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ORIGINAL INVESTIGATION

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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

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INTRODUCTION

Healthcare organizations have vigorously increased their efforts in surveillance, reduction, and management of pressure ulcers (PrUs) that occur in patients under their care. As evidence of these changes, many organizations' goals, including the Joint Commission's 2010 National Patient Safety Goals, included a reduction in PrUs.¹ Such efforts stem from evidence that PrUs lead to significant problems in terms of individual morbidity and financial costs. Estimates of cost of care range from \$500 to \$70,000 per PrU, leading to total expenditures of \$11 billion per year. About 60,000 patients die yearly of PrU-related complications, such as sepsis.^{2,3} In the United States, the average Medicare payment for a PrU is \$44,000.⁴ In addition to the information on morbidity and cost, incidence and prevalence data also elucidate the magnitude of the problem.⁵⁻⁸ Despite the existence of effective tools to measure the risk of PrU development, incidence has not decreased in 10 years, and the prevalence, as recently as 2008, was estimated to be between 5.6% and 27.3%, depending on the facility and type of patient being considered.⁸⁻¹⁰

Because PrUs continue to occur, correct identification of the wound severity using staging as one characteristic is an important descriptor. Correctly applying a well-known classification label to a PrU has several positive effects. First, it facilitates more effective communication among healthcare workers by providing a standardized language to describe the wound and its characteristics. This reduces ambiguity and leads to efficiency in consultation and documentation. Second, it facilitates appropriate care among practitioners. When a wound is accurately and clearly described by a classification system, established protocols for wounds with that classification can be appropriately used. Third, it affects reimbursement from payers, such as Medicare in the United States. Medicare increases the

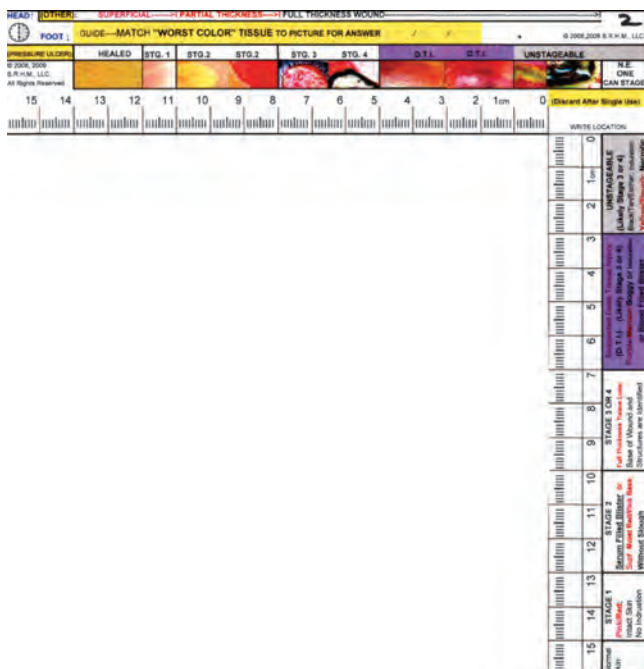
payment to a facility when patients are admitted with a qualifying PrU and requires facilities to return this payment and pay a fine if a wound was improperly staged and then billed to Medicare.¹¹

Of the several classification systems developed, the National Pressure Ulcer Advisory Panel (NPUAP) and the European Pressure Ulcer Advisory Panel (EPUAP) classification systems have strong support and are widely utilized.¹²⁻¹⁵ Reliability studies for the NPUAP and EPUAP classification systems have returned generally positive findings.^{5,6,16-24} A recent systematic review by Kottner et al²⁵ of 24 studies on NPUAP staging reports Spearman ρ values ranging between 0.39 and 1.00 and κ values between 0.12 and 0.97 (95% confidence interval [CI], 0.10-1.00). One of the most interesting statements in this review article was regarding the types of individuals serving as subjects. The authors noted that the practitioners tested did not usually represent the population of healthcare providers typically assessing wounds in most facilities because most of the subjects were certified wound care experts.²⁵ Also noted in their review, some of these studies used pictures to test the practitioner's ability to correctly stage a wound.^{16,18,24,26-34} Although examination of pictures is different than live examination of a patient with a wound, it can provide a valid assessment of a practitioners' ability to stage a PrU because staging is based on visible tissue in the wound bed.²⁶

