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Validation of the NE1 Wound Assessment Tool to Improve Staging of Pressure Ulcers on Admission by Registered Nurses

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Background and Purpose: There is a need for a simple bedside tool to improve the ability of nurses to identify skin alterations, describe wounds, and stage pressure ulcers for proper care management and present on admission documentation. This study tests the test–retest reliability and criterion validity of the NE1 Wound Assessment Tool (NE1 WAT), a single-use tool featuring wound pictures and stage descriptions according to National Pressure Ulcer Advisor Panel criteria. **Methods:** Registered nurses ($N = 94$) identified and staged 30 wound photographs under 3 test conditions: (a) without NE1 WAT, (b) with NE1 WAT after viewing a 10-min instructional presentation, (c) with NE1 WAT but no additional instruction after a 7–14-day delay. **Results:** Out of a possible 90 points, scores increased 12.3 points between Tests 1 and 2 ($p < .001$) and 14.1 points between Tests 1 and 3 ($p < .001$). Test–retest reliability was high: intraclass correlation coefficient (ICC; 3, 1) = .892 (95% confidence interval [CI]: 0.840–0.927). **Conclusions:** The NE1 WAT is a simple tool that, with little training, improved the skin assessment ability of registered nurses.

Keywords: pressure ulcer; registered nurse; nursing assessment; tool validation

Skin alterations, wounds, and pressure ulcers can become serious medical conditions that require intensive efforts by nurses to assess, monitor, prevent complications, and treat. Significant financial and human costs are associated with alterations in skin integrity. In the United States, the estimated cost of care for pressure ulcers per incidence ranges from \$500 to \$50,000—an expenditure that can reach a total of up to \$11 billion each year (Berlowitz et al., 2011; Chan et al., 2012; Russo, Steiner, & Spector, 2008). Pressure ulcers interfere with patient recovery and contribute to excess hospital stay, poor prognosis, and premature mortality (Berlowitz, Brandeis, Anderson,

Du, & Brand, 1997; Graves, Birrell, & Whitby, 2005). An estimated 60,000 patients die each year from complications attributable to pressure ulcers (National Pressure Ulcer Advisory Panel, 2001). Accordingly, the recognition, assessment, and clinical documentation of skin alterations, wounds, and pressure ulcers are important, but these activities are not always accomplished in a consistent and accurate format.

In 2008, the Centers for Medicare and Medicaid Services (CMS) added pressure ulcers to the list of hospital-acquired conditions requiring documentation of present on admission (POA) to receive full reimbursement (Centers for Medicare & Medicaid Services, 2012). CMS will base reimbursement for pressure ulcers on criteria documented at admission (Centers for Medicare & Medicaid Services, 2012; Lyder & Ayello, 2009). For Stage III and IV pressure ulcers, only those with proper POA documentation will be reimbursed at a higher diagnosis-related group rate. Pressure ulcers that develop during a patient's hospitalization or that are not documented at admission will receive no additional reimbursement (Centers for Medicare & Medicaid Services, 2012). Thus, timely and accurate nursing assessment and documentation of skin alterations, wounds, and pressure ulcers are important for billing compliance as well as the creation of a medical treatment plan.

The NE1 Wound Assessment Tool (NE1 WAT, previously called the N.E. One Can Stage tool; NE Solutionz, LLC, Las Vegas, Nevada) was designed to facilitate this assessment of skin alterations, wounds, and pressure ulcers. This article presents results from testing of this tool for use by registered nurses (RNs). A preliminary study indicated that the NE1 WAT has good reliability and validity; subjects with varied levels of experience demonstrated an increased ability to identify skin alterations and accurately stage pressure ulcers with use of this tool (Young, Estocado, Landers, & Black, 2011). The study presented here expands on these results by testing a slightly modified tool with RN subjects from several different geographic areas. This study also contributed to the understanding of the reliability and validity of this tool with a focus on RNs, a population that is likely to be required to document specific details associated with skin alterations without specialized training and competency assessment in this area.

BACKGROUND AND CONCEPTUAL FRAMEWORK

The classification of pressure ulcers into defined categories based on severity can facilitate communication, documentation, and coordination of care among providers. This supports the efficient application of appropriate care and management protocols, which will ultimately affect patient outcomes (Dini, Bertone, & Romanelli, 2006; Whitney et al., 2006). Classification systems developed by the National Pressure Ulcer Advisory Panel (NPUAP) and the European Pressure Ulcer Advisory Panel are widely used to assign stages to wounds of different severity (Black et al., 2007; European Pressure Ulcer Advisory Panel & National Pressure Ulcer Advisory Panel, 2009). Although reliability studies of these systems are generally positive (Beeckman et al., 2007; Defloor & Schoonhoven, 2004; Pedley, 2004), there are some concerns about whether these studies represent the ability of nonexpert practitioners to accurately stage a pressure ulcers (Kottner, Raeder, Halfens, & Dassen, 2009).

