

# Effect of Weekly Specialized Surgeon-led Bedside Wound Care Teams on Pressure Ulcer Time-to-heal Outcomes: Results From a National Dataset of Long-term Care Facilities

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## Abstract

**Introduction.** Delayed healing of pressure ulcers (PUs) in long-term care facilities (LTCFs) is associated with increased morbidity and expense. **Objective.** The authors hypothesize that guideline-based, weekly coordinated care using specialized wound care surgeon-led bedside teams (SLBTs) may improve PU time-to-heal (TTH) outcomes when compared with usual care (UC). **Materials and Methods.** Using a deidentified United States nationwide database, the authors retrospectively compared TTH outcomes of PUs diagnosed in LTCFs treated by either weekly SLBTs or UC. The SLBTs included an external specialized wound care surgeon (with or without a physician assistant and nurse practitioner) collaborating with facility nurses. Usual care was defined as all patient encounters not known to incorporate this team process. Variables assessed included patient age, gender, and comorbidities. The primary outcome measure was TTH; the TTH outcomes then were compared graphically and statistically between groups. Statistical significance was double-sided  $P < .05$ . **Results.** In 2014, there were 39 459 consecutive PUs treated by UC and 5985 by SLBTs. The 5985 SLBT wounds originated from 3435 patients in 10 states and all geographic regions (mean age, 76.6 years; 55.9% female; 42.8% with hypertension; 23.7% with diabetes). The mean TTH for wounds managed by SLBTs was 47.5 days (median, 21 days) versus 69.0 days (median, 28 days) for wounds managed by UC, corresponding to an absolute TTH decrease of 21.5 days in wounds managed by SLBTs versus UC. Wounds managed by SLBTs also were significantly more likely to heal in less than 28 days ( $P < .0001$ ). **Conclusions.** Pressure ulcers managed by coordinated nursing and weekly SLBTs appear to heal significantly faster than wounds managed by UC. Further studies are required to confirm these hypothesis-generating results.

## Key words

pressure ulcer, pressure injury, surgeon, surgeon-led team, wound care, long-term care, wound healing, quality of care, outcomes

## Index

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The management of chronic, nonhealing wounds, and specifically pressure ulcers (PUs), in patients in long-term care facilities (LTCFs) is an area of continued research. Delayed or failed healing of these wounds is associated with increased morbidity, sepsis, hospital readmission, and mortality, as well as significant expenditures of time, money, and limited staffing resources.<sup>1-4</sup> A review of death and severe harm incidents reported to the British National Reporting and Learning System<sup>4</sup> found PUs were the most common patient safety incident in 2011 to 2012, accounting for 19% of all reports. In

the United States, up to 24% of patients in LTCFs will acquire a PU, with an average cost of as much as \$70 000 per ulcer and potential total annual costs of \$11 billion.<sup>5</sup> Similarly, the estimated annual cost in the United Kingdom in 2004 was between £1.4 billion and £2.1 billion.<sup>6</sup>

In addition to efforts to decrease incidence, numerous regulatory initiatives have been implemented to improve the outcome of patients with existent PUs in LTCFs.<sup>1,4,7-9</sup> However, it remains unclear precisely which factors most affect PU time-to-heal (TTH) outcomes.<sup>5</sup> Further, although in-

creased physician or surgeon involvement has been encouraged,<sup>10,11</sup> it remains unclear if additional direct bedside management of PUs in LTCFs by a surgeon is beneficial to patient or ulcer outcomes. Many LTCFs have medical directors or staff who are not surgically trained and thus may be uncomfortable or unable to immediately surgically debride these wounds at the bedside during regular rounds. In this article, the authors sought to determine whether guideline-based,<sup>1,2,4,7,9</sup> weekly coordinated care between facility nursing staff and specialized wound care surgeon-led bedside teams

**Table 1.** Baseline characteristics of patients treated by SLBT

BASILINE CHARACTERISTICS	SLBT
Total no. of wounds	5985
Total no. of patients	3435
Male (%) / Female (%) patients	1514 (44.1) / 1921 (55.9)
Wounds/patient	1.74
Mean age, y (range)	76.6 (19–115)
Sex	
Male-associated wounds (%)	2830 (47.3)
Female-associated wounds (%)	3155 (52.7)
Diabetes-associated wounds (%)	1419 (23.7)
HTN-associated wounds (%)	2560 (42.8)
Mean TTH, d (SD)	47.5 (68)
Median TTH, d	21
Percentage of wounds healing in <28 d (%)	56.3

SLBT: surgeon-led bedside team; y: year; HTN: hypertension; SD: standard deviation; TTH: time-to-heal; d: day

**Table 2.** Pressure ulcer TTH by treatment cohort

	UC	SLBT
Total no. of wounds	33 474	5985
Mean TTH, d (SD)	69 (n/a)	47.5 (68)
Median TTH, d	28	21
Percentage of wounds healing in < 28 d (%) <sup>b</sup>	50.0	56.3

TTH: time-to-heal; UC: usual care; SLBT: surgeon-led bedside team; d: day; SD: standard deviation

<sup>a</sup> Standard deviation was not available for the usual care group.

