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## Evidence for the Validity of a Tool for Improved Pressure Ulcer Staging by the Non-Expert in the Live Patient

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EVIDENCE FOR THE VALIDITY OF A TOOL FOR IMPROVED PRESSURE  
ULCER STAGING  
BY THE NON-EXPERT IN THE LIVE PATIENT

By

Janelle Borg

Carrie Johnston

Megan Lucke

Jordan Sinclair

A doctoral project submitted in partial fulfillment  
of the requirements for the

Doctorate of Physical Therapy

Department of Physical Therapy

School of Allied Health Sciences

The Graduate College

University of Nevada, Las Vegas

May 2014



THE GRADUATE COLLEGE

We recommend the doctoral project prepared under our supervision by

**Janelle Borg, Carrie Johnston, Megan Lucke, and Jordan Sinclair**

entitled

**Evidence for the Validity of a Tool for Improved Pressure Ulcer Staging  
by the Non-Expert in the Live Patient**

is approved in partial fulfillment of the requirements for the degree of

**Doctor of Physical Therapy**

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**May 2014**

## **Abstract**

**Background and Purpose:** Pressure ulcers (PrUs) are a costly issue for the health care system. The utilization of a tool that increases the accuracy of PrU identification and staging may allow the health care team to better manage these wounds. The purpose of this study was to determine the validity of the NE1 Wound Assessment Tool (NE1 WAT) for increasing the wound assessment accuracy of novice nurses.

**Subjects:** A convenience sample of 11 novice nurses evaluated 11 wounds on eight patients at a 730 bed, hospital in Las Vegas, Nevada.

**Methods:** Subjects assessed 11 wounds on the patients independently. They then received brief orientation to the NE1 WAT. The subjects then re-assessed the same 11 wounds utilizing the NE1 WAT. Accuracy in wound assessment was then compared when performed with and without the tool.

**Results:** Wilcoxon signed-rank tests were used to compare scores before and after training on how to use the tool. The subjects showed a significant improvement in pressure ulcer staging ( $p=.005$ ), identification of wounds other than pressure ulcers ( $p = .024$ ), and overall score across all aspects of wound assessment when using the NE1 WAT ( $p = .017$ ).

**Discussion:** This study provides evidence for the validity of the NE1 WAT. Improved wound assessment would likely improve care. Due to Medicare billing rules, the NE1 WAT has the potential to impact hospital remuneration.

**Conclusion:** Following brief orientation on tool use, there was increased accuracy of novice nurse wound assessment on live patients.

**Acknowledgements:**

We would like to thank Sunrise Hospital and Medical Center in Las Vegas, NV for the use of their facilities. We would also like to recognize the nurses and patients at Sunrise Hospital and Medical Center who participated in the study. We would also like to thank Nancy Estocado at Sunrise Hospital and Medical Center for patient and nurse subject recruitment and logistics in running this research study.

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## **Introduction**

The incidence of pressure ulcers (PrUs) among patients in hospitals and long-term care facilities is a continual issue.<sup>1</sup> The prevalence of PrUs depends on the setting and patient population, but ranges from 10% to 30%.<sup>2,3</sup> PrUs accounted for 281,300 hospital related stays in 1993, but by 2006 that number had risen to 503,300, nearly an 80 percent increase.<sup>4</sup> In Healthy People 2020, the United States Department of Health and Human Services (DHHS) identified PrU reduction among the top priorities for older adults.<sup>5</sup> In acute care settings, PrUs contribute to nearly 60,000 deaths each year either from PrUs or PrU related complications.<sup>6</sup>

PrUs are not only an increasing health problem, but also place a heavy financial burden on the health care system. The cost of patient care per PrU can range from \$20,900 to \$151,700.<sup>6</sup> The Healthcare Cost and Utilization Project (HCUP) reported that in 2006, adult hospital stays involving diagnoses of PrUs totaled \$11 billion.<sup>7</sup> HCUP also estimated the cost of care for primary and secondary diagnoses of PrUs were \$1,200 and \$1,600 per day, respectively.<sup>7</sup> One decisive factor that makes a difference in these costs is the accurate staging of PrUs. The stage of a PrU is required for documentation, reimbursement, as well as establishing an appropriate plan of care.

In 2008, the Centers for Medicare & Medicaid Services (CMS) made changes to their Inpatient Prospective Payment Systems (IPPS) to incentivize better care for largely preventable conditions. Among conditions identified as being largely preventable were facility acquired PrUs.<sup>8</sup> CMS made adjustments to their 2008 IPPS to prompt better care in health care facilities.<sup>8</sup> CMS suggested that skin assessments could lead to earlier detection and treatment of PrUs that are Present on Admission (POA)<sup>8</sup> CMS further defines reimbursement and non-reimbursement for PrUs based upon certain criteria. The

criteria included differentiating between PrUs that are POA from those that are hospital acquired conditions (HACs), and whether the PrU is a primary or secondary diagnosis. The CMS introduced an additional method of payment, called Medicare Severity-Diagnosis Related Groups (MS-DRG).<sup>8</sup> A Stage III or IV PrU that is POA and documented within 24 hours, allows the treating hospital to receive a higher paying DRG reimbursement from Medicare.<sup>9</sup>

With correct staging, treatment options can be narrowed down and help to reduce unnecessary health care costs and deaths. An accurately staged PrU guides proper treatment, allowing for wound care that is specific to the patient and the PrU with use of: appropriate dressings, specialty beds, and patient positioning procedures.<sup>10,11</sup> Correct staging could potentially reduce the risk of less severe PrUs advancing to more severe stages.<sup>1,8,12</sup> Accurate assessment and documentation of PrUs can have an impact on these costs.<sup>13</sup> However, a large tertiary care center study done by Bruce et al<sup>13</sup> has shown that PrU staging is not very reliable, even with use of PrU classification guidelines.