Within the acute care environment, RNs perform an initial patient assessment that includes a focus on skin integrity to identify and document the presence of any skin alteration, wound, or pressure ulcer. However, skin assessment by nurses, including wound assessment and staging, can be affected by the nurse's level of training and experience. Although nurse training has been shown to improve the reliability of pressure ulcer staging

(Beeckman, Schoonhoven, Boucque, Van Maele, & Defloor, 2008; Briggs, 2006), there has been a lack of training programs or tools that are cost-effective, have a high rate of retention after training, and are appropriate for any RN regardless of skill level.

Existing tools for wound management are designed to aid providers in various aspects of care. The Braden Scale for Predicting Pressure Sore Risk is primarily intended for pressure ulcer prevention (Prevention Plus, 2013). The Braden Scale is a tool for detecting risk and is not a skin assessment tool. In addition, the predictive ability of the Braden Scale improves with repeated assessment (Bergstrom & Braden, 2002), which may make it less ideal for POA documentation.

Recommended tools for assessing wound status include the Pressure Ulcer Scale for Healing (PUSH tool) and the Bates-Jensen Wound Assessment Tool. Developed and recommended by the NPUP, the PUSH tool contains three variables, one of which is subjective (National Pressure Ulcer Advisory Panel, 2010). This tool scores wound characteristics for monitoring of pressure ulcer status over time but does not contain any photographs to assist providers in assessing wounds. The Bates-Jensen Wound Assessment Tool includes 13 items that direct and help standardize wound assessment (Bates-Jensen, 2001; Bates-Jensen, Vredevoe, & Brecht, 1992). Scoring of the wound based on the provider's assessment aids in tracking wound progression and healing, but the specificity of this tool requires providers to have knowledge of or be trained in wound vocabulary and wound assessment. The development of a pictorial guide aids in training with this tool but this guide is not conducive to easy reference at the bedside (Harris et al., 2010). Various other wound pocket guides, posters, and reference tools exist to help the clinician classify wounds. However, the persistent lack of accuracy and transparency in wound documentation suggests that these tools are inadequate or not easily accepted into the provider's workflow.

Neither the PUSH nor the Bates-Jensen tools promote wound photography. Although commercially available products exist to aid the photography of wounds at admission and during a patient's stay, these tools are primarily suited for capturing wound size and standardizing photographic documentation. In general, these tools do not assist with wound classification or assessing the level of tissue damage nor has their effectiveness in clinical use been studied.

The NE1 WAT was designed to assist the average bedside clinician to accurately assess skin alterations, wounds, and pressure ulcers. This tool addressed inconsistency in wound classification, wound measurement, and wound photography by simplifying a complicated wound classification system. The NE1 WAT was designed to facilitate more effective communication among health care workers by giving them standardized language to describe skin alterations and their characteristics, which has implications for the initiation of appropriate patient care and receiving reimbursement for care of pressure ulcers from third party payers. Designed to be simple and cost-effective, the tool uses real wound pictures to represent possible classifications. In addition, the NE1 WAT promotes standard wound photography to allow for measurement of wound size, comparison between photographs, and incorporation into the patient's medical records.

DESCRIPTION, ADMINISTRATION, AND SCORING OF THE INSTRUMENT

The NE1 WAT was developed by a physical therapist and certified wound expert with 22 years of clinical experience (Nancy Estocado). Development centered on the perceived need for a tool that would improve accuracy in wound classification, be valid and reliable when used by

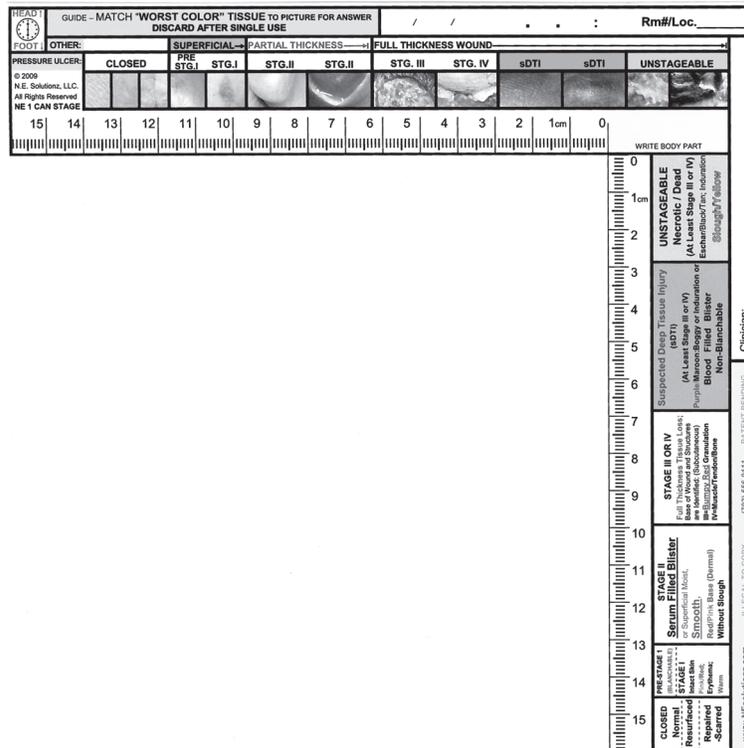


Figure 1. The NE1 Wound Assessment Tool (NE1 WAT). The NE1 WAT contains representative pictures and descriptions of pressure ulcer classifications according to National Pressure Ulcer Advisory Panel criteria. Other features (metric ruler, space for date/time/clinician signature) aid in documentation for patient chart.

