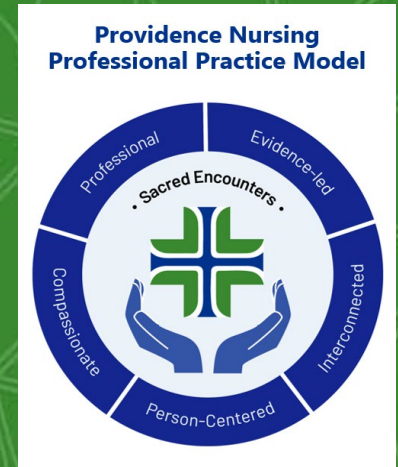




Oregon Nursing Quality Research Consortium

# The Murdock Daily Reilly (M.D.R.) Scale: A Pressure Injury Risk Assessment Scale for Critical Care

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# Background and Literature Review

- The Braden Scale is a validated pressure injury risk assessment scale, but it only provides a score based on six sub-scales which **fail to account for critical-care specific factors** and nuances that impact the ICU patient's risk for pressure injury assessment and prevention
- The 2021 Press Ganey Guidelines suggest specific characteristics that impact the formation of pressure injuries that should be considered when determining appropriate evidence-based interventions
- These factors include, but are not limited to, **age, perfusion, oxygenation, comorbidities, general health status, and current or prior pressure injuries**
- NPIAP does not offer a tool or instrument for pressure injury risk assessment
- Several other risk assessment scales in addition to the Braden Scale were reviewed, including the COMHON Index and Cubbin-Jackson Scale



# Study Objectives

- Create an objective risk assessment scale appropriate for use in the critical care setting to identify patients at risk for pressure injuries
- Include evidence-based interventions with the scale to guide staff toward pressure reduction interventions
- Reduction in the incidence of pressure injuries in ICU patients at Providence St. Vincent (PSVMC) by 20 percent or greater



# Study Methods

- **Design:** Retrospective/prospective cohort study
- **Population:** All consenting ICU patients over the age of 18 years
- **Setting:** Providence St. Vincent Medical Center ICU
- **Time frame:** 3-month period
- **Intervention:**
  - Development of data collection form
  - Chart review of all patients with hospital-acquired pressure injuries from 2020, 2021, and 2022 to determine trends in pressure injury development using data collection form
  - Analysis of chart review findings
  - M.D.R. Scale formalized
  - Nursing staff educated on use of scale
  - Scale piloted in the ICU over a 3-month period (November 2023-February 2024)
  - Feedback obtained from nurses via nurse survey
  - Data from scale, nurse survey, and pressure injury prevalence/incidence rates analyzed; statistics formalized
  - Braden Scale used as a comparative tool



# Inclusion and Exclusion Criteria and Considerations for Vulnerable Populations

## Inclusion Criteria for Patients

- **Retrospective Portion:**
  - All patients 18 years or older that developed stage 2 or greater pressure injuries in the PSVMC ICU during 2020, 2021, and 2022
- **Prospective Portion:**
  - All consenting patients 18 years or older admitted to PSVMC ICU during the 3-month study period
- Exclusion criteria included patients not meeting the inclusion criteria (both study portions) or non-consenting patients (prospective portion)

## Inclusion and Exclusion Criteria for Nurses

- **Included:**
  - All staff nurses at PSVMC ICU
  - All Critical Care Float Pool nurses at PSVMC ICU
- **Excluded:**
  - Contract nurses
  - Any nurse completing their orientation period with a preceptor during the 3-month study period

## Considerations for Vulnerable Populations

- **Patients:**
  - Consent obtained from patients or legally-authorized representatives per "Consent and Refusal of Consent for Procedures" policy
- **Nurses:**
  - Provided with informational sheet and participation only by consent
  - Consent obtained via a checked box on the survey form which was able to be turned into a drop box anonymously

# Analysis of Data from Retrospective Portion

- Total skin integrity events reviewed: 147
- Final sample size: 35 patients
- Trends from this portion showed (among other findings) increased age and BMI, long hospital and ICU lengths of stay, extended vasopressor use, poor nutritional status, elevated WBC, and decreased albumin levels
- These trends were used in conjunction with knowledge obtained from the literature review to create the M.D.R. Scale