Because assignment of correct stage to PrUs is so important but not always accurate, improvement in this ability is needed for the nonexpert practitioner. Specific training has been shown to improve the reliability of a practitioner in PrU staging.²⁷ Training needs to be made cost-effective, and retention of the training information is necessary. Improving the ability of every practitioner, from novice (eg, student, new graduate) to expert, to apply the correct NPUAP stage to a PrU should improve

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Figure 1.
NEOCS TOOL IMAGE



patient care and would likely save money. It is with this goal in mind that a new tool has been developed to facilitate more effective communication among healthcare workers by giving them standardized language to describe the wound and its characteristics, facilitate appropriate care among practitioners, and improve reimbursement from third-party payers. The tool has been named the N.E. One Can Stage (NEOCS [NE Solutionz, LLC, Las Vegas, Nevada]). In this article, the tool is introduced, and evidence for its validity and reliability is presented.

METHODS

Tool Development

The NEOCS was developed by a physical therapist (PT) who is a certified wound specialist with 22 years of clinical experience. It was developed to improve the correct staging of PrUs. Five wound care experts, with 81 years of combined wound care experience, assessed the construct and content validity of the NEOCS. Suggestions from their review were incorporated into design revisions.

The NEOCS contains written descriptions, including key words about wound color and verbiage from the NPUAP stage criteria, with representative pictures of PrUs. The NEOCS brings these 2 elements together in a concise format to guide

the user to the correct classification. It also helps in proper documentation with 2 additional elements: a metric-ruled border and space for key elements of documentation. Metric-ruled borders have been placed on the inside edges, and a space is provided for the practitioner to insert the date and wound location (Figure 1). When a picture of the wound is taken with the tool positioned at its margins, length and width measurements can even be obtained at a later time or date, assigned stage can be reassessed, and review of progression or deterioration of the wound can be made.

NEOCS Reliability and Validity

To determine if the NEOCS would be clinically useful or important, psychometric properties needed to be established. Thus, a pilot study was developed to test the reliability and validity of the NEOCS tool. Following institutional review board approval, a convenience sample was recruited, and their informed consent was obtained. The subject pool consisted of 101 total individuals: 27 registered nurses (RNs) and 11 RN students, 20 licensed practical nurses (LPNs), 17 PTs and 19 PT students, 3 physical therapy assistants (PTAs), 3 medical doctors (MDs), and 1 occupational therapist (OT). Each subject was asked how many years of experience he/she had in wound care, which yielded the following data: 54 reported less than 1 year, 8 reported 1 to 3 years, 13 reported 4 to 10 years, 15 reported 11 to 21 years, and 11 reported more than 21 years' experience (Figure 2). Except students, all subjects worked in urban home health ($n = 7$), urban community acute care hospital ($n = 58$), or urban outpatient settings ($n = 6$). All students had studied PrU pathology and staging in their curriculum prior to participation.

The test contained 10 pictures with brief case descriptions. A separate sheet contained the questions with space to record

Figure 2.
EXPERIENCE GRAPH

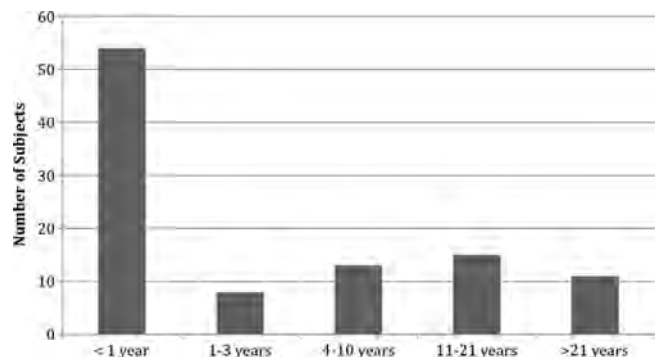


Table 1.