all clinicians, standardize wound measurement and wound photography, promote coordination and communication between health care teams, and assist with POA documentation and compliance with existing regulations. The developer consulted with five wound care specialists with 81 years of combined wound care experience. These specialists contributed their expertise, critical review, and construct assessment throughout the tool development process.

Each component of the NE1 WAT was designed to meet existing regulations and address observed obstacles for clinicians. The NE1 WAT contains written descriptions and representative pictures of pressure ulcers for each NPUAP stage (Figure 1). The representative pictures are on one arm of the “L”-shape tool to allow for easy references and matching of worst wound color when framed around the wound. The metric-ruled border on both arms was intended to help increase accuracy and consistency of length and width measurements.

Additional elements include spaces for key documentation elements such as date, time, body part, and clinician signature. A gentle, non-latex adhesive back holds the tool in place on the patient’s skin during use. An orienting marker ensures consistent placement for photographic documentation. Together these attributes can encourage complete and accurate wound photo documentation for later reference or incorporation into the patient medical record. The tool is intended for single-use only.

The representative pictures for the tool were obtained from Sunrise Hospital (Las Vegas, Nevada). All patients signed consent to photograph at admission. Photographs used in the tool contained no patient identifying markers. Photographs were reviewed by the Institutional Review Board (IRB) at Sunrise Hospital prior to use.

Minor updates were made to the tool based on clinician and expert feedback after the initial study (Young, et al., 2011). The category of “pre-Stage 1” was added. The term *healed* was changed to *closed* to more correctly represent the physiological changes associated with wound healing. Three subclassifications were added to closed: normal (healed), resurfaced (history of partial-thickness injury), and repaired (history of full-thickness injury). In addition, several wound pictures were changed to better represent the condition, picture sizes were increased, and a clinician signature line was added.

METHODS

Design

This study used a repeated measures design to determine the test–retest reliability and criterion validity of the NE1 WAT when used by RNs.

Setting and Participants

This study was sponsored by the Hospital Corporation America (HCA) Nursing Research Network (NRN). Founded to encourage development of evidence in nursing practice, the NRN promoted this study to its member hospitals and supported their participation. Nine acute care community hospital sites in four states (Texas, Kentucky, Virginia, and Nevada) volunteered to participate.

Subjects for this study were RNs who perform skin and wound assessments as a part of their routine work duties in acute care hospitals. A convenience sample of RNs was recruited from the acute care hospital sites that agreed to participate in the study. The participant pool consisted of 107 RNs. All participants completed a survey about nursing education, experience, and skill level immediately prior to the study. This demographic information was not matched to test results.

This study was approved by the IRB of each participating facility. All participants provided informed consent upon enrollment. Study burden was estimated at 5 hr per participant to complete all study activities. Participation was voluntary, and neither subjects nor facility moderators were compensated for their time.

Data Collection

Prior to study initiation, 30 wound scenarios, consisting of a wound photograph and brief case description, were prepared (Figure 2). Wound photographs were obtained from patients at Sunrise Hospital. Patients provided consent to photograph, and no patient identifying marks were included in the photograph. All photographs received IRB approval prior to use. The 30 wound scenarios were evaluated by a team of five wound experts with an average of 30 years of experience each. These experts determined the correct wound assessment for each wound by consensus. Of the 30 wound scenarios, 17 were of pressure ulcers and 13 were of other wound types.

"N.E. 1 CAN STAGE"
SKIN AND WOUND ASSESSMENT STUDY

- **LOCATION (ANATOMICAL SITE):** RIGHT BACK HEEL

- **Patient History:** 81year old Hispanic male who suffered a recent stroke with left hemi-paresis. He was transferred to our Emergency Department from a nursing home due to low blood pressure. He is a diabetic and can not lift his leg or turn on his own.