Established in 1987, the National Pressure Ulcer and Advisory Panel (NPUAP) defined a classification system of PrU stages to promote unified identification and treatment throughout all health care settings. While many health care providers are involved in tasks related to assessing, preventing, and managing PrUs, the primary caregivers to whom this task falls upon are the nurses.<sup>13,14</sup> A pilot study of Enterostomal Therapy nurses' upon completing a five-week education course using two-dimensional pictures showed that only one out of three nurses correctly staged the PrU.<sup>15</sup> Buckley et al<sup>16</sup> compared the accuracy of PrU staging between Wound, Ostomy and Continence nurses (WOC) and homecare nurses by using case studies with demographic data, black

and white photographs as well as color photographs of wounds. The investigators found a mean of 72.5% accuracy in homecare nurse staging of the ten cases, with 39% being the lowest.<sup>16</sup>

Zulkowski et al<sup>17</sup> used the Pieper Pressure Ulcer Knowledge Tool in the assessment of non-certified nurses, that is, nurses with no other certification other than an associate's, bachelor's, master's degree or diploma, and their ability to accurately assess and stage wounds. The researchers found that non-certified nurses were the least knowledgeable in regards to prevention, staging, and general wound knowledge.<sup>17</sup> The study found little difference in PrU knowledge based on: level of education, facility type, or years of practice.<sup>17</sup> Those that spend the most time with the patient, the nurses, need to be able to assess wounds and stage PrUs accurately. With the development of the right tool and training, nurses may be able to provide better patient care through more accurate staging of PrUs and identification of other wounds.

Nancy Estocado, a physical therapist and certified wound specialist (CWS) with 22 years of clinical experience, recognized this dilemma and designed the N.E. One Can Stage (NEOCS [NE Solutionz, LLC, Las Vegas, Nevada]) wound assessment tool to improve accuracy of PrU staging. In a pilot study, nurse participants used the NEOCS to stage pictures of wounds before and after a five minute instruction session. The study found an increase of 37.7% in staging accuracy following the instruction session, lending validity to the NEOCS.<sup>12</sup>

The NEOCS tool underwent considerable changes and was then renamed as the NE1 Wound Assessment Tool (NE1 WAT). This is an L-shaped ruler that contains detailed written descriptions of NPUAP PrU staging criteria, with corresponding

examples of wound and periwound colors and sample pictures for the health care provider to reference (Figure 1). The NE1 WAT is placed directly on the skin around the wound. The pictures provided on the tool give examples of PrUs, wound thicknesses, and colors which the patient's wound is compared to and then staged or identified. Therefore, the logical use of this in clinical practice begins upon patient admission to a health care facility. After assessing and documenting the PrU or wound, the tool can be used throughout the course of care to document wound changes and healing.

While the NEOCS did increase PrU staging accuracy when used on photographs of wounds, it was not tested on live patients.<sup>12</sup> The use of live patients in the present study allowed for access to tangible clues that are not available via photography; which can provide important information about wound type or stage.<sup>12</sup> By allowing nurses to use the NE1 tool on live patients, rather than on pictures, this study allowed closer approximation of clinical practices such as palpation, tissue damage, temperature, and wound characteristics. The purpose of this study was to determine the validity of the NE1 Wound Assessment Tool (NE1 WAT) for increasing the wound assessment accuracy of novice nurses.

## **Methods**

The study took place at a 730 bed, Level II trauma and medical center in Las Vegas, Nevada. Eleven newly graduated nurses were asked to assess 11 wounds in random order and fill out an answer sheet (Figure 2) for each wound. After turning in this first answer sheet, the nurses received a brief in-service on how to use the NE1 WAT and a systematic evaluation methodology called HATT (copyrighted to NE Solutionz, LLC, Las Vegas, Nevada), as well as an explanation of PrU stages. The methodology referred

to as HATT, stands for History, Anatomy, Tissue type and Touch details. HATT will be explained in further detail later in the methods. Following this in-service, the participants then reassessed the same 11 wounds using a new copy of the same answer sheets while using the NE1 WAT and the HATT methodology to aid them in their assessment.

### *Sample*

Eleven nurses were recruited to be the subjects for the study. Eleven total wounds were selected based on patient availability at the time of the study. All patients with wound(s) who participated in the study were selected to provide a wide variety of wound types and based on their willingness to participate.

A power calculation was performed using the statistical data from the NEOCS pilot study.<sup>12</sup> This indication revealed that a sample size of seven nurses would be necessary to power the current study. A convenience sample of 11 registered nurses (RNs) at new employee orientation was invited to participate. All RNs had recently graduated from entry level nursing programs and were attending their first day of training at the hospital. None of the subjects had any prior exposure to the NE1 WAT. Demographic information was collected on the subjects, including: education level, prior experience in wound staging, any specialty certifications held, fatigue level, attitudes toward wound care, and confidence level in staging. All 11 nurses were provided with an overview of the study and asked to sign written consent forms prior to participation.

Patients with wounds who participated were also asked to provide written consent for participation. Each patient was given a \$25 gift certificate at the completion of the study as compensation for his or her participation. In total, 11 wounds were selected on the eight patients for evaluation.

## *Procedures*

Following Institutional Review Board<sup>a</sup> approval, the 11 wounds were assessed, and staged by four wound care specialists who unanimously agreed upon stage and type. The wounds were: (1) right medial foot, arterial insufficiency wound; (2) sacral, Stage IV; (3) left heel, suspected deep tissue injury (sDTI); (4) right hip, unstageable; (5) above knee amputation; surgical wound (6) left Achilles, unstageable; (7) left heel, unstageable; (8) sacral, dermatitis; (9) right heel, Stage III; (10) right heel, diabetic ulcer; (11) left arm, skin tear. Wounds 2, 3, 4, 6, 7, and 9 were PrUs. Wounds 1, 5, 8, 10, and 11 were not PrUs.