<sup>b</sup> z score and chi-square  $P < .0001$

(SLBTs) might improve PU TTH outcomes when compared with usual care (UC).

## MATERIALS AND METHODS

Using a large, deidentified US nationwide patient database, the authors retrospectively compared TTH outcomes of PUs diagnosed in LTCFs treated by either weekly SLBTs or UC. Surgeon-led bedside teams consisted of a specialized wound care surgeon and 1 or more facility nurses, with or without a physician assistant and nurse

practitioner, such as a wound-specialized physician assistant or nurse practitioner. Facility nurses and staff were provided regular training and continuing education courses by either the rounding specialized wound care surgeon or a regional wound care surgeon. All wound care surgeons were board certified in plastic surgery, vascular surgery, or general surgery and had received additional education in wound care. The wound care surgeons (with or without a physician assistant and nurse

practitioner) were not from the facility; they were external surgeons who came to the facilities specifically for rounding on the wound care patients. The SLBTs provided guideline-based weekly care as indicated and included immediate bedside debridement as necessary, with or without local anesthesia. Usual care was defined as all patient encounters not specifically known to incorporate this SLBT process and, as expected from a national dataset, included a wide mix of real-world current practices from varied practitioners.

Outcome data from all patients were entered contemporaneously into a widely used wound care software platform developed by a large, national, third-party health care information and electronic medical records management firm (WoundExpert; NetHealth, Pittsburgh, PA). This software is used by 83% of wound care clinics that have adopted electronic health records.<sup>12</sup> Usual care TTH measures of central tendency (mean, median) were extrapolated and analyzed from the PU nationwide outcomes and benchmark reports from this firm.<sup>12</sup> Variables assessed included patient age, gender, and comorbidities.

The primary outcome measure was TTH, defined by subtracting the date of resolution from the date of diagnosis for wounds classified as healed. The results were analyzed on an individual wound basis, regardless of whether the patient had multiple wounds. Wounds were excluded if they were missing data. Histograms and measures of central tendency then were compared graphically and statistically between groups. Using the arithmetic assumption that 50% of the parent dataset's wounds healed less than and greater than their median TTH, both a z score and chi-square comparison of proportions was used to determine whether the proportion of PUs healing faster than the national median was significantly different with SLBTs. Statistical significance was defined as double-sided  $P < .05$ .

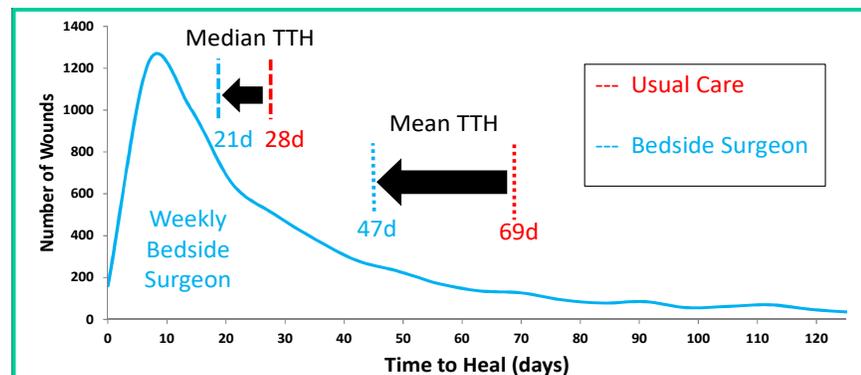
## RESULTS

Between January 1, 2014, and December 31, 2014, there were 39 459 consecutive PUs treated and entered contemporaneously

into the wound care software database. Of these, 5985 were known to be managed by SLBTs, and the remainder (33 474) were classified as UC. Patient characteristics of the patients managed by SLBTs are displayed in **Table 1**. The 5985 SLBT wounds originated from 3435 unique patients in 10 states and all geographic regions and socioeconomic strata (average age, 76.6 years; 55.9% female). In the SLBT group, there was an average of 1.74 wounds per patient. Unfortunately, only the total number of wounds was available from the rest of the national dataset (but not total number of patients or individual patient demographic information). Of the wounds managed by the SLBTs, 42.8% were associated with patients with hypertension and 23.7% were associated with patients with diabetes. Time-to-heal data are presented in **Table 2**. The mean TTH for wounds managed by SLBTs was 47.5 days (median, 21 days) versus 69.0 days (median, 28 days) for wounds managed by UC. This represented a 25% decrease in median TTH (from 28 days to 21 days) and an absolute decrease of 21.5 days faster healing on average. Wounds managed by SLBTs (**Figure**) also were significantly more likely to have healed in < 28 days than wounds managed by UC ( $P < .0001$  for  $z$  score and chi-square).