- **Palpated** (touched) skin/wound and compared to adjacent tissues and found:
(findings are in red)
- ***Temperature:** Cool / Normal / Warm
- ***Texture:** Intact skin / Boggy /Soft / Normal / Firm / Hard
Non-intact skin / Smooth /Bumpy / Bone / Muscle /Tendon
- ***Blanch Test** (capillary refill of intact skin): Blanching / Non-Blanching

Case Study

1

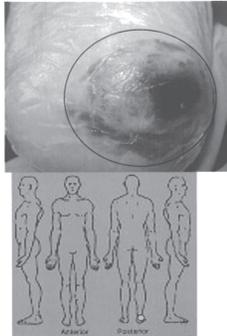


Figure 2. Sample of a wound scenario as presented to study participants. Each scenario featured a full-color wound photograph and brief case description.

Question 1	Select the <i>worst color</i> tissue type located in the circle area on wound picture (choose one): (A): Black (Worst) (B): Yellow (C): Purple (D): Red (E): Opaque (F): Pink (G): Normal (Best)
Question 2	Does this wound picture represent a Pressure Ulcer ? If yes , choose the stage. If no , select the choice that states the wound picture does not represent a pressure ulcer. (A): This wound picture does not represent a pressure ulcer (B): Pressure Ulcer - Unstagable (C): Pressure Ulcer - "sDTI" Suspected Deep Tissue Injury (D): Pressure Ulcer - Stage IV (E): Pressure Ulcer - Stage III (F): Pressure Ulcer - Stage II (G): Pressure Ulcer - Stage I (H): Pressure Ulcer - Pre-Stage I (I): Pressure Ulcer - Closed
Question 3	Does this wound picture represent an " Other " type of wound? If yes , choose the level of tissue damage. If no , select the choice that states the wound picture does not represent an " Other " type of wound. (A): This wound picture does not represent an " Other " type of wound. (B): Other Wound - Full Thickness (C): Other Wound - Partial Thickness (D): Other Wound - Superficial (E): Other Wound - Closed

Figure 3. Test questions that accompanied scenarios; questions were presented via a learning management system.

The 30 wound scenarios were presented to each participant in a printed booklet. All copies of the booklet of scenarios were produced in a single printing to control the color and quality of the wound photographs. The same booklet was used for all test conditions.

The reliability and validity of the NE1 WAT in improving the skill of RNs in staging pressure ulcers was evaluated by asking subjects (RNs) to assess these 30 wound scenarios in three different test conditions: (a) without the NE1 WAT; (b) with the NE1 WAT after a brief instruction session; and (c) retest with the NE1 WAT, after a 7–14-day delay and no additional instruction. During the test, participants were instructed to review each scenario and answer three multiple-choice questions for each of the 30 scenarios (Figure 3). Scoring for study subjects was based on the whether the participant's assessment of each scenario agreed with the previously established expert consensus as measured by the multiple-choice test questions.

The three test conditions were administered during two proctored sessions. A test proctor distributed the test materials, administered the test, and collected all materials from participants at exit. Test proctors received training so that test administration details were identical at every study site.

In the first proctored session, the subject was provided with the printed booklet of wound scenarios and access to a learning management system where Test 1 was administered without the NE1 WAT. Immediately after the first test, the subject completed a 10-min e-learning session that provided instruction in the use of the NE1 WAT. After this instruction, the subject was provided with the NE1 WAT, and Test 2 was administered via the learning management system using the NE1 WAT and the printed booklet. The NE1 WAT and the printed booklet of wound scenarios were collected by the proctor at the end of the first session. The subject returned 7–14 days after the first session to complete the third test. During this second proctored session, the subject was provided with the printed booklet of wound scenarios, the NE1 WAT, and access to the learning management system for Test 3. No additional instruction on how to use the NE1 WAT was provided for Test 3. Participants were not given any feedback on their performance for any individual question or on the test as a whole.

Statistical Analysis

Data were analyzed from those participants who completed all three test administrations (94 out of 107 total participants). All statistical analyses were performed using SPSS Version 18 (Chicago, IL).

The NE1 WAT was analyzed for test–retest reliability between Test 2 and Test 3 using an intraclass correlation coefficient (ICC) in the Shrout and Fleiss convention (Shrout & Fleiss, 1979).

Paired *t* tests were used to assess criterion validity and the NE1 WAT to improve the ability to identify and stage wounds, skin alterations, and pressure ulcers. Paired *t* tests were carried out between Tests 1 and 2 and between Tests 2 and 3. The alpha level was set at .05. Experiment wide error was controlled with a conservative Bonferroni correction for significance.