Total Patients n = 35			
<b>DEMOGRAPHIC DATA</b>		<b>NUTRITION DATA</b>	
Age	64 Years [55-72]	Time to Nutrition	2 Days [0-5]
Race	29 White (82.9%)	<b>CONTINENCE DATA</b>	
	4 Hispanic (11.4%)	Indwelling Urinary Catheter	33 (94.3%)
	1 Asian (2.9%)	Fecal Incontinence Device	24 (68.6%)
	1 Other (2.9%)	<b>MOBILITY DATA</b>	
Gender	26 Male (74.3%)	Proned	8 (22.9%)
	9 Female (25.7%)	<b>LAB DATA</b>	
BMI	28.6 [24-33]	Highest Serum Glucose	229 mg/dL [186-273]
BMI < 18.5	2 (5.7%)	Serum WBC <sup>2</sup>	14.2 cells/μL [10-24]
BMI 18.5-25.0	6 (17.1%)	Highest Serum Creatinine	1.6 mg/dL [1.1-3.6]
BMI > 25.0	27 (77.1%)	Serum Albumin <sup>2</sup>	2.2 g/dL [1.8-2.5]
LOS in ICU	12 Days [8-18]	COVID-19 Positive	17 (48.6%)
LOS in Hospital	23 Days [13-34]	Blood Cultures Positive	11 (31.4%)
Time to PI Discovery	10 Days [5-14]	Respiratory Cultures Positive	18 (51.4%)
<b>ADMISSION DATA</b>		Blood and Respiratory Cultures Positive	7 (20%)
Respiratory Failure Admitting Diagnosis	12 (20.7%)	<b>PRESSURE INJURY DATA</b>	
Diabetes Comorbidity	12 (34.3%)	Pressure Injury on Admission	5 (14.3%)
Mortality this Admission	25 (71.4%)	Total Number of Pressure Injuries	58
Blood Products	7 None (20%)	Coccyx/Sacrum/Buttocks	32 (55.2%)
	7 Albumin only (20%)	Back/Spine	6 (10.3%)
	21 Yes (60%)	Ear	3 (5.2%)
Corticosteroids this Admission	29 (82.9%)	Lip/Tongue	5 (8.6%)
		Other	12 (20.7%)
		Device-Related	11 (19%)
<b>HEMODYNAMIC DATA</b>		<b>BRADEN SCALE SCORE DATA</b>	
On 1 Vasopressor <sup>3</sup>	10 (28.6%)	Lowest Braden Score	11.2
On 2 Vasopressors	13 (37.1%)	Average Braden Score	13.3
On 3 Vasopressors	6 (17.1%)	Average Moisture	3.3
On 4+ Vasopressors	5 (14.3%)	Average Sensory	2.5
No Vasopressors	1 (2.9%)	Average Mobility	2.1
Time on Vasopressors	5 Days [3-13]	Average Nutrition	2.2
<b>NEUROLOGICAL DATA</b>		Average Friction & Shear	1.8
Chemically Sedated	31 (88.9%)	Average Activity	1.3
Paralytic Infusion	10 (28.6%)		
GCS 3 Days Prior to PI Discovery	10.5 [4-12.5]		
<b>RESPIRATORY DATA</b>			
Intubated	30 (85.7%)		

# The M.D.R. Scale ©

## Pressure Injury Risk Assessment Scale for ICU

Patient Sticker

**Hemodynamics**

Stable w/o vasopressors	1
Stable w/ vasopressors	2
Unstable w/o vasopressors	3
Unstable w/ vasopressors	4

MAP ≥ 65, SBP ≥ 90 on 1 vasoactive gtt
MAP < 65, SBP < 90 ≥ 1 vasoactive gtt

**Neurological**

A&Ox4	1
A&O ≤ 3	2
Sedated/responsive	3
Sedated/paralyzed	4

RASS 0 with CAM -
RASS +1 to +2 or CAM +, agitated/confused
RASS -1 to -3 ≥ 1 sedation medication
RASS < -4, proned, ARDS, synch w/vent

**Respiratory**

RA/NC ≤ 6L	1
Noninvasive	2
Invasive <72 hours	3
Invasive >72 hours	4

CPAP at night
> 6L NC, open face mask, HHFNC, BiPAP
Mech ventilation, FiO2 ≤ 40%, ≤ 72 hours on vent
Mech ventilation, FiO2 ≥ 40%, ≥ 72 hours on vent