For the study, the nurses were asked to stage the 11 wounds just as they would when performing a standard wound care assessment. Each nurse filled out a separate answer sheet for each wound. Only one nurse was allowed in each room at a time; they were asked not to discuss the wounds with each other while transitioning from room to room. The answer sheet (Figure 2) required the nurses to indicate: location of the wound, and classification as a PrU or other wound type. If the wound was identified as a PrU, the NPUAP stage was also required. If the subject determined the wound was not a PrU, they were required to document the wound depth as either closed, superficial, partial-thickness, or full-thickness on their answer sheet (Figure 2). After assessment of all 11 wounds and filling in their answer sheets, the nurses turned them in and were given ten minutes of training on utilizing the NE1 WAT. The presentation included a brief overview of the PrU stages and the difference between PrU and other wound types. The majority of the training was dedicated to orienting the subjects to the NE1 WAT and how

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<sup>a</sup> UNLV IRB Approval Number: 1204-4114, Approval Date: 4/17/12

to use it bedside. Examples of wounds and PrUs were shown during the training. Along with training on how to use the NE1 WAT, the subjects were educated on the systematic assessment method called HATT. HATT stands for History, Anatomy, Tissue type and Touch details and is used in conjunction with the NE1 WAT. History reminds the clinician to look at the wound history to determine what caused the wound. Anatomy or location of the wound can also help the clinician to determine the cause. For example, PrUs are commonly found over bony prominences such as the heel or ischial tuberosity. The type and color of tissue and color assists the clinician in determining the depth of the wound. Finally, touching the skin in and around the wound can reveal characteristics such as temperature and blanchability. All of these combined can help the clinician distinguish between stages and determine if unseen damage has occurred.

In order to reinforce the use of the HATT method along with the NE1 WAT, example pictures were presented during the in-service. The participants were guided through the process of using the NE1 WAT and HATT in a step-by-step process for each wound picture in order to achieve the correct answer. Immediately following the training, the nurses were asked to stage the same 11 wounds, with new answer sheets, while using the NE1 WAT and HATT methodology. This re-staging involved the same patients and wounds they had staged in the first portion of the study. The nurses did not receive any help with the re-staging of these 11 wounds.

#### *Plan for Analysis*

The answer sheets from both pre and post NE1 WAT training were scored to use for analysis. A Wilcoxon signed-rank test was used to determine the differences in accuracy between the nurse wound assessments with and without the use of the NE1

WAT. A comparison of pre and post testing was used to look at overall test scores and the score for each question. All statistical analyses were performed using SPSS statistical software (v. 18.0, International Business Machines Corp., Armonk, NY, USA) and the significance level was set as 0.05.

## Results

The Participant demographics data is presented in Table 1. The participants' attitude toward wound care showed that 27% enjoy doing wound care, 54% feel that it is just a job, and 18% reported they avoid wound care. Fatigue level was assessed and 54% of the participants reported feeling slightly fatigued and 46% reported being rested. In addition participants perceived wound assessment ability was reported as 45% fair, and 36% poor. The study sample consisted of all new graduated nurses; none reporting having any specialty skin certification.

A descriptive analysis was done to identify the impact the tool had on each wound. Figure 3 is graphic representation of the percentage of correct assessment of all the wounds within the study. There was a statistically significant improvement in nurses wound assessment performance ( $Z = -2.382, p = .017$ ), which is represented by participant's average of all percentage values within the graded test: without the tool (mean= 39%  $\pm$  8.05%) and with the tool and training (mean= 51.82%  $\pm$  12.59%). There was no statistical significant improvement in participants ability to correctly differentiate whether the wound was a PrUs or non-PrUs ( $Z = -1.492, p = .136$ ) without the tool (mean = 58.09%  $\pm$  9.32%) compared to using the tool and training (mean = 64.64%  $\pm$  14.41). There was a statistically significant improvement for accurately identifying the correct PrUs stage for the wounds that were PrUs ( $Z = -2.814, p = .005$ ) without the tool (mean =

25.73%  $\pm$ 17.15%) and with the tool and training (mean= 56.09%  $\pm$ 21.43%). There was also a statistically significant improvement for correctly assessing wound depth for non-PrU wounds ( $Z = -2.251, p = .024$ ) comparing without the tool (mean = 1.82%  $\pm$  6.03%) and with the tool and training (mean = 18.18%  $\pm$  18.87%), which, is represented in Figure 4.

## **Discussion**

The pilot study of the NEOCS wound assessment tool provided evidence for its reliability and validity to improve staging of PrUs by healthcare professionals using photographs.<sup>12</sup> In the present study, the researchers investigated novice nurse's ability to accurately stage PrUs on live patients using a similar test-retest protocol. Among the novice nurse subjects in this study, use of the NE1 WAT used in conjunction with the HATT methodology improved wound assessment in the live patients. Overall, participants' scores improved to a mean of 51.82% correct with the tool and training. This represented a statistically significant difference with a 12.82% increase in overall score of wound assessment, following a short educational in-service and use of the NE1 WAT and HATT methodology.

In the current study, there was no feedback about the first test given to the subjects prior to the post-test; both tests were completed on the same day. This indicates that the improved scores were most likely a direct effect of the NE1 WAT and associated training. Although we are unable to separate the effect of the in-service from the effect of using the NE1 WAT itself, it was demonstrated in the pilot study that improvements were seen in staging despite using the tool with or without the in-service.<sup>12</sup> This is illustrated by a mean improvement of only 9.4% when the subjects re-assessed the wound

photographs after receiving the in-service on the NE1 WAT.<sup>12</sup> Therefore, it can be surmised that there is an independent effect of the tool above that of in-service training alone.