## DISCUSSION

Pressure ulcers remain a common and serious problem for residents of LTCFs. In addition to their prevention, the rapid management and resolution of these wounds is critical to the health and well-being of such patients.<sup>1-5,7,13-16</sup> In addition, rapid healing of these wounds is beneficial to the facilities and staff, as it may be expected to reduce costs and expenditures of both time and staffing. In 2013, the US Department of Health and Human Services Agency for Healthcare Research and Quality reported a comprehensive comparative study of more than 1800 wound care articles<sup>5</sup> in an attempt to clarify and compare the effectiveness of various interventions for improving PU wound care outcomes. They attempted to study factors, such as wound care teams and facility type, but were unable to find



**Figure.** Distribution of healing times for pressure ulcers with weekly bedside surgeon oversight, with comparison of measures of central tendency versus usual care.  $P < .001$  for both  $z$  score and chi-square test. TTH: time-to-heal; d: day

studies that stratified outcomes by facility type or team intervention.<sup>5</sup> The authors hope the present study helps provide some additional data for such efforts.

Using a large national dataset, the authors demonstrated that PUs appear to heal more quickly in LTCFs that use weekly surgeon-led rounds directly at the bedside, resulting in an absolute decrease of mean healing time by more than 3 weeks compared with UC. The results appear robust, because such facilities achieved a 25% decrease in median TTH (from 28 days to 21 days) and an absolute decrease of 21.5 days faster healing on average. Given the limitations of this study, these findings should be considered hypothesis-generating and will require additional randomized or case-controlled studies to confirm.

The reasons for the decrease in TTH are unclear, but the authors speculate several key components likely explain the bulk of the findings. First, having a surgeon available to immediately and aggressively debride PUs without delay or need for scheduled appointment, patient transfer, or further consultation shortens the management timeline and therefore quickens the healing of these wounds.<sup>17,18</sup> Second, open lines of communication between nursing staff and qualified wound care surgeons with regularly scheduled, guideline-based appointments and rounds likely facilitates the rapid identification and management of issues as they arise con-

temporarily and optimizes the implementation of standardized guideline-based treatment protocols. This may improve nursing education and potentially could aid in identification and early treatment of PUs. Finally, the knowledge that a rounding surgeon will be making routine wound checks may also positively bias the facility care providers to spend additional time and efforts addressing these wounds.

Guideline-based wound care has been studied in the LTCF setting. A relatively large prospective multicenter study of a mixed-wound LTCF population by Bolton et al<sup>13</sup> using standardized treatment (but not inclusive of routine bedside surgeons) revealed the average TTH for full-thickness PUs using guideline-based recommendations to be about 62 days and even faster for partial-thickness wounds. In their study,<sup>13</sup> the plurality of the 767 total wounds were PUs, of which 373 were full-thickness (stage 3-4). There also were 134 partial-thickness PUs, which healed in an average of 31 days. Although they<sup>13</sup> did not compare with a cohort without guideline-based care, these results do generally appear consistent to the present study findings (with guideline-based care and SLBTs, PUs averaged 47.5 days TTH). Again, both their findings<sup>13</sup> and the present results seem to support, in general, TTH with guideline-based care is faster than UC (in the nationwide UC cohort, average TTH was 69 days). Although previous large studies vary widely in outcomes, it does

appear the UC cohort outcomes in this study are in line with multiple previously reported studies<sup>5,19,23</sup> that looked at mean and median TTH outcomes for PUs.

Notably, the incorporation of physicians into the wound care program of LTCFs is not new. For instance, the new Resident Assessment Instrument from the Centers for Medicare & Medicaid Services recommends the medical director “can and should assume a leadership role” in education and collaboration with primary care physicians and wound care clinicians, and they posit that integrating the medical director into the facility’s wound care program will improve the quality of care for LTCF patients.<sup>11</sup> However, medical directors are not typically surgeons, nor are they often experts in wound care, and integrating this physician into the program rarely is expected to include the medical director performing bedside surgical care.