TEST-RETEST BY SUBCATEGORY AND DISCIPLINE

Test-Retest for	n	ICC (3,1)	95% CI
All clinicians	57	0.794	0.673–0.873
All students	25	0.785	0.571–0.899
PTs	Overall	0.801	0.623–0.900
	Clinicians	0.608	0.178–0.843
	Students	0.821	0.530–0.939
RNs	Overall	0.793	0.697–0.862
	Clinicians	0.842	0.637–0.936
	Students	0.665	0.144–0.897
LPNs	18	0.698	0.356–0.875

answers. Subjects were asked the same questions about each of the 10 pictures. Of the 10 pictures, 8 wounds were PrUs, and 2 were other wound types. Among the 8 pictures of PrUs, 7 were full-thickness ulcers and thereby met Medicare criteria for additional reimbursement if staged correctly. In order of presentation in the examination, the pictures were of the following: (1) sacral-coccyx area, deep tissue injury (sDTI); (2) right elbow, unstageable; (3) sacral-coccygeal area, unstageable; (4) perianal excoriation, partial thickness; (5) right heel, sDTI; (6) right ischial tuberosity, Stage II; (7) right below-knee amputation incision, full-thickness; (8) sacral-coccygeal area, Stage III; (9) right anterior ankle, sDTI; and (10) right heel, sDTI.

Subjects were asked to take the test 4 different times. The first 3 tests were given on the same day, one after another. The first time, they took the test without instruction or the NEOCS. The second time, they were given the NEOCS but not provided any instruction. The third time, they were read scripted instruction on the use of the NEOCS and PrU staging that took approximately 5 minutes. The test was given a fourth time 1 week later, when the NEOCS was provided but the instructions were not reread. Subjects were not given any feedback on their performance on the

test as a whole, or for any individual question, until after test condition 4. All subjects took the test for conditions 1 to 3, but 19 subjects (3 LPNs, 3 MDs, 5 PT students, 1 PT clinician, and 8 RN clinicians) did not return for test condition 4. The tests were scored according to the experts' assignment of the correct response for each question. Comparing the score of test condition 3 to test condition 4 was done with the intraclass correlation coefficient (ICC) to assess test-retest reliability, and paired *t* test comparison of the scores from test conditions 1 to 2, 1 to 3, and 2 to 3 was performed to assess evidence for the validity of the NEOCS in PrU classification.

RESULTS**Reliability**

Reliability was examined by comparing the percentage of correct responses on test condition 3 to the percentage of correct responses on test condition 4 using ICC. Test-retest reliability for all subjects was calculated and yielded the following: ICC (3,1) = 0.793 (95% CI, 0.697–0.862). Table 1 contains the reliability statistics for the subgroups of the study's subject pool. Because there were so few MDs, PTAs, and OTs, these data were not examined individually.

Validity

Evidence for the criterion-related validity of the NEOCS was obtained by comparing the test answers of the subjects to those of the experts. Subject test scores were evaluated relative to a 100% score on the test. For all subjects tested, the percentage correct averaged 31.9% on the first test condition and 69.6% on the third test condition. This represented a 37.7% increase in accurate staging when subjects used the NEOCS and were given 5 minutes of instruction. Table 2 shows the mean test scores of the different subgroups.

Validity was also examined by calculating the percentage change in correct staging for each question of the test. The

Table 2.

PERCENTAGE CORRECT FROM TEST CONDITION 1 (WITHOUT NEOCS), TEST CONDITION 2 (WITH NEOCS BUT NO INSTRUCTION), TEST CONDITION 3 (WITH NEOCS AND INSTRUCTION), AND TEST CONDITION 4 (7 DAYS FOLLOWING TEST CONDITION 3, WITH NEOCS BUT NO ADDITIONAL INSTRUCTION) BY SUBCATEGORY AND DISCIPLINE

