

## BACKGROUND

According to the Centers for Medicare and Medicaid, pressure injuries can be "reasonably prevented" with evidence-based care. Risk assessment is the cornerstone of evidence-based pressure injury prevention.<sup>1</sup> Although twenty-six pressure injury risk assessment tools have historical use in the critical care setting, the Braden Scale remains the most commonly employed tool.<sup>2</sup> Conversely, use of the Braden Scale in the critical care setting has several limitations, including the omission of known critical-care specific pressure injury predictors, sub-optimal validity and reliability, and a complex scoring matrix. These deficiencies present challenges to accurate risk prediction, effective primary prevention, and may leave vulnerable patients at risk.

## PURPOSE

To optimize and evaluate the Norton Scale for use in the critical care setting and evaluate its reliability, validity, usability, and preference among critical care nurses.

## METHODS

**DESIGN:** Single-site IRB-approved scholarly nursing practice project

**SETTING:** Large Magnet-designated, academic medical center, and level 1 trauma center in the southeast United States

**TOOL SELECTION:** The Norton Pressure Sore Risk Assessment Scale (Norton Scale) was selected for optimization based on a systematic review of the literature; which revealed that it had the highest mean validity and reliability scores among the twenty-six tools with historical use in the critical care setting.

### NORTON SCALE OPTIMIZATION:

#### CHANGED

- Statistically-significant critical care risk factors included
- Subjective measures made objective
- Vague language clarified

#### UNCHANGED

- Risk categories
- Total score range
- Subscale range
- Risk levels

#### VALIDITY

- Five possible versions subjected to peer review
- Experimental oNS selected by peer consensus

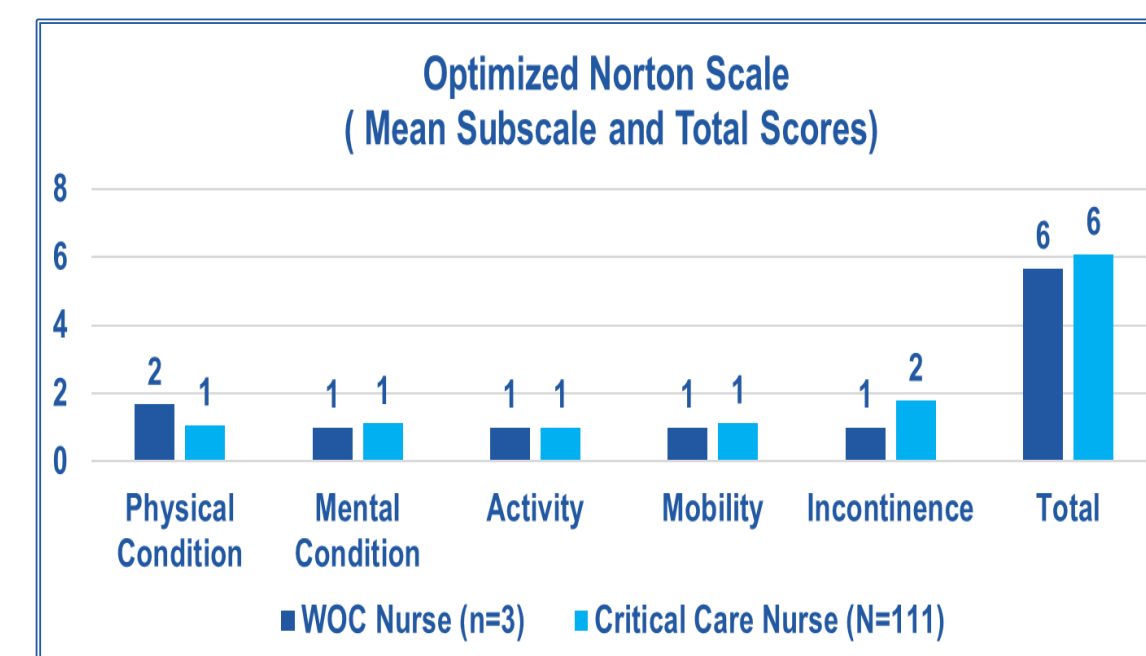
**IMPLEMENTATION:** A convenience sample of critical care nurses and certified WOC nurses assessed the pressure injury risk of a video simulated critical care patient using the optimized Norton Scale (oNS) and the Braden Scale. The facility's incumbent tool, the Braden Scale, was used as the benchmark of the test patient's level of risk. The WOC nurses' assessments using the oNS represented the benchmark for the oNS total and subscale scores.