**Nutrition**

Full, Special, General	1
Clear, Liquid	2
TF, TPN, Age 65 or greater	3
NPO, IVF resuscitation, BMI<22	4

50-100% of 2-3 meals per day
≤ 50% of 1-2 meals per day
< 48 hours without nutrition
≥ 48 hours without nutrition

**BMI**

BMI > 30 or < 19	2
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**Comorbidities**

DM and/or CBG >230 w/wo steroids	1
Albumin <3 and/or WBC >15	2

**Continenence**

Fully continent	1
Continent with potential for moisture	2
Incontinent of urine or stool	3
Fully incontinent	4

Ambulates to bathroom/commode
Straight/Indwelling Cath, Formed Stool, Anuric, Condom Cath
Diarrhea, Ostomy, Female/Male Wick, Rectal Tube, Incont Wrap
Incontinent of urine and stool, no tone

**Mobility**

Independent	1
Chair, edge of bed	2
Immobile/dependent, tolerates turns	3
Dependent, does not tolerate turns	4

Self turns, walks in room or hallway
Sacral gap turns, 1 RN, uses walker
2 RN, turn team, sacral gap turns
3+ RNs, turn team, prone, micro turns, refuses repositioning

**Devices**

0 to 1	1
2 to 4	2
5 to 6	3
7+	4

IV tubing, PIVs, SCDs
CVC, A-line, NG/OG
Mechanical ventilator, cooling blankets, ice/heat packs
CRRT, chest tubes, hypothermia Tx, femoral line

**ICU Length of Stay**

1 to 3 days	1
4 to 7 days	2
8 to 13 days	3
>14 days or readmission to ICU	4

Day 10 is average day of PI discovery

**Total Score** \_\_\_\_\_

# The M.D.R. Scale ©

## Pressure Injury Risk Assessment Scale for ICU

**Interventions**

Circle the Interventions Currently being used for this Patient to Prevent Skin Breakdown or Write Specifics

4-Eyes within 4 hours  
Photo  
Measurement  
Do Not Stage - Involve Wound Care as Needed  
Open LDA  
Safety Event Reporting

Pad Boney Areas  
Sacral, Heel, and Elbow Dressings  
Heel Boots / Floating Heals  
Pillows or Specialized Pillow to Float Extremities  
Skin Perfusion

DAT  
SBT  
Response to Pain  
Lite Foam Dressings  
Device Patterns

Mouth Care  
Clock Rotation ET tube  
SpO2 Monitor Rotation

Weight /BMI of Pt  
Advocate for Tube Feedings  
Tube Feeds to start within 12 to 24 hours  
Advocate for TPN

Specialty Bed Low Air Loss / Support Surface  
Bariatric Bed  
Skin to Skin – Absorbent Lite Foam Dressing

Microclimate – no briefs in bed  
Hydrophilic Cream

Sacral Gap Turns vs Micro Turns  
Q2hr turns or less  
Using Specialty Bed for Degree Turns

**The Higher the Score the Higher the Risk**

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# The M.D.R. Scale

The scale is made up of 10 categories:

- Hemodynamics
- Neurological
- Respiratory
- Nutrition
- BMI
- Comorbidities
- Continenence
- Mobility
- Devices
- ICU length of stay