In the present study on live patients the nurses showed statistically significant improvement in their overall test scores, the PrU stage scores, and the depth of non-pressure ulcer wound type scores. The improvements seen in the PrU staging scores are attributed to the NE1 WAT's border which has evolved to include detailed descriptions of each PrU stage on the vertical axis and picture examples of each PrU stage on the horizontal axis for user reference. Results of the pilot study also highlight the test conditions in which subjects staged pictures of wounds first with no instruction and then again with the NE1 WAT and no in-service.<sup>12</sup> These results demonstrated a statistically significant mean increase of 23.82% in correct staging with use of the pictures with the tool alone.<sup>12</sup> The border elements on the NE1 WAT make it very easy for the user to locate a similar picture and description of the wound in question and correctly stage it, as seen in the 30% improvement in novice nurses scores within the post-test portion of this study.

Another improvement, which was not anticipated, was the 16% increase in the correct identification of the thickness of the other type wounds. Other type wounds in this study were classified as wounds not developed by pressure over a bony prominence. The delineation between the PrU or other type was made by the nurses using the HATT methodology. Unlike PrUs, these wounds are classified; not staged, using four categories: closed, superficial, partial and full thickness. The horizontal axis border of the NE1 WAT has picture examples correlating to these four categories of other wound

thickness which may have accounted for the 16% increase in correct identification of other wound thickness. There was also an increase in the initial correct identification of a PrU versus another type of wound prior to the question regarding other wound thickness however; this increase was not found to be significant. The statistical improvements shown in this study demonstrate validity for the use of the NE1 WAT to improve nurse staging with limited training time.

As discussed previously, the pictures and descriptions on the NE1 WAT are critical visual aids to improve in staging accuracy. In addition to these features, the perimeter of this disposable tool is designed for accurate and timely documentation, which is needed for reimbursement. Surrounding the pictures and descriptions of PrUs on the tool's border are prompts to document the date, time, and signature of the clinician involved in the wound assessment. The inner portion of the tool reminds healthcare providers to use photo documentation of the NE1 WAT around the wound in order to record the assessment in the patient's chart. While not directly part of this study, the features on the NE1 WAT may also help improve documentation as they allow for consistent wound measurement, patient identification data, and encourage photographic verification.

Within this same day test re-test design there were limitations that require acknowledgement. The previous study looked at staging accuracy of healthcare professionals using two-dimensional photographs.<sup>12</sup> In the present study, recruitment of live patients was limited. Many patients were busy with various tests being conducted, changes in their health status, physical and occupational therapy visits, and family visits that all contributed to time restraints and prevented participation. The patients were also

located on different floors and in different wings of the hospital and the nurse subjects were not directly observed transitioning from room to room. Therefore, the subjects may have discussed aspects of the study when not being observed.

Another limitation was that despite an instructional in-service, the tool and the HATT method, or potentially both may not have been used by the nurses during the study. Nurses could have made educated guesses with or without the tool. Researchers observed during the nurses in-room assessment of a patient, that touching of the patient's periwound; discerning surrounding tissue temperature was not utilized frequently, even following the in-service training. These two important aspects of wound care assessment, if overlooked, could lead to incorrect staging of the wound.

While this preliminary live patient study demonstrated validity for the NE1 WAT, a broader study utilizing more subjects in varied bedside healthcare professions could provide more evidence for the use of the NE1 WAT as a standardized healthcare tool in larger hospital settings.

## **Conclusion**

In the unpredictable health care market that we currently reside in, the initial and accurate staging of PrUs is paramount. There are many reasons why staging is so important. These reasons include: the rising incidence of PrUs as a secondary diagnosis in the acute care setting, increased costs from treating the sequelae stemming from incorrectly staged PrUs and financial incentives for quickly identified POA PrUs.<sup>6,7,9</sup> However, even with the importance of accurate staging being stressed, there is evidence that healthcare provider staging could be improved. Hart et al.<sup>18</sup> found that nurses certified in wound, continence, and/or ostomy care performed better on a criterion-

referenced web-based test than those without certification; stressed that staff nurses receive additional education which could be administered at the time of initial employment. This information suggests that a tool such as the NE1 WAT in conjunction with the HATT methodology and an educational in-service at orientation may be appropriate in order to improve staging accuracy of non-certified bedside healthcare providers.

The results of our study show that the NE1 WAT along with the HATT methodology when taught in a 10 minute in-service, improves novice nurses PrU overall assessment by 12.82%. This shows that little time is required for the nurse to increase overall wound assessment accuracy. With the statistically significant improvement seen after brief training and use of the NE1 WAT by novice nurses, the tool may have potential to help improve staging for other bedside healthcare providers and those with more wound care experience. Future live patient studies should be conducted with a larger sample size. This could be accomplished by collecting data from similar sized populations, but with studies being completed at multiple facilities. Inclusion of other bedside healthcare providers, such as physicians and physical therapists, would make the results more relevant to a multi-disciplinary team. Matching the respondent answers to their de-identified demographic data may also elucidate psychosocial factors such as fatigue level or desire to stage wounds to the level of improvements in pre and post-tests. In addition, investigating co-variants such as the tool with and without training or the tool with graphics only or descriptions only would further test its validity. Finally, exploration of utilization of this tool for staging and documentation may also help with plan of care

strategies, as correct stages need to be identified before a proper treatment regimen is initiated.

Tables and Figures

Figure 1. The NE1 WAT available for distribution by Medline Industries, Inc.

# NE1™

## WOUND ASSESSMENT TOOL

DATE: / /
PT. INITIALS: . .
TIME: :
RM#/LOC. \_\_\_\_\_

MATCH "WORST COLOR" TISSUE TO PICTURE FOR ANSWER												BODY PART	
OTHER: PRESSURE ULCER:		SUPERFICIAL			PARTIAL THICKNESS			FULL THICKNESS					
CLOSED		PRE STG. I	STG. I	STG. II	STG. II	STG. III	STG. IV	sDTI		UNSTAGEABLE			

1. Peel off NE1™ Wound Assessment Tool from the adhesive backing.

2. Frame the tool around the wound, placing it at the 12 o'clock position. Maintain 90° angle. Do not wrap tool around body part.

3. Ensure that the camera is perpendicular to the wound. Take a picture and place in the patient's medical record.

Use the guidelines on the tool to assist with wound evaluation. Always use professional judgement and consult appropriate medical professionals as needed.