% Correct for		Test 1, % n = 101	Test 2, % n = 101	Test 3, % n = 101	Test 4, % n = 82
All clinicians		34.7	63.5	70.7	71.1
All students		26.0	52.3	67.0	68.0
PTs	Overall	39.2	61.2	71.4	70.7
	Clinicians	52.4	72.4	79.4	77.5
	Students	27.4	51.1	64.2	62.9
RNs	Overall	32.4	63.4	71.8	76.0
	Clinicians	35.9	67.0	71.9	76.8
	Students	23.6	54.6	71.8	74.6
LPNs		23.0	53.0	63.0	58.3

photograph that subjects most frequently misidentified was picture 1, a PrU of the sacral-coccygeal area staged as sDTI, with only 13% of subjects correctly staging this PrU on test condition 1 and 45% in test condition 4. In the first testing condition picture 3, an unstageable sacral-coccygeal PrU was correctly classified more than any other at 75% and in test condition 4 was second (97%) only to picture 8 (98%) at being correctly classified. The largest improvement was realized on picture 8, a sacral-coccygeal area stage 3 PrU, where the percentage correct improved 61 percentage points, from 37% to 98% between test conditions 1 and 4. The smallest improvement was 14 percentage points for picture 4, partial-thickness perianal excoriation, increasing from 33% to 47% correct on test conditions 1 and 4, respectively. Table 3 contains the percentage of subjects who chose a particular answer for each picture.

Additional evidence for the validity of the NEOCS was obtained using a paired-sample *t* test of the scores from test conditions 1 to 2, 1 to 3, and 2 to 3. There was a statistically significant difference between the overall percentage correct ($t_{100} = -14.408, P < .001$) on test condition 1 (mean, 31.88%; SD, 20.819%) and test condition 2 (mean, 60.20%; SD, 19.390%). There was also a statistically significant difference between the overall percentage correct ($t_{100} = -19.505, P < .001$) on test condition 1 (mean, 31.88%; SD, 20.819%) and test condition 3 (mean, 69.60%; SD, 15.679%). In addition, there was a statistically significant difference between

the overall percentage correct ($t_{100} = -6.265, P < .001$) on test condition 2 (mean, 60.20%; SD, 19.390%) and test condition 3 (mean, 69.60%; SD, 15.679%). Tables 4 and 5 contain the statistics for subgroups of the authors' subject pool considering all 10 questions. As with reliability testing, there were so few MDs, PTAs, and OTs, these were not examined individually.

Also examined was the percentage correct on the 7 test pictures that would increase the payment from Medicare. Again, there was a statistically significant difference between the overall percentage correct ($t_{100} = -15.128, P < .001$) on test condition 1 (mean, 28.31%; SD, 23.594%) and test condition 2 (mean, 62.3%; SD, 23.5%); the overall percentage correct ($t_{100} = -18.718, P < .001$) on test condition 1 (mean, 28.31%; SD, 23.594%) and test condition 3 (mean, 71.96%; SD, 18.977%); and the overall percentage correct ($t_{100} = -5.579, P < .001$) on test condition 2 (mean, 62.27%; SD, 23.511%) and test condition 3 (mean, 71.96%; SD, 18.977%). Tables 6 and 7 contain the statistics for subgroups of the study's subject pool considering only these 7 pictures. Again, because there were so few MDs, PTAs, and OTs, these were not examined individually.

DISCUSSION

For the NEOCS, or any other tool, to guide or aid PrU staging and to be useful in clinical practice, it must both assist the user in correctly matching stage to wound and do so consistently as

Table 3.

RESPONSE PERCENTAGES FOR EACH POSSIBLE ANSWER ON EACH PICTURE IN TESTING CONDITIONS 1 AND 4

Picture No. and Body Location	Test Condition	Pressure Ulcer							Other Wound		
		Healed	Stage I	Stage II	Stage III	Stage IV	sDTI	Unstageable	Superficial Thickness	Partial-thickness	Full-thickness
1	1		67%	11%	3%		13%		6%		
Sacrum	4		47%	5%			45%		3%		
2	1			28%	18%	5%	5%	20%	3%	17%	3%
Elbow	4			1%	10%	7%		77%		1%	3%
3	1			1%	12%	1%	7%	75%		3%	
Sacrum	4							97%			3%
4	1		5%	7%	3%		7%	1%	40%	33%	3%
Perineum	4		1%	7%	5%	1%	3%	1%	20%	47%	13%
5	1	1%	17%	8%	5%		47%	18%	3%		
Heel	4			3%		1%	88%	5%	3%		
6	1		38%	35%	1%		5%		13%	7%	
Ischium	4		7%	63%	1%		17%		1%	10%	
7	1					1%	1%	10%		18%	68%
Leg	4							8%			92%
8	1			47%	37%	5%	5%	5%			1%
Sacrum	4				98%	2%					
9	1		22%	1%		1%	20%	7%	37%	12%	
Ankle	4		10%	1%			58%		18%		12%
10	1		63%	10%	2%		23%		2%		
Heel	4		22%	8%	2%		68%				

The correct answer has its percentage in bold.