RESULTS

Demographics

Participants were RNs with a range of educational preparation. Choosing all that apply, most (61%) participants reported having a bachelor of science in nursing degree, 32% reported an associate degree in nursing, 16% reported a bachelor's degree in other fields,

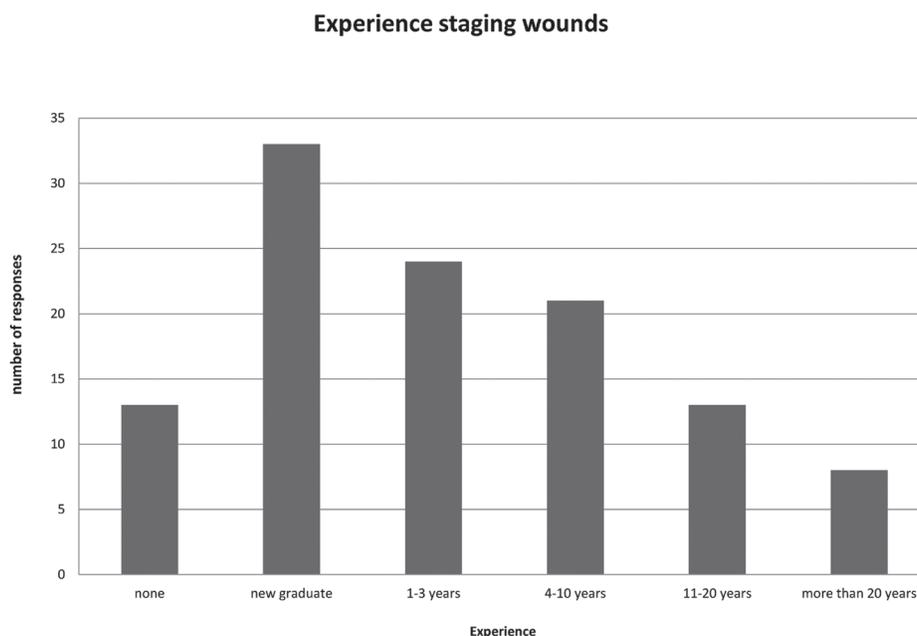


Figure 4. Participant self-assessment of experience staging wounds. *Note.* Total number of participants = 107.

7% reported a diploma, and 2% reported a master's degree in nursing or other field. Nearly one-third (30%) assessed themselves as new graduates with less than 1 year of experience staging wounds. Approximately 21% had 1–3 years of experience, and 18% had 4–10 years of experience (Figure 4). Almost all (97%) had no special training in skin assessment or pressure ulcer staging, which correlates with the overall average self-assessment of clinical skill in assessing skin status for pressure ulcers and other problems as “fair” (43%; Figure 5).

Test Results

Participants ($N = 94$) were scored on correct responses for each of the three test conditions. Only participants that completed all three tests were included. Average percent correct by scenario for each test condition is presented in Table 1. Percentage of correct for pressure ulcer scenarios is based on responses to test Question 2 (evaluation of wound as potential pressure ulcer and determination of stage) for each applicable scenario. Percentage of correct for other wound scenarios is based on responses to test Question 3 (evaluation of wound as an “other wound” and determination of depth of tissue damage) for each applicable scenario.

Reliability. Test–retest reliability was determined by comparing the percentage of correct responses on Test 2 to the percentage of correct responses on Test 3 using an ICC. For the 94 participants that completed all three test administrations, test–retest reliability was high: $ICC(3,1) = .892$ (95% CI: 0.840–0.927).

Validity. Criterion validity for the tool was evaluated by comparing scores between Tests 1 and 2 and between Tests 1 and 3. Between the first and second tests, average score improvement was 12.3 points ($SD \pm 8.4$) out of 90 points, $t(93) = 14.2$, $p < .001$. Scores

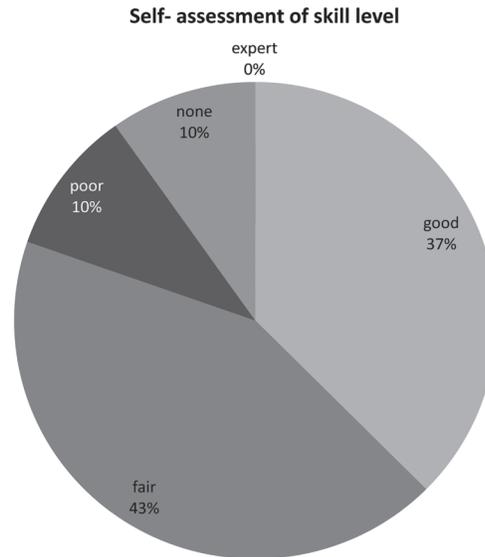


Figure 5. Participant self-assessment of clinical skill level for assessing human skin status for pressure ulcers and nonpressure skin problems. *Note.* Total number of participants = 107.

