the validation of the PUSH tool to monitor the healing of pressure ulcers. In the first study, principal components analysis confirmed that the PUSH tool accounted for 58% to 74% of the wound healing variance over a 10-week period; in the second study, 40% to 57% of the wound healing variance over a 12-week period was noted. In addition, multiple regression analysis used to measure the sensitivity of the model to total healing showed PUSH accounted for 39% of the variance in 6 weeks and 31% of the variance over 12 weeks ($P < 0.001$). Data from these two studies confirmed that the PUSH tool is a valid and sensitive measure of pressure ulcer healing.

A descriptive study by Ratliff et al. evaluated the feasibility of using the PUSH tool to monitor healing in 27 venous ulcer patients; PUSH scores decreased in 23 patients over the 2-month study. Based on this study, the PUSH tool was found to be an effective monitor of healing trends in venous ulcers. However, larger studies are needed to confirm this finding.

In a prospective study by Gardner et al., 32 pressure ulcers were assessed with the PUSH tool, PSST, and acetate tracings. The PUSH scores decreased significantly ($P = 0.10$) over time among the healed ulcers but not among the unhealed ulcers. Total scores on the PUSH tool were highly correlated with both the PSST and surface area measurements. The authors reported that the PUSH tool provides a valid measure of pressure ulcer healing over time and accurately differentiates a healing from a non-healing ulcer.

**Methods**

**Design.** This prospective methodological study was conducted between September 2006 and November 2007. All study participants were followed for a maximum of 8 weeks.

Before beginning the research, permission to translate the PUSH tool into Turkish was obtained. To ensure the language validity of the tools, two nursing instructors and one English specialist translated the tool from English to Turkish. The author compared the three translated versions and the researcher developed a common Turkish text from these three Turkish translations. Then, English language specialists who had not seen the original English text translated the initial Turkish translation back into English. The English statements that had been translated from Turkish into English were compared to the original statements and necessary revisions were made.

**Participants.** A convenience sample was recruited in Izmir for this study that included university hospital inpatients who had a Stage II or higher pressure ulcer, were >18 years of age, and had more than 2 months’ life expectancy. If the patient had more than one pressure ulcer, all ulcers were assessed using the PUSH tool and a PUSH score was obtained for each individual ulcer.

The study was approved by the Ethic Committees of Ege University School of Nursing and all study participants provided informed consent before study enrollment.

**Data collection.** The following variables were obtained from the patients’ medical records: age, gender, pressure ulcer stage, type of wound care dressing used, number of ulcers per patient, and ulcer location and duration (history). Pressure ulcers were staged according to the NPUAP classification, which comprises six stages. An investigator trained in use of the instrument assessed the participants’ pressure ulcers each week using the PUSH tool version 3.0 according to the procedures described in the instrument. Weekly wound assessments continued until the ulcer healed, the resident died or was transferred from the facility, or 8-week follow-up was completed. Wound area in all ulcers was measured with a digital planimetry system (Visitrak, Smith & Nephew Healthcare Ltd., Hull, UK).

**PUSH Tool 3.0.** The PUSH tool is a three-item scale with a possible total score range of 0 to 17. The three wound characteristics considered by the PUSH tool include size (length x width), exudate amount (none, light, moderate, or heavy), and tissue type (necrotic tissue, slough, granulation tissue, epithelial tissue, and closed). To determine a wound severity score, the three PUSH subscale scores are added together. Lower scores suggest less severity and higher scores greater severity (see Figure 1). Because the PUSH tool includes only three wound variables, it takes less than 1 minute to complete.

The PUSH tool differentially weights the three PUSH items. Size is weighted about 3.33 times more heavily than...
exudate amount and 2.5 times more heavily than tissue type. Thus, when using the PUSH tool, changes in wound size may affect the estimated status of the wound more than changes in exudate amount or tissue type.12

The NPUAP suggests that tracking changes in the PUSH score across time provides an indication of changes in wound healing or deterioration. The validity and reliability of the PUSH tool for measuring pressure ulcer healing have been established.5,6,11 The tool can provide a consistent, evidence-based method for communicating wound status toward healing among healthcare providers.