**CAUTION:** Do not photocopy. Photocopying this tool may result in incorrect documentation due to altering the tested standardized colors and measurements.

Need more clinical information? Call our Educare Hotline: 1-888-701-SKIN (7546), Monday-Friday 8am-5pm Central Standard Time

1-800-MEDLINE (1-800-633-5463)  
www.medline.com/woundcare  
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EXTERNAL USE ONLY

NON-STERILE PRODUCT  
REORDER MSCNE1TOOL

LATEX FREE

0	UNSTAGEABLE Necrotic/Dead Get next Stage III or IV Eschar/Black/Tan, Induration SLOUGH/YELLOW
1	
2	
3	sDTI SUSPECTED DEEP TISSUE INJURY Get next Stage III or IV Raggy or Induration or Blood Filled Blister Non-Blanchable PURPLE/MAROON
4	
5	
6	STAGE III OR IV Full Thickness Tissue Loss Base of Wound and Structures are Indentified (Subcutaneous)
7	
8	STAGE II - BUMPY RED GRANULATION STAGE IV - MUSCLE/TENDON/BONE
9	
10	STAGE II Serum Filled Blister or Superficial Moist, Smooth, RED/PINK BASE (DERMAL) WITHOUT SLOUGH
11	
12	STAGE I Intact Skin; PINK/RED; ERYTHEMA, MARGIN
13	
14	PRE-STAGE I Blanchable
15	CLOSED Normal Resurfaced Repaired - Scarred

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Figure 2. Answer sheet from NE1 WAT live patient study at Sunrise Hospital and Medical Center November 17, 2011

**“NE1™”**

**SKIN AND WOUND ASSESSMENT STUDY**

1

- **Patient History:**
  
- **LOCATION (ANATOMICAL SITE):**
  
- **WORST wound bed tissue COLOR (check one):**
- **Black (worst)**  **Yellow**  **Purple**  **Red**  **Opaque**  **Pink**  **Normal (best)**
  
- **WOUND TYPE (check one):**  **Pressure Ulcer** or  **Other**
  
- **If “Pressure Ulcer”, Stage (check one):**  **Closed**  **Pre-Stage 1**  **Stage 1**
- **Stage 2**  **Stage 3**  **Stage 4**  **Deep Tissue Injury (SDTI)**  **Unstageable**
  
- **OR**
  
- **If “Other”, describe (check one):**
- **Closed**  **Superficial**  **Partial Thickness**  **Full Thickness**
  