TABLE 1. Percent Correct by Wound Type and Test Condition

Wound Type	Number of Scenarios	Percent Correct		
		Test 1	Test 2	Test 3
Pressure ulcer				
Closed	2	23.3%	54.0%	60.4%
Pre-Stage 1	1	75.2%	87.1%	89.1%
Stage 2	2	42.6%	82.2%	77.2%
Stage 3	2	48.5%	44.6%	57.9%
Stage 4	2	70.3%	78.2%	78.2%
sDTI	4	36.9%	62.4%	62.1%
Unstageable	4	38.1%	55.0%	59.2%
Other wound				
Superficial thickness	1	37.6%	58.4%	69.3%
Partial thickness	3	16.5%	49.5%	50.8%
Full thickness	9	32.7%	72.4%	75.5%
Total	30	42.2%	64.4%	68.0%

Notes. Percentages represent average percent correct across participants and scenarios. For pressure ulcer scenarios, percentage of correct is based on responses to Question 2 for each applicable scenario. For other wound scenarios, percent correct is based on responses to question 3 for each applicable scenario. sDTI = suspected deep tissue injury.

also improved between the first and third test, with an average improvement of 14.1 points ($SD \pm 8.9$) out of 90 points, $t(93) = 15.4, p < .001$. Mean lag time between Tests 2 and 3 was 10.78 days. Mean improvement between Tests 2 and 3 was 1.8 points ($SD \pm 6.2$) out of 90 points, $t(93) = 2.864, p < .005$.

DISCUSSION

The NE1 WAT was created to improve the ability of the average bedside clinician to accurately assess tissue damage and improve consistency in documentation. This study showed that the use of the NE1 WAT for the assessment of a series of wound scenarios significantly improved the ability of RNs to describe wounds and pressure ulcers. The good test–retest reliability demonstrated that this improvement could be sustained with minimal training. The improvements seen in this study suggest that the NE1 WAT is an assessment tool that could be used by any RN regardless of skill level to enhance their ability to identify and document skin alterations, wounds, and pressure ulcers at the bedside.

The targeting of pressure ulcers as a condition requiring POA documentation has increased the need for RNs with varied experience and education levels to improve their ability to reliably identify and stage these wounds. In this study, the NE1 WAT fulfilled this need by improving the accuracy and consistency of wound assessments among RNs. The NE1 WAT prompts the collection of key information necessary for POA documentation and can be used as a part of normal admission assessments. When incorporated into the nursing assessment routine, the NE1 WAT may have additional benefits that were not measured by this study, such as promoting consistency in wound size measurements. In addition, the photographic and written examples of pressure ulcer staging criteria on the tool itself can serve as reminders for the user, which may increase nurses' confidence in their ability to consistently identify pressure ulcers (Ayello, Baranoski, & Salati, 2005).

The NE1 WAT could facilitate the standardization of wound photography for inclusion in the patient's medical record as a complement to the written documentation. Consistent wound photography would increase transparency in reporting and allow for later review. Although this study did not investigate the use of the NE1 WAT in wound photography, it is possible that this tool could allow for nurses and other providers to incorporate wound photography into their assessment process with little additional training or act as an interim measure as electronic wound documentation protocols are developed (Bradshaw, Gergar, & Holko, 2011; Rennert, Golinko, Kaplan, Flattau, & Brem, 2009).

The NE1 WAT was designed to simplify the complex NPUAP staging criteria for all clinicians. The NE1 WAT deviates from NPUAP in two ways: (a) The NE1 WAT includes pre-Stage 1 to differentiate red intact skin that blanches (reactive hyperemia or blanchable erythema) as a condition that exists distinct from Stage 1, where the skin does not blanch (Barton, 1973; Farid, Winkelman, Rizkala, & Jones, 2012); and (b) the NE1 WAT groups the NPUAP classifications of *suspected deep tissue injury* (sDTI) and *unstageable* as full-thickness injuries, which is consistent with NPUAP illustrations.

One limitation of this study was the use of wound photographs rather than actual pressure ulcers as presented on patients. Although the use of the tool on live tissue provides contextual information that is absent from photographs, such testing brings additional complications related to subject burden, priorities of care, and consensus on correct answers. Pictures have been used in other studies of pressure ulcer staging (Baumgarten et al., 2009; Buckley, Tran, Adelson, Agazio, & Halstead, 2005; Stausberg, Lehmann,

Kroger, Maier, & Niebel, 2007), and training with photographs is likely to translate to clinical ability (Arnold & Watterworth, 1995).

Another limitation is that the convenience sample of RNs may not fully represent the entire population of clinicians who may use the tool. However, this sample does represent nurses with a range of education and training levels in several different geographic areas. This diversity of subjects and the use of several testing sites precluded strict standardization of the circumstances surrounding testing. Subjects took the test at different times of the day and at different points in their work shift. Although these factors may have influenced performance, these variations are more reflective of actual working conditions. The ability of the NE1 WAT to improve assessment ability in these conditions is valuable as it shows the potential for this tool to transition to bedside use. Additional study will be needed to determine the effect of educational background, training, and work load on the use of this tool within the care environment.

The NE1 WAT will need to be compared to existing and new skin assessment and wound healing status tools. Additional work is also needed to examine the effect of the NE1 WAT on pressure ulcer care and patient outcomes. Future studies should also examine the effect of the NE1 WAT on staff efficiency as well as reimbursement for care. In addition, if used as part of photographic documentation for wound care, this tool could aid in administrative review and risk management; plans are underway to study these potential benefits.