Data analysis. Data were entered in an Excel spreadsheet and analyzed according to a pre-established plan, using the Statistical Package for the Social Sciences (SPSS version 11.0 for Windows, SPSS Inc., Chicago, IL). Repeated measures ANOVA were calculated to compare PUSH scores. P <0.05 was used for statistical significance. The differences between PUSH total scores in healed and unhealed ulcers were analyzed using two-way repeated measures ANOVA.

Results

Seventy-two patients (mean age 66.9 ± 12.8 years) with a total of 86 pressure ulcers and more than 2 months’ life expectancy were enrolled in this study. Of the 86 pressure ulcers, 49% were Stage II, 47% were Stage III, and 4% were Stage IV. Among the 72 patients, 44 (61%) had one pressure ulcer and 28 (39%) had two pressure ulcers. Most ulcers (77%) were at the sacrum. Approximately two thirds of the ulcers had been present for at least 1 month before the study (see Table 1). Twenty ulcers (23%) healed during the study period, all of them Stage II. The average number of weeks to closure was 6.2 ± 3.09. Of the healed ulcers, nine were assessed for 8 weeks, six for 5 weeks, four for 4 weeks, and one for 6 weeks. All the unhealed ulcers were assessed for 8 weeks. No data were missing during this period.

Dressings used included hydrogel dressing (45 patients, 63%), hydrocolloid dressing (20 patients, 28%), and honey soft dressing (seven patients, 9%).

At baseline, the mean PUSH total score was 7.00 ± 0.48 in the healed ulcer and 13.2 ± 2.11 in the unhealed ulcer group (not analyzed for significance). PUSH total scores in the healed and unhealed ulcers over time are shown in Figure 2. Repeated measures analysis showed that PUSH total scores decreased significantly during the 8-week study (F = 365.9, df = 7, P <0.001). Significant differences were noted in PUSH total scores between healed and unhealed ulcers (F = 214.1, df= 1, P <0.001). Week-by-week comparisons of the ulcers revealed that the mean PUSH total scores decreased significantly from weeks 1 through 8 among the healed ulcers (F = 117.4, df = 7, P <0.001). The only significant difference in the total PUSH scores among the unhealed ulcers was noted between weeks 1 and 8 (F = 98.4, df = 1, P <0.001), not between successive weeks (see Table 2).

Analyses of items on the PUSH tool showed that scores of the length-by-width item decreased significantly from weeks 1 through 8 in ulcers that healed (F = 114.8, df = 7, P <0.001); whereas, the difference in the length-by-width item scores was significant only between weeks 1 and 8 in the unhealed ulcers (F = 213.2, df = 1, P <0.001). The other item scores — ie, tissue type and exudate amount — did not decrease significantly over time in these ulcers (P >0.05).

Discussion

Wound assessment is pivotal to the development of the plan of care and evaluation of healing.1,13 Terminology describing wound assessment is not standardized nor has consensus been reached on the most appropriate wound healing parameters to monitor. Several approaches to wound assessment are available12 but no single approach has been found superior to the others in evaluating wounds. As a result, lack of a well-defined, universal approach to wound assessment has resulted in confusion among practitioners and inconsistencies in documentation.14

Wound documentation can be improved by using valid, reliable, and efficient measuring tools.15,16 The primary purposes of a wound assessment tool should be to monitor the

### Table 1. Baseline patient and wound characteristics

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Mean Age (SD)</th>
<th>Pressure Ulcer Stage, n (%)</th>
<th>Ulcer Location, n (%)</th>
<th>Ulcer Duration, n (%)</th>
<th>Patients with one ulcer, n (%)</th>
<th>Patients with two ulcers, n (%)</th>
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<tbody>
<tr>
<td>Mean Age (SD)</td>
<td>66.9 ± 12.8 years</td>
<td>Stage II 43 (49%)</td>
<td>Sacrum 66 (77%)</td>
<td>≤2 weeks 18 (20.9%)</td>
<td>51 (71%)</td>
<td>51 (71%)</td>
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<tr>
<td>Men, n (%)</td>
<td>51 (71%)</td>
<td>Stage III 40 (47%)</td>
<td>Trochanter 20 (23%)</td>
<td>&gt;2 weeks to 1 month 20 (23.3%)</td>
<td>44 (61%)</td>
<td>44 (61%)</td>
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<tr>
<td>Pressure Ulcer Stage, n (%)</td>
<td></td>
<td>Stage IV 3 (4%)</td>
<td></td>
<td>&gt;1 month to 4 months 48 (55.8%)</td>
<td>28 (39%)</td>
<td>28 (39%)</td>
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<td>Ulcer Location, n (%)</td>
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<td>Ulcer Duration, n (%)</td>
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<td>Patients with one ulcer, n (%)</td>
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<td>Patients with two ulcers, n (%)</td>
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### Table 2. Average baseline Total PUSH and Item Scores