- **(There are only 3 answers per sheet)**

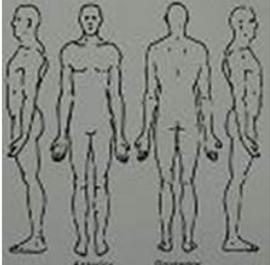


Figure 3. Percentage of Correctly Answered Wounds without and with the NE1 WAT

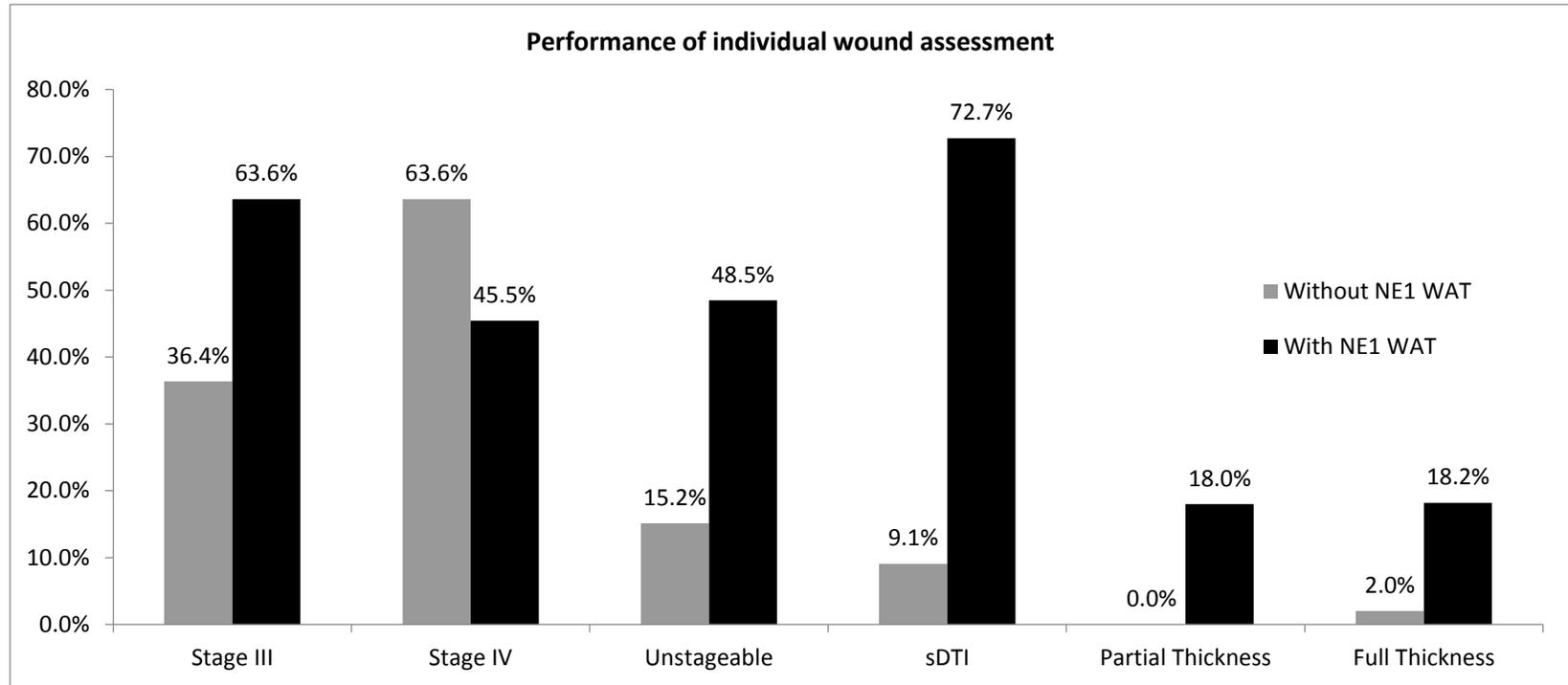


Figure 4. Performance without and with the NE1 WAT

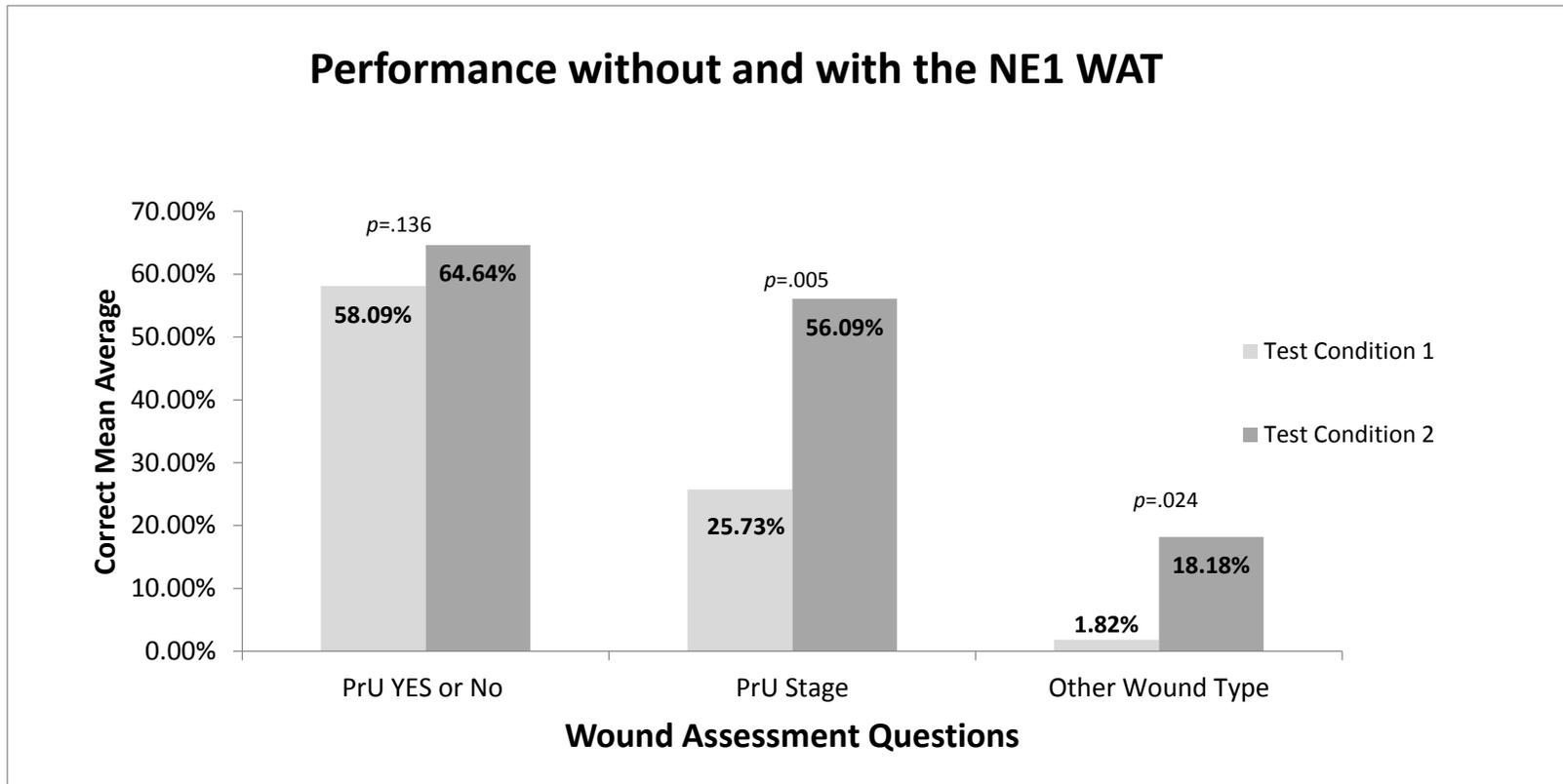


Table 1. Respondent Demographic Data

Subject	RN	Educational Preparation	Specialty	Level of Perceived Skill of Wound Assessment	Fatigue Level	Attitude Toward Wound Care
1	Y	BSN*	None	Fair	Rested	Enjoy
2	Y	BSN	None	Fair	Slightly Fatigued	Job
3	Y	BSN	None	Poor	Slightly Fatigued	Job
4	Y	BSN	None	Good	Slightly Fatigued	Job
5	Y	BSN	None	Poor	Rested	Enjoy
6	Y	BSN	RN, C/RN	Fair	Slightly Fatigued	Enjoy
7	Y	BSN	None	Fair	Rested	Job
8	Y	Associate Degree	None	No Skill	Rested	Avoid
9	Y	BSN	None	Poor	Rested	Avoid
10	Y	BSN	None	Poor	Slightly Fatigued	Job
11	Y	BSN	None	Fair	Slightly Fatigued	Job

\* BSN, Bachelor of Science in Nursing

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**Curriculum Vitae  
Janelle Borg**

**Education**

- **University of Nevada, Las Vegas** **Expected: May 2014**
  - Doctor of Physical Therapy
- **University of Arizona** **May 2011**
  - Bachelor of Arts, Music
    - Minor: Psychology
    - Graduated Magna Cum Laude. GPA 3.81

**Doctoral Dissertation**

**April 2012-May 2014**

- Borg, Janelle, Johnston, Carrie, Lucke, Megan, Sinclair, Jordan. Validation of a tool for improved pressure ulcer staging by the non-expert in the live patient