Table 4.

COMPARISON OF PERCENTAGE CORRECT (MEANS AND SDS) FROM TEST CONDITION 1 (WITHOUT NEOCS) TO PERCENTAGE CORRECT FROM TEST CONDITION 2 (WITH NEOCS BUT NO INSTRUCTION) BY SUBCATEGORY AND DISCIPLINE FOR ALL 10 TEST QUESTIONS

Comparison of Percentage Correct for	n	Test 1 Mean (SD), %	Test 2 Mean (SD), %	t Statistic	P
All clinicians	71	34.7 (23.28)	63.5 (19.79)	$t_{70} = -11.32$	<.0005
All students	30	26.0 (11.63)	52.3 (16.12)	$t_{29} = -10.12$	<.0005
PTs	Overall	36	39.2 (21.03)	$t_{35} = -8.23$	<.0005
	Clinicians	17	52.4 (20.78)	$t_{16} = -4.49$	<.0005
	Students	19	27.4 (12.84)	$t_{18} = -7.45$	<.0005
RNs	Overall	38	32.4 (20.19)	$t_{37} = -9.16$	<.0005
	Clinicians	27	35.9 (22.41)	$t_{26} = -6.95$	<.0005
	Students	11	23.6 (9.24)	$t_{10} = -7.09$	<.0005
LPNs	20	23.0 (18.38)	53.0 (20.03)	$t_{19} = -6.23$	<.0005

the tool is used repeatedly. The NEOCS demonstrated good reliability for the tested healthcare providers as a group. Although 3 subgroups in the subject pool (PT clinicians, RN students, and LPNs) were slightly lower than the average, they still demonstrated moderate test-retest reliability. This indicates that healthcare providers of different disciplines can get consistent results when using the tool to stage PrUs.

In addition, the NEOCS also significantly improved the accuracy of PrU staging by all subjects, which supports the validity of the tool. All groups improved significantly in their ability to accurately stage PrUs when given the tool without instruction and improved even further with only 5 minutes of instruction on how to use it. It is important to note that there was no feedback for performance given between tests. This prevented subjects from answering the test questions on conditions 2, 3, and 4 differently based on knowledge of their prior performance on the test. Testing on the same day for conditions 1, 2, and 3 also provided a control for maturation and learning of the subjects over time. Even for the fourth testing condition to assess test-retest reliability, the break needed to

be long enough only to forget the previous responses but not so long as for maturation and learning to occur in the subjects. This indicates that different types of healthcare providers can, with very little time invested, improve their ability to correctly stage PrUs using the NEOCS.

Because of the added cost of care for patients with PrUs of NPUAP Stage III or greater, Medicare will increase payment to acute care hospitals to care for these patients. Importantly, if these wounds are not staged correctly, they can be costly. For instance, if a facility bills Medicare for the care of a person with a Stage III PrU or greater, when in fact that wound was not Stage III or greater, the payment must be repaid with a penalty.¹¹ Therefore, it is essential that facilities correctly identify the stage of PrUs in their patients and bill accordingly. In this study, 7 of the pictures used to test subjects fit the criteria for additional reimbursement. The performance of subjects on these pictures followed the trends for all 10 pictures.

In this pilot study, the NEOCS improves PrU staging reliability and accuracy. Moreover, it did so without any training on its use. With only a brief tutorial, that accuracy improves

Table 5.