**EVALUATION:** Data were collected digitally via Qualtrics® (Qualtrics Analytics, Seattle, WA) and analyzed using SPSS statistical package version 24 (SPSS Inc, Chicago, IL).

## RESULTS

### Optimized Norton Scale (oNS)

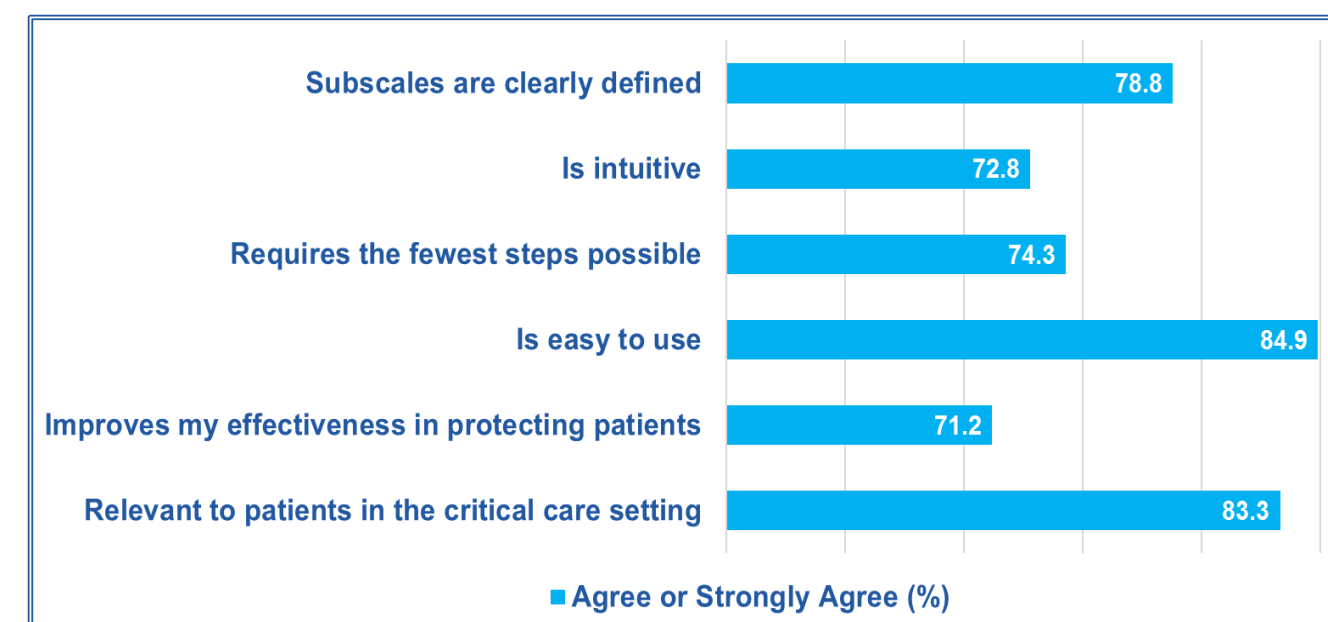
| PHYSICAL CONDITION                                                                                                                                                                                                                                                                                                                                                                                                                                 |   |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
| No deficits                                                                                                                                                                                                                                                                                                                                                                                                                                        | 4 |
| Fair                                                                                                                                                                                                                                                                                                                                                                                                                                               | 2 |
| <ul style="list-style-type: none"> <li>• Current or previous pressure injury</li> <li>• Edema</li> <li>• Malnutrition</li> <li>• BMI &lt;19 or &gt; 40</li> <li>• Albumin level &lt; 2.4 g/dL</li> <li>• Smoker</li> <li>• Blood glucose level &gt; 180 mg/dL</li> <li>• Cardiovascular or pulmonary disease</li> <li>• ICU LOS &gt; 12 days</li> </ul>                                                                                            |   |
| Poor                                                                                                                                                                                                                                                                                                                                                                                                                                               | 1 |
| <ul style="list-style-type: none"> <li>• Hemodynamic instability</li> <li>• Mean arterial BP &lt; 60</li> <li>• Diastolic BP &lt; 50 or Systolic BP &lt; 90</li> <li>• Use of &gt; 1 vasopressor</li> <li>• Body temperature, °C &lt;36 or &gt;38</li> <li>• Continuous veno-venous hemodialysis</li> <li>• Svo2 or Scvo2 &lt; 60% for 5 min</li> <li>• Spo2 &lt; 90%</li> <li>• Hemoglobin level &lt; 7.7 g/dL</li> <li>• P/F &lt; 200</li> </ul> |   |
| MENTAL                                                                                                                                                                                                                                                                                                                                                                                                                                             |   |
| Alert and appropriate                                                                                                                                                                                                                                                                                                                                                                                                                              | 4 |
| Altered mentation or sensory perception                                                                                                                                                                                                                                                                                                                                                                                                            | 1 |
| ACTIVITY                                                                                                                                                                                                                                                                                                                                                                                                                                           |   |
| Independent ambulation                                                                                                                                                                                                                                                                                                                                                                                                                             | 4 |
| Walks with help                                                                                                                                                                                                                                                                                                                                                                                                                                    | 3 |
| Chair bound                                                                                                                                                                                                                                                                                                                                                                                                                                        | 2 |
| Bed bound                                                                                                                                                                                                                                                                                                                                                                                                                                          | 1 |
| MOBILITY                                                                                                                                                                                                                                                                                                                                                                                                                                           |   |
| Completely independent                                                                                                                                                                                                                                                                                                                                                                                                                             | 4 |
| Requires 1 person assistance                                                                                                                                                                                                                                                                                                                                                                                                                       | 2 |
| Total turn                                                                                                                                                                                                                                                                                                                                                                                                                                         | 1 |
| INCONTINENCE                                                                                                                                                                                                                                                                                                                                                                                                                                       |   |
| Continent                                                                                                                                                                                                                                                                                                                                                                                                                                          | 4 |
| Incontinent urine or stool                                                                                                                                                                                                                                                                                                                                                                                                                         | 2 |
| Dual incontinence                                                                                                                                                                                                                                                                                                                                                                                                                                  | 1 |