**Clinical Internships**

- **PRO Therapy** **June 2012-August 2012**  
**Lake Havasu City, AZ**
  - Rural/Underserved Outpatient Orthopedics
    - Evaluated and treated general outpatient orthopedics, balance assessment/treatment
- **Health South Rehabilitation Institute of Tucson** **July 2013-September 2013**  
**Tucson, AZ**
  - Inpatient Rehabilitation
    - Inpatient rehab following surgery, joint replacement, stroke, neurological and orthopedic rehabilitation.
- **Maricopa Integrated Health Systems-** **October 2013-December 2013**  
**Arizona Burn Center, Phoenix, AZ**
  - Acute Care
    - Inpatient unit. Wound care of sheet/mesh grafts, fabrication of aids to prevent contracture development, evaluation of mobility and treatment/education. Caseload ranged from minor to severe burns.
- **Industrial Hand and Physical Therapy** **January 2014-March 2014**  
**Gilbert, AZ and Mesa, AZ**
  - Outpatient Orthopedics
    - Evaluation, diagnosis and treatment of various hand, wrist, and elbow impairments. Caseload ranged from simple to complex, acute to chronic; status-post surgical interventions.

## Continuing Education

- **American Physical Therapy Association**
  - ✧ Combined Sections Meeting: Chicago, IL February 2012
  - ✧ Combined Sections Meeting: San Diego, CA January 2013
  - ✧ Combined Sections Meeting: Las Vegas, NV February 2014
    - Presented Poster on NE1 Wound Assessment Tool in the staging of pressure ulcers by the non-expert
  - ✧ Attended various courses on wound care, hand rehabilitation, and orthopedics
- **Cleveland Clinic Educational Foundation**
  - ✧ Advances in Neurological Therapeutics Las Vegas, NV (9/29/12)
- **Nevada Physical Therapy Association**
  - ✧ Fall Risk Assessment and Fall Prevention for Older Nevadans. Jennifer Nash. (9/11/12)
  - ✧ McKenzie Method, Introduction to MDT, fallacies, realities and research validity. Boyd Etter (10/27/12)
- **UNLV**
  - ✧ Understand and Explain Pain. Adriaan Louw (2/29/12)
  - ✧ Before the Fall: Strength, Balance, Flexibility and Osteoporosis. Sue Schuerman (11/14/12)
  - ✧ Innovations in Rehabilitation Outcome Measurement. Alan Jette (11/16/12)
  - ✧ Face into the Storm. Alan Jette (11/16/12)
  - ✧ Neuroscience of Pain. Adriaan Louw (3/20/13)
  - ✧ Distinguished Lecture Series
    - Knowledge Translation. Linda Fetters (4/4-4/5/13)

## Professional Memberships/Certifications

- **American Physical Therapy Association** **2011-present**
  - ✧ Sections
    - Clinical Electrophysiology and Wound Care (2012-2013)
    - Hand Rehabilitation (2011-2014)
    - Home Health (2011-2012)
    - Sports (2012-2014)
    - Women's Health (2011-2012)
- **Healthcare Provider CPR and AED Certification** **2012-present**
  - ✧ American Heart Association

## Other Awards/Recognitions

- **Phi Beta Kappa Honor Society** **May 2011-present**
  - ✧ Alpha of Arizona-University of Arizona

# Curriculum Vitae

Carrie L. Johnston

## Education

- **University of Nevada, Las Vegas - Las Vegas, NV** **Expected: May 2014**  
Doctor of Physical Therapy
- **Arizona State University – Tempe, AZ** **May 2006**  
Bachelor of Science: Recreation Management and Tourism

## Doctoral Dissertation

- Borg Janelle, Johnston Carrie, Lucke Megan, Sinclair Jordan. Validation of a tool for improved pressure ulcer staging by the non-expert in the live patient. April 2012-May 2014

## Professional Experience

<b>HealthSouth Valley of the Sun–Glendale, AZ</b> Clinical Internship-Acute Rehabilitation	<b>January 2014 – April 2014</b>
<b>Flagstaff Medical Center – Flagstaff, AZ</b> Clinical Internship-Acute Inpatient	<b>October 2013 – December 2013</b>
<b>Scripps Mercy Hospital – San Diego, CA</b> Clinical Internship-Outpatient Orthopedics	<b>July 2013 – September 2013</b>
<b>Kelly Hawkins Physical Therapy – Las Vegas, NV</b> Clinical Internship-Outpatient Orthopedics	<b>June 2012 – August 2012</b>
<b>Camelback Sports Therapy - Phoenix, AZ</b> Lead Physical Therapy Technician	<b>August 2009-May 2011</b>
<b>Camelview Physical Therapy-Phoenix, AZ</b> Physical Therapy Technician	<b>January 2009-August 2009</b>

## Professional Membership

- American Physical Therapy Association Member since 2011
- Nevada Physical Therapy Association Member 2011-2013
- Arizona Physical Therapy Association Member since 2014