COMPARISON OF PERCENTAGE CORRECT (MEANS AND SDS) FROM TEST CONDITION 1 (WITHOUT NEOCS) TO PERCENTAGE CORRECT FROM TEST CONDITION 3 (WITH NEOCS AND INSTRUCTION) BY SUBCATEGORY AND DISCIPLINE FOR ALL 10 TEST QUESTIONS

Comparison of Percentage Correct for	n	Test 1 Mean (SD), %	Test 3 Mean (SD), %	t Statistic	P
All clinicians	71	34.4 (23.28)	70.7 (16.42)	$t_{70} = -14.40$	<.0005
All students	30	26.0 (11.63)	67.0 (13.68)	$t_{29} = -16.06$	<.0005
PTs	Overall	36	39.2 (21.03)	$t_{35} = -10.52$	<.0005
	Clinicians	17	52.4 (20.78)	$t_{16} = -5.14$	<.0005
	Students	19	27.4 (12.84)	$t_{18} = -11.67$	<.0005
RNs	Overall	38	32.4 (20.19)	$t_{37} = -13.19$	<.0005
	Clinicians	27	35.9 (22.41)	$t_{26} = -9.49$	<.0005
	Students	11	23.6 (9.24)	$t_{10} = -13.69$	<.0005
LPNs	20	23.0 (18.38)	63.0 (16.89)	$t_{19} = -8.61$	<.0005

Table 6.

COMPARISON OF PERCENTAGE CORRECT (MEANS AND SDS) FROM TEST CONDITION 1 (WITHOUT NEOCS) TO PERCENTAGE CORRECT FROM TEST CONDITION 2 (WITH NEOCS AND INSTRUCTION) BY SUBCATEGORY AND DISCIPLINE FOR THE 7-PICTURE SUBSET

Comparison of Percentage Correct for	n	Test 1 Mean (SD), %	Test 2 Mean (SD), %	t Statistic	P
All clinicians	71	31.6 (26.12)	67.2 (23.26)	$t_{71} = -12.32$	<.0005
All students	30	20.5 (13.52)	50.5 (19.95)	$t_{30} = -9.52$	<.0005
PTs	Overall	36	35.8 (25.67)	$t_{36} = -8.21$	<.0005
	Clinicians	17	50.5 (27.63)	$t_{16} = -4.80$	<.0005
	Students	19	22.6 (14.67)	$t_{18} = -7.82$	<.0005
RNs	Overall	38	29.3 (21.77)	$t_{37} = -11.01$	<.0005
	Clinicians	27	34.4 (23.16)	$t_{26} = -8.61$	<.0005
	Students	11	16.9 (10.95)	$t_{10} = -7.05$	<.0005
LPNs	20	19.3 (21.00)	54.9 (21.82)	$t_{19} = -6.01$	<.0005

significantly. Although not yet available for purchase at press time, the intent is to print the tool on a material that would be single-use and affordable. The impact for facilities that admit patients with PrUs would be immediate. Increased accuracy in PrU staging would improve the financial health of facilities where payers use PrU stage to determine reimbursement. The NEOCS would also help to drive improved patient care because accurate PrU staging may lead to appropriate treatment implementation. In addition to appropriate treatment being selected, the NEOCS, by improving staging accuracy, would also enable care decisions to be standardized and implemented quickly and confidently.

The authors believe that this tool improves the reliability and accuracy of PrU staging by serving as a quick, visual reference of the NPUAP stage criteria. The tool assists clinicians by offering pictures to which they can compare the wound to be staged and also key wording from the NPUAP stage criteria. In addition, the focus on wound color simplifies the decision-making process. Clinician memory and cognitive processing are consequently aided to increase staging accuracy.

The accuracy of this subject pool in staging PrUs without the NEOCS is somewhat lower than most reported studies.²⁵ This is likely due to the broad range of clinical disciplines that were tested and that more than 50% of the study's subjects reported less than 1 year of experience in staging PrUs. However, this same subject pool improved to levels equal to or better than those in other studies when they were given the NEOCS and taught how to use it.²⁵ This finding strongly supports the use of the NEOCS, especially among the nonexpert, to improve PrU staging accuracy.