The value of surgical debridement, a multidisciplinary team approach, and routine reassessment in the management of PUs in the elderly has been acknowledged for many years.<sup>4,7,24,25</sup> In the LTCF population specifically, Anvar and Okonkwo<sup>26</sup> recently demonstrated the feasibility of bedside surgical debridement while studying the outcomes of 227 nursing home patients with sacrum, sacrococcyx, coccyx, ischium, and trochanter PUs. After debriding 190 wounds in these patients, they reported the interventions to be well tolerated, with a median TTH of 137 days in what appears to have been a complex patient cohort. However, in the LTCF population specifically, there are no large studies similarly comparing bedside surgical wound care against UC, although others<sup>10,26</sup> have described providing general surgical care for geriatric patients successfully within LTCFs.

One notable study<sup>27</sup> of this population is the experience at the Johns Hopkins Bayview Medical Center, in which from 1991 to 1994 Zenilman et al<sup>27,28</sup> developed the “Geriatric Surgery Consult Service” specifically to meet the surgical care needs of chronically ill elderly patients residing at an affiliated nursing home. This service

was led by a general surgeon, and Zenilman<sup>27</sup> posited that such a service could be “critical in ensuring that proper care is delivered to the healthy geriatric or frail elderly patient in a nursing home.” Nonetheless, even this landmark service did not routinely engage in routine bedside care by a general surgeon for the patient of LTCFs, as the authors have done in the study described herein, and instead relied on a routine centralized location for referrals of such patients.

A decade later, Zenilman’s group updated their study and reported on a relevant separate subset group of 105 nursing home patients treated by a geriatric surgical consult service based directly at a community geriatric center.<sup>10</sup> These patients all had chronic PUs, and “most ... were debrided at the bedside in the nursing facility.” Unfortunately, although the study period spanned more than 2 years, each patient only received a single debridement, and no information about the wound outcomes were provided, only actuarial survival rates of the patients themselves.<sup>10</sup>

Nonetheless, Zenilman’s group goes to lengths to speak about the need for dedicated integrated multidisciplinary surgical care for these residents<sup>10</sup> and also carefully considers the evolving ethical issues of treating patients of advanced age and morbidity. As they state, “Although the surgical approach to the healthy and frail elderly patient may be basically the same as normal surgical care, the ultimate goals ... are quite different. ... [The] focus must shift from maximizing survival to maximizing also the quality of life, dignity, and minimizing suffering.”<sup>27</sup> However, they further note the goal of maximizing quality of life does not equate to eliminating surgical interventions. Rather, they advocate “early identification of problems and aggressive preventive surgical care [as] actually more palliative than waiting for problems to develop.”<sup>27</sup> The present authors agree and believe the intervention of SLBTs contributes to achieving the goals of palliation and improved quality of life while also minimizing the inconvenience to patients of LTCFs and the interference with their treatment and care routines.

## LIMITATIONS

The present study is not without limitations. Notably, the nationwide outcomes for UC were derived from multiple facilities with differing practice patterns and patient populations, and data were available on a per-wound basis but were lacking in terms of individual patient characteristics. There may be differences among the patient populations, practice patterns, facility quality, or other factors unknown to the authors that could limit generalizability of the results. Nonetheless, the large size and geographic variation of the data set may serve as a strength and offset small variations in patient demographics, wound characteristics, and treatment paradigms at the individual level. The fact that outcomes of the UC cohort are similar to other published large data sets would seem to bolster this explanation.<sup>5,13</sup>

Likewise, the LTCFs that utilized the SLBTs are generally representative of national demographics and were not self-selected by facilities treating patients of higher socioeconomic status. The SLBT cohort thus represented the full range of facilities in all socioeconomic strata. The authors would assume that with the widespread use of the platform used herein, there is a similar mix of facility qualities in the UC group. Nonetheless, it remains possible that there were differences in facility quality that the authors were unable to assess, therefore possible selection bias may be a factor in the findings of this study. In addition, the wounds were not classified by depth or stage, and it is possible the SLBT group had a lower proportion of severe PUs than the UC group. It is also possible that a small fraction of the TTH reduction could be arithmetic artifact. For example, without regular weekly bedside rounds, if a wound healed in 4 weeks but was not seen in the UC clinician’s office until 5 weeks, it artifactually would appear the healing was delayed by 1 week. However, the authors believe the entirety of the 3-week average reduction in TTH unlikely to be explained by such artifact.

Finally, the analysis is retrospective and not randomized. Although the large number of patients may serve to bolster the robustness of the findings, randomized prospective trials would be more definitive.

## CONCLUSIONS

Pressure ulcers remain a common and serious problem for patients of LTCFs. In this retrospective national database study, the authors found PUs managed by coordinated nursing and weekly SLBTs appear to heal significantly faster than wounds managed by UC, resulting in an absolute decrease of more than 3 weeks' healing time. Limitations of the data set may limit the strength of these conclusions, therefore further studies are required to confirm these hypothesis-generating results. **W**

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