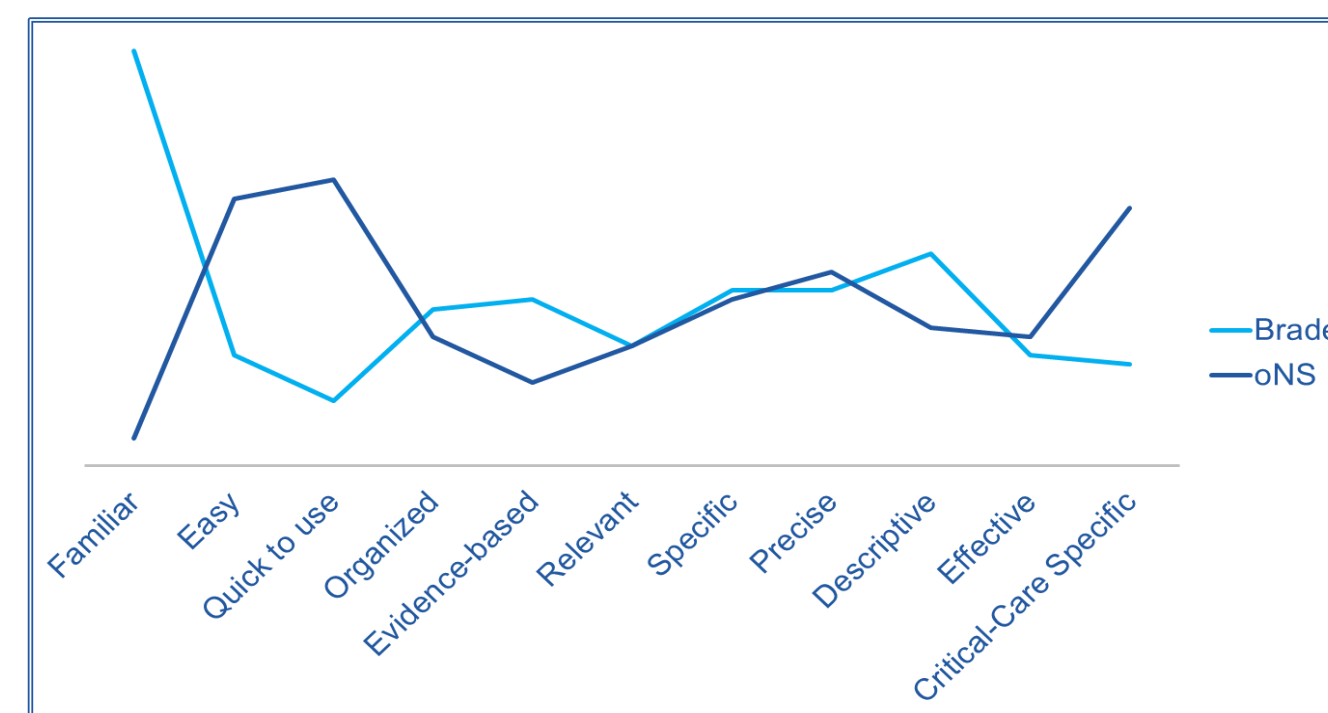
### oNS Validity & Reliability

- 100% of the participants accurately identified the patient as high risk
- Excellent Predictive Validity: Positive correlation between the mental condition ( $r=.978, p<.001$ ), activity ( $r=.950, p<.001$ ), mobility ( $r=.881, p<.001$ ), incontinence ( $r=.885, p<.001$ ) and the total score ( $r=1$ ). Physical condition not reported because it was constant.
- Excellent Reliability: Cronbach's alpha: 0.944
- High Interrater Reliability: Average measure intraclass correlation coefficient was .933 with a 95% confidence interval from .911 to .950 ( $F(113,456) = 14.841, p<.001$ )

### oNS Usability



### oNS Preference



## CONCLUSION

Individualized, patient centered care that addresses the critically ill patient's unique vulnerabilities is a necessary tool in the pressure injury prevention paradigm. This study demonstrates that the oNS, a critical care specific risk assessment tool, is a viable option for identifying and addressing these unique vulnerabilities. The oNS demonstrated excellent predictive validity, excellent reliability, and high interrater reliability. It also demonstrated superior usability and preference over the Braden Scale among critical care nurses because it is quick, easy to use, and critical care specific.

## IMPLICATIONS FOR PRACTICE

The oNS is a practical risk assessment tool for prevention of pressure injuries among patients in the critical care setting. Implementation of the oNS into practice offers critical care nurses a quick, easy to use, and effective critical-care specific risk assessment tool. This increase in the efficiency of pressure injury risk assessment serves as the foundation for timely and effective initiation of risk-focused pressure injury prevention strategies and may help to mitigate associated adverse outcomes for the patient, nurse, and healthcare organization.

## REFERENCES

1. National Pressure Ulcer Advisory Panel, European Pressure Ulcer Advisory Panel and Pan Pacific Pressure Injury Alliance. (2014). Prevention and treatment of pressure ulcers: Quick reference guide. Cambridge Media: Perth, Australia.
2. García-Fernández, F.P., Pancorbo-Hidalgo, P.L., Agreda, J.J., & Rodríguez-Torres, M.C. (2013). Risk assessment scales for pressure ulcers in intensive care units: A systematic review with meta-analysis. European Wound Management Association Journal, 13(2), 7-13.

## ACKNOWLEDGEMENTS

To the nurses at University of Alabama in Birmingham Hospital, I thank you for your willingness to take time out of your busy day to participate in my project, from inception to fruition. Your contribution to this work will not be in vain. I promise to contribute to the nursing profession by disseminating the results of this project, where appropriate, to positively impact the care of patients at risk for pressure injuries.