- Healthcare Provider CPR and AED Certification since 2009

## **Continuing Education**

- UNLV's Distinguished Lecture Series-Las Vegas, NV April 2013
- Dr. Linda Fetters, PhD, PT, FAPTA-" Translating Discoveries in Movement Science into Relevant and Practical Clinical Bottom Lines"
- International Spine and Pain Institute lecture- Las Vegas, NV March 2013
- Dr. Adriaan Louw PT, M.App.Sc (physio), GCRM, CSMT - "Explain Pain"
- UNLV's Distinguished Lecture Series- Las Vegas, NV November 2012
- Dr. Alan Jette PT, PhD, FAPTA- "Innovations in Rehabilitation Outcome Measurement." and "Face Into the Storm"
- The Honor Society of Phi Kappa Phi Showcase Lecture November 2012
- Dr. Sue Schuerman PT, MBA, Ph.D., GCS- "Before the Fall: Strength, Flexibility and Osteoporosis"
- UNLV Presentation October 2012
- Eric Siller MPT, C/NDT, CBIS- "Traumatic Brain Injury"
- UNLV Presentation April 2012
- Michael T. Lebec PT, Ph.D.-"Emergency Department Physical Therapist Service: Enhanced Care thru an Emerging Area of Practice"
- NPTA Student Special Interest Group lecture- Las Vegas, NV March 2012
- Dr. Jennifer Nash PT, DPT, NCS -"Vestibular Rehabilitation"
- International Spine and Pain Institute lecture- Las Vegas, NV February 2012
- Dr. Adriaan Louw PT, M.App.Sc (physio), GCRM, CSMT - "Explain Pain"
- NPTA Student Special Interest Group lecture- Las Vegas, NV November 2011
- Dr. James Dettling M.D.- "Rotator Cuff Injuries, Diagnosis, Treatment & Rehab"
- Autism Research Institute Conference- Las Vegas, NV October 2011

# Curriculum Vitae

Megan Lucke

## Education:

- **University of Nevada, Las Vegas - Las Vegas, NV** **Expected: May 2014**  
Doctor of Physical Therapy
- **University of Nevada, Reno – Reno, NV** **May 2011**  
Bachelor of Science: Community Health Sciences

## Doctoral Dissertation:

- **Borg, Janelle, Johnston, Carrie, Lucke, Megan, Sinclair, Jordan. Validation of a tool for improved pressure ulcer staging by the non-expert in the live patient. April 2012-May 2014**

## Professional Experience:

- **Peter Barbieri Manual Therapy – Reno, NV** **January 2014 – April 2014**  
Clinical Internship-Outpatient Orthopedics
  - Developed extensive manual therapy skills
  - Learned how to relate osteopathic medicine to physical therapy
- **Saint Mary’s Regional Medical Center – Reno, NV** **October 2013 – December 2013**  
Clinical Internship-Acute Inpatient
  - Evaluated and treated patients in all settings
  - Developed confidence in working with very involved patients including those in the ICU
- **Renown Regional Medical Center – Reno, NV** **July 2013 – September 2013**  
Clinical Internship-Acute Rehab
  - Worked with a wide variety of patient pathologies including SCI, TBI, CVA, and various orthopedic conditions
- **Sports Therapy and Rehabilitation - Carson City, NV** **June 2012 – August 2012**  
Clinical Internship-Outpatient Orthopedics
  - Evaluated, diagnosed, and treated numerous musculoskeletal pathologies in a diverse age population
  - Implemented therapeutic and home exercise programs relevant to patient needs
  - Developed interpersonal skills
  - Presented an in-service on Platelet Rich Plasma and its effects on rehabilitation
- **Reno Sport & Spine Institute - Reno, NV** **June 2006 – May 2011**  
Physical Therapy Aide
  - Assisted in patient treatment
  - Supervised patients in therapeutic exercises
  - Took responsibility for office paperwork

- Provided information and answered patient inquiries regarding insurance
- **Renown Regional Medical Center - Reno, NV** **January 2006 – November 2007**  
Physical Therapy Aide
  - Assisted in patient treatment including wound care
  - Worked in all settings including ICU, Oncology, Pediatrics, Orthopedics and Neurology
  - Responsible for cleaning and maintaining equipment

### **Professional Development:**

- **APTA Combined Sections Meeting Poster Presenter** **February 2014**
  - Presented research on the NE1 Wound Assessment Tool in the staging of pressure ulcers by the non-expert

### **Professional Memberships:**

- **APTA and Nevada Chapter Member since 2011**
  - Orthopedic and Research Sections

### **Continuing Education:**

- **APTA Combined Sections Meeting – Various presenters** **February 2014**  
Las Vegas, NV
- **APTA Combined Sections Meeting - Various presenters** **January 2013**  
San Diego, CA
- **Introduction to the McKenzie Method - Boyd Etter, PT, Cert. MDT, OCS** **October 2012**  
Las Vegas, NV
- **APTA's Introduction to Professionalism Module (online)** **August 2012**
- **International Spine and Pain Institute (Explain Pain) - Adrian Louw, PT, PhD** **February 2012**
- **Rotator Cuff Injuries Rehab Presentation – Dr. James Dettling** **November 2011**  
Las Vegas, NV
- **Association for Gerontology in Higher Education Conference** **December 2010**  
Reno, NV

### **Honors and Awards:**

- **UNLV Physical Therapy Department Scholarship 2012**
- **Millennium Scholarship 2005-2008**

# Curriculum Vitae

**Jordan Sinclair**

## **Education**

- University of Nevada, Las Vegas- In progress, expected graduation date may 2014
  - Doctor of Physical Therapy
- University of San Diego, San Diego – 2010
  - Bachelor of Science, Psychology

## **Clinical Experience**

- Physical Therapy and Wellness Center, Red Bluff, CA (January 2014 – March 2014) Orthopaedic outpatient physical therapy
- Enloe Physical Therapy, Chico, CA (October 2013 – December 2013) Inpatient Acute Care physical therapy
- St. Rose Dominican Hospitals: Rose de Lima Campus, Las Vegas, NV (July 2013 – September 2013) Rehabilitation physical therapy
- Dreams Therapies, Las Vegas, NV (June 2012 – July 2012) Pediatrics physical therapy

## **Continuing/Supplemental Education**

- Combined Sections Meeting of the American Physical Therapy Association (APTA), 2014: Las Vegas, Nevada
- Explain the Pain Seminar by Dr. Adrian Lowe, 2012 and 2013: Las Vegas, Nevada
- Combined sections Meeting of the APTA, 2013: San Diego California

## **Research in Progress**

Evidence for the Validity of Pressure Ulcer Staging by Nurses in the Live Patient Using the NE1 Wound Assessment Tool.

## **Professional Membership**

- American Physical Therapy Association Member : 2012-2014