<table>
<thead>
<tr>
<th>Total PUSH score (SD)</th>
<th>9.88 (1.52)</th>
<th>7.00 (0.48)</th>
<th>13.2 (2.11)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length x width item (SD)</td>
<td>6.8 (2.05)</td>
<td>3.9 (1.98)</td>
<td>10.1 (1.65)</td>
</tr>
<tr>
<td>Exudate item (SD)</td>
<td>1.9 (0.95)</td>
<td>1.8 (0.78)</td>
<td>2.3 (0.97)</td>
</tr>
<tr>
<td>Tissue type item (SD)</td>
<td>2.7 (0.81)</td>
<td>2.3 (0.97)</td>
<td>3.0 (0.90)</td>
</tr>
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</table>
progress of healing and to detect nonhealing wounds early in the repair process. In addition, the tool must be sensitive to change over time and simple to use. In the present study, the mean score for the PUSH tool decreased significantly over time. This result corroborates the sensitivity of the tool to change. Similarly, 23 of the participants in the Ratliff and Rodeheaver study experienced a decrease in their PUSH score over the 2-month study period.

Although total PUSH scores decreased significantly over 8 weeks in the healed ulcers, there was a significant decrease between weeks 1 and 8 in the unhealed ulcers. The mean scores for PUSH tool were consistent with the healing outcomes. These results confirm the ability of the tool to differentiate healing from nonhealing ulcers. This tendency also was observed by Gardner et al.

When the researcher analyzed the items in the PUSH tool separately, only length-by-width decreased significantly from weeks 1 through 8 among the healed ulcers. Similarly, Gardner et al. found that only the scores of length x width item decreased significantly among the healed ulcers. As mentioned before, the PUSH tool differentially weights the three PUSH items. Size is weighted about 3.33 times more heavily than exudate amount and 2.5 times more heavily than tissue type. Thus, when using the PUSH tool, changes in wound size may affect the estimated status of the wound more than changes in exudate amount or tissue type. Because tissue type and exudate amount did not change appreciably from week to week, the wound size parameter of the tool contributed to changes in the PUSH score in these studies. Additionally, the literature underscores that percentage of area reduction is an important predictor of healing within the first few weeks of treatment. Specifically, a percentage of area reduction <20% to 40% over the initial 2 to 4 weeks is a reliable indicator
that the wound is not responding well to treatment. The results of the present study confirm these observations and raise the question of whether regular wound area measurements would be sufficient to monitor healing. Meanwhile, it is important to note that clinically important wound changes may not be detected by PUSH score changes. The PUSH tool was not sufficient to assess deep wounds because wound volume or the extent of undermined margins could not be adequately assessed. For example, large wounds could show considerable improvement but the PUSH scores remained unchanged. Therefore, additional assessments such as wound depth, a size subscale, should be included in the tool.

This study demonstrates that the PUSH tool 3.0 provided a method for quantitatively describing current wound status. If sequential assessment scores are tracked across time, it establishes a basis for identifying changes in wound status.

Study Limitations
This trial had several limitations. First, the size of the study restricted its power. Secondly, because dressing type was not standardized for each ulcer, the effect of the dressing type on healing outcome was not analyzed and it may have influenced assessment of wound exudate. It is suggested that this factor should be investigated in future studies. Additionally, studies using larger and more diverse samples are needed to determine that wound area measurements may be used instead of the PUSH tool to monitor healing.

Conclusion
Numerous wound assessment tools have been developed and used in clinical practice. However, sufficient evidence for using one tool over another does not exist. The present study sought to prospectively evaluate the use of the PUSH tool. In this study, the PUSH tool accurately differentiated the healing outcomes of pressure ulcers. The PUSH tool version 3.0 may be used to provide the clinician with information that would show whether the wound showed positive progression. Although a clinically practical tool, the PUSH tool would benefit from some additional assessments such as wound depth information/size subscale to improve its value.

References