The different healthcare providers who were tested in this study allow for interesting comparison. There was lower test-retest reliability among PT clinicians, RN students, and LPNs. LPNs have the least formal education, sometimes as short as 9 months, of the tested subjects. This shortened educational background is a possible explanation for both their lower reliability and lower accuracy. RN students have little practical experience to support their education on staging PrUs and thus likely the lowest confidence. Lower certainty in staging could logically increase the variability in choice. However, RN students

Table 7.

COMPARISON OF PERCENTAGE CORRECT (MEANS AND SDS) FROM TEST CONDITION 1 (WITHOUT NEOCS) TO PERCENTAGE CORRECT FROM TEST CONDITION 3 (WITH NEOCS AND INSTRUCTION) BY SUBCATEGORY AND DISCIPLINE FOR THE 7-PICTURE SUBSET

Comparison of Percent Correct for	n	Test 1 Mean (SD), %	Test 3 Mean (SD), %	t Statistic	P
All clinicians	71	31.6 (26.12)	74.6 (19.68)	$t_{70} = -14.17$	<.0005
All students	30	20.5 (13.52)	65.6 (5.76)	$t_{29} = -14.03$	<.0005
PTs	Overall	36	35.8 (25.67)	$t_{35} = -9.72$	<.0005
	Clinicians	17	50.5 (27.632)	$t_{16} = -4.83$	<.0005
	Students	19	22.6 (14.67)	$t_{18} = -10.83$	<.0005
RNs	Overall	38	29.3 (21.77)	$t_{37} = -12.89$	<.0005
	Clinicians	27	34.4 (23.16)	$t_{26} = -9.46$	<.0005
	Students	11	16.9 (10.95)	$t_{10} = -11.43$	<.0005
LPNs	20	19.3 (21.00)	66.4 (18.68)	$t_{19} = -8.57$	<.0005

showed more accuracy than the PT students. The study's population of PT students had almost no clinical exposure to wound care at the time they participated in the study, and this may have contributed to their lower accuracy. On the other hand, PT clinicians, even though trained on PrU staging in their formal education, may evaluate and treat wounds less frequently in clinical practice. And although most new PT graduates have a doctorate, there are still many bachelor and master's degree trained PTs in practice. This may have contributed to the variability in educational background and experience of this group. Despite their lower reliability, PTs had the highest accuracy. It is also significant to note that we were unable to locate any other studies that compared PrU staging accuracy between PT, RN, and LPN.

When comparing students with clinicians, regardless of discipline, the reliability was similar; however, clinicians tended to be more accurate. This is not a surprising finding and may indicate that greater clinical exposure to wounds may improve accuracy in staging PrUs.

Interestingly, PT students demonstrated higher reliability than their clinician counterparts. In addition to the varied education level among PT clinicians, which may explain this finding, a few of the PT clinician subjects had very low reliability and lowered the average for the whole group. With these outliers removed, the overall pattern for higher reliability and accuracy for clinicians is true for PTs just as it is for the pool of RNs and RN students.

Like all studies, there were limitations. The subjects were not randomly selected and may not represent the larger community of PTs, RNs, and LPNs. However, with 101 subjects, the generalizability is improved despite the sample limitation. Also, pictures were used to test subjects' use of the tool rather than actual PrUs. Live tissue provides contextual cues to the wound type and perhaps would be the ideal setting for testing a subject's ability to stage PrUs. However, the use of actual patients is complex in a testing situation because of clinical change, subject burden, and priorities of care. Pictures have been used in many other PrU staging studies and can be a valid indicator of clinician ability.²⁷ There are several areas on which the NEOCS may have an impact, which were not evaluated in this study. Future studies should measure the effect of using the NEOCS on outcomes such as reimbursement, staff efficiency in PrU management, and PrU healing.

CONCLUSIONS

The NEOCS is a cost-effective, reliable, and valid tool to increase the ability of clinicians to accurately stage PrUs. In this study, accuracy more than doubled when subjects were trained to use the NEOCS. It has the potential to improve reimburse-

ment for facilities and drive better care for people with PrUs. If the tool is placed at the wound margin and a photograph is taken, it can also be used for administrative review and protection against litigation. The NEOCS should be considered for adoption by all facilities where PrUs occur. ●

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