CONCLUSION

This study supports the test–retest reliability and criterion validity of the NE1 WAT as a mechanism for improving the ability of RNs to consistently describe skin alterations and accurately stage pressure ulcers. As a tool for RNs and other providers, the NE1 WAT provides standardization for wound care assessment and documentation. Through brief education of providers, the NE1 WAT can improve the assessment of skin alterations, wounds, and pressure ulcers. The NE1 WAT should be considered as a simple, inexpensive, and easy to use tool to aid wound assessment, documentation, and care.

REFERENCES

- Arnold, N., & Watterworth, B. (1995). Wound staging: Can nurses apply classroom education to the clinical setting? *Ostomy/Wound Management*, 41(5), 40–44.
- Ayello, E. A., Baranoski, S., & Salati, D. S. (2005). A survey of nurses' wound care knowledge. *Advances in Skin & Wound Care*, 18(5), 268–275.
- Barton, A. A. (1973). Pressure sores viewed by electron microscope and thermographically. *Geriatrics*, 28(10), 143–147.
- Bates-Jensen, B. (2001). *Bates-Jensen Wound Assessment Tool*. Retrieved from http://www.geronet.med.ucla.edu/centers/borun/modules/Pressure_ulcer_prevention/puBWAT.pdf
- Bates-Jensen, B. M., Vredevoe, D. L., & Brecht, M. L. (1992). Validity and reliability of the Pressure Sore Status Tool. *Decubitus*, 5(6), 20–28.
- Baumgarten, M., Margolis, D. J., Selekof, J. L., Moye, N., Jones, P. S., & Shardell, M. (2009). Validity of pressure ulcer diagnosis using digital photography. *Wound Repair and Regeneration*, 17(2), 287–290. <http://dx.doi.org/10.1111/j.1524-475X.2009.00462.x>
- Beeckman, D., Schoonhoven, L., Boucque, H., Van Maele, G., & Defloor, T. (2008). Pressure ulcers: E-learning to improve classification by nurses and nursing students. *Journal of Clinical Nursing*, 17(13), 1697–1707. <http://dx.doi.org/10.1111/j.1365-2702.2007.02200.x>

- Beeckman, D., Schoonhoven, L., Fletcher, J., Furtado, K., Gunningberg, L., Heyman, H., . . . Defloor, T. (2007). EPUAP classification system for pressure ulcers: European reliability study. *Journal of Advanced Nursing*, 60(6), 682–691. <http://dx.doi.org/10.1111/j.1365-2648.2007.04474.x>
- Bergstrom, N., & Braden, B. J. (2002). Predictive validity of the Braden Scale among Black and White subjects. *Nursing Research*, 51(6), 398–403.
- Berlowitz, D., Brandeis, G. H., Anderson, J., Du, W., & Brand, H. (1997). Effect of pressure ulcers on the survival of long-term care residents. *Journals of Gerontology. Series A, Biological Sciences and Medical Sciences*, 52(2), M106–M110.
- Berlowitz, D., VanDeusen Lukas, C., Parker, V., Niederhauser, A., Silver, J., Logan, C., . . . & Zulkowski, K. (2011). *Preventing pressure ulcers in hospitals: A toolkit for improving quality of care* (AHRQ Publication No. 11-0053-EF). Retrieved from <http://www.ahrq.gov/research/ltc/pressureulcertoolkit/>
- Black, J., Baharestani, M., Cuddigan, J., Dorner, B., Edsberg, L., Langemo, D., . . . Taler, G. (2007). National Pressure Ulcer Advisory Panel's updated pressure ulcer staging system. *Dermatology Nursing*, 19(4), 343–349.
- Bradshaw, L. M., Gergar, M. E., & Holko, G. A. (2011). Collaboration in wound photography competency development: A unique approach. *Advances in Skin & Wound Care*, 24(2), 85–92. <http://dx.doi.org/10.1097/01.ASW.0000393762.24398.e3>
- Briggs, S. L. (2006). How accurate are RGNs in grading pressure ulcers? *British Journal of Nursing*, 15(22), 1230–1234.
- Buckley, K. M., Tran, B. Q., Adelson, L. K., Agazio, J. G., & Halstead, L. (2005). The use of digital images in evaluating homecare nurses' knowledge of wound assessment. *Journal of Wound, Ostomy and Continence Nursing*, 32(5), 307–316. <http://dx.doi.org/00152192-200509000-00008>
- Centers for Medicare & Medicaid Services. (2012). Hospital-acquired conditions (present on admission indicator). Retrieved from <https://www.cms.gov/HospitalAcqCond/>
- Chan, B. C., Nanwa, N., Mittmann, N., Bryant, D., Coyte, P. C., & Houghton, P. E. (2012). The average cost of pressure ulcer management in a community dwelling spinal cord injury population. *International Wound Journal*, 10(4), 431–440. <http://dx.doi.org/10.1111/j.1742-481X.2012.01002.x>
- Defloor, T., & Schoonhoven, L. (2004). Inter-rater reliability of the EPUAP pressure ulcer classification system using photographs. *Journal of Clinical Nursing*, 13(8), 952–959. <http://dx.doi.org/10.1111/j.1365-2702.2004.00974.x>
- Dini, V., Bertone, M., & Romanelli, M. (2006). Prevention and management of pressure ulcers. *Dermatologic Therapy*, 19(6), 356–364. <http://dx.doi.org/10.1111/j.1529-8019.2006.00094.x>
- European Pressure Ulcer Advisory Panel, & National Pressure Ulcer Advisory Panel. (2009). *Treatment of pressure ulcers: Quick reference guide*. Washington, DC: National Pressure Ulcer Advisory Panel.
- Farid, K. J., Winkelman, C., Rizkala, A., & Jones, K. (2012). Using temperature of pressure-related intact discolored areas of skin to detect deep tissue injury: An observational, retrospective, correlational study. *Ostomy/Wound Management*, 58(8), 20–31.
- Graves, N., Birrell, F., & Whitby, M. (2005). Effect of pressure ulcers on length of hospital stay. *Infection Control and Hospital Epidemiology*, 26(3), 293–297. <http://dx.doi.org/10.1086/502542>
- Harris, C., Bates-Jensen, B., Parslow, N., Raizman, R., Singh, M., & Ketchen, R. (2010). Bates-Jensen wound assessment tool: Pictorial guide validation project. *Journal of Wound, Ostomy and Continence Nursing*, 37(3), 253–259. <http://dx.doi.org/10.1097/WON.0b013e3181d73aab>
- Kottner, J., Raeder, K., Halfens, R., & Dassen, T. (2009). A systematic review of interrater reliability of pressure ulcer classification systems. *Journal of Clinical Nursing*, 18(3), 315–336. <http://dx.doi.org/10.1111/j.1365-2702.2008.02569.x>
- Lyder, C. H., & Ayello, E. A. (2009). Annual checkup: The CMS pressure ulcer present-on-admission indicator. *Advances in Skin & Wound Care*, 22(10), 476–484. <http://dx.doi.org/10.1097/01.ASW.0000361385.97489.51>
- National Pressure Ulcer Advisory Panel. (2001). Pressure ulcers in America: Prevalence, incidence, and implications for the future. An executive summary of the National Pressure Ulcer Advisory Panel monograph. *Advances in Skin & Wound Care*, 14(4), 208–215.
- National Pressure Ulcer Advisory Panel. (2010). *PUSH tool*. Retrieved from <http://www.npuap.org/resources/educational-and-clinical-resources/push-tool/>
- Pedley, G. E. (2004). Comparison of pressure ulcer grading scales: A study of clinical utility and inter-rater reliability. *International Journal of Nursing Studies*, 41(2), 129–140. <http://dx.doi.org/S0020748903001330>
- Prevention Plus. (2013). Braden Scale for predicting pressure sore risk. Retrieved from <http://www.bradenscale.com/faq.htm>

- Rennert, R., Golinko, M., Kaplan, D., Flattau, A., & Brem, H. (2009). Standardization of wound photography using the Wound Electronic Medical Record. *Advances in Skin & Wound Care*, 22(1), 32–38. <http://dx.doi.org/10.1097/01.ASW.0000343718.30567.cb>
- Russo, C. A., Steiner, C., & Spector, W. (2008). *Hospitalizations related to pressure ulcers among adults 18 years and older, 2006* (Statistical Brief No. 64). Retrieved from <http://www.hcup-us.ahrq.gov/reports/statbriefs/sb64.pdf>
- Shrout, P. E., & Fleiss, J. L. (1979). Intraclass correlations: Uses in assessing rater reliability. *Psychological Bulletin*, 86(2), 420–428.
- Stausberg, J., Lehmann, N., Kroger, K., Maier, I., & Niebel, W. (2007). Reliability and validity of pressure ulcer diagnosis and grading: An image-based survey. *International Journal of Nursing Studies*, 44(8), 1316–1323. <http://dx.doi.org/10.1016/j.ijnurstu.2006.06.006>
- Whitney, J., Phillips, L., Aslam, R., Barbul, A., Gottrup, F., Gould, L., . . . Stotts, N. (2006). Guidelines for the treatment of pressure ulcers. *Wound Repair and Regeneration*, 14(6), 663–679. <http://dx.doi.org/10.1111/j.1524-475X.2006.00175.x>
- Young, D. L., Estocado, N., Landers, M. R., & Black, J. (2011). A pilot study providing evidence for the validity of a new tool to improve assignment of National Pressure Ulcer Advisory Panel stage to pressure ulcers. *Advances in Skin & Wound Care*, 24(4), 168–175. <http://dx.doi.org/10.1097/01.ASW.0000396304.90710.ea>

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