A higher score on the M.D.R. scale corresponds with higher risk for breakdown

The Braden score is listed at the bottom of the scale for comparison



## The M.D.R. Scale © Pressure Injury Risk Assessment Scale for ICU

Patient Sticker

<b>Hemodynamics</b>	Stable w/o vasopressors	1	
	Stable w/ vasopressors	2	MAP ≥ 65, SBP ≥ 90 on 1 vasoactive gtt
	Unstable w/o vasopressors	3	
	Unstable w/ vasopressors	4	MAP < 65, SBP < 90 ≥ 1 vasoactive gtt
<b>Neurological</b>	A&Ox4	1	RASS 0 with CAM -
	A&O ≤ 3	2	RASS +1 to +2 or CAM +, agitated/confused
	Sedated/responsive	3	RASS -1 to -3 ≥ 1 sedation medication
	Sedated/paralyzed	4	RASS < -4, prone, ARDS, synch w/vent
<b>Respiratory</b>	RA/NC ≤ 6L	1	CPAP at night
	Noninvasive	2	> 6L NC, open face mask, HHFNC, BiPAP
	Invasive <72 hours	3	Mech ventilation, FiO2 ≤ 40%, ≤ 72 hours on vent
	Invasive >72 hours	4	Mech ventilation, FiO2 ≥ 40%, ≥ 72 hours on vent
<b>Nutrition</b>	Full, Special, General	1	50-100% of 2-3 meals per day
	Clear, Liquid	2	≤ 50% of 1-2 meals per day
	TF, TPN, Age 65 or greater	3	< 48 hours without nutrition
	NPO, IVF resuscitation, BMI < 22	4	≥ 48 hours without nutrition
<b>BMI</b>	BMI > 30 or < 19	2	
<b>Comorbidities</b>	DM and/or CBG > 230 w/wo steroids	1	
	Albumin < 3 and/or WBC > 15	2	
<b>Continenence</b>	Fully continent	1	Ambulates to bathroom/commode
	Continent with potential for moisture	2	Straight/Indwelling Cath, Formed Stool, Anuric, Condom Cath
	Incontinent of urine or stool	3	Diarrhea, Ostomy, Female/Male Wick, Rectal Tube, Incont Wrap
	Fully incontinent	4	Incontinent of urine and stool, no tone
<b>Mobility</b>	Independent	1	Self turns, walks in room or hallway
	Chair, edge of bed	2	Sacral gap turns, 1 RN, uses walker
	Immobile/dependent, tolerates turns	3	2 RN, turn team, sacral gap turns
	Dependent, does not tolerate turns	4	3+ RNs, turn team, prone, micro turns, refuses repositioning
<b>Devices</b>	0 to 1	1	IV tubing, PIVs, SCDs
	2 to 4	2	CVC, A-line, NG/OG
	5 to 6	3	Mechanical ventilator, cooling blankets, ice/heat packs
	7+	4	CRRT, chest tubes, hypothermia Tx, femoral line
<b>ICU Length of Stay</b>	1 to 3 days	1	
	4 to 7 days	2	
	8 to 13 days	3	Day 10 is average day of PI discovery
	>14 days or readmission to ICU	4	
<b>Total Score</b>			_____



# Results and Statistical Analysis

## Application (prospective portion):

- Final sample size: 46 patients, 166 scales and nurse surveys returned
- Nurse feedback:
  - 96.7% nurses indicated the scale provides an accurate and objective picture of the patient
  - 94.9% nurses indicated the scale is reliable in identifying patients at higher risk for pressure injury development
  - 93.6% of nurse indicated the scale is valid for use in critical care
  - 69.2% of nurses preferred the M.D.R. Scale over the Braden Scale
- Intra-class correlation coefficient to determine reliability of 0.81
  - Cicchetti – Excellent Score
  - Koo and Li – Good Score
- Strong Inverse Correlation with the Braden scale
  - Pearson Correlation Coefficient of -0.85 (p-value<0.0001)
- Pressure injury incidence and prevalence rates in ICU patients during study period decreased by 50% (goal was 20%)



# Study Limitations

- 3-year time frame of data collection and 3-month study period
- Data collection period during COVID-19
- Large number of nurse raters
- Challenges with practical aspects of obtaining patient consent
- Unable to show statistical significance in pressure injury incidence and prevalence rates due to limited sample size



# Discussion and Next Steps

- Phase 1 showed promising data and outcomes
- Further research is needed to validate the psychometrics and gather stronger data to support use of the scale
- Replication study with 6-month time frame covering all critical care units at PSVMC and PPMC in progress



# References

- Padula WV, Delarmente B. The national cost of hospital-acquired pressure injuries in the United States. *Int Wound J*. 2019;16(3):634-640.
- Press Ganey. Guideline for Data Collection and Submission on Pressure Injury Indicator. Published January 2021. Accessed June 23, 2025.
- Braden B, Bergstrom N. Braden Scale II, Predicting Pressure Injuries. 2022. Accessed June 23, 2025. <http://www.bradenscale.com>
- National Pressure Injury Advisory Panel (NPIAP). 2021 Fact Sheet: About Pressure Injuries in US Health Care. Accessed June 23, 2025. <http://npiap.com/page/2021factsheet>
- Delawder JM, Leontie SL, Maduro RS, Morgan MK, Zimbardo KS. Predictive validity of the Cubbin-Jackson and Braden skin risk tools in critical care patients: a multisite project. *Am J Crit Care*. 2021;30(2):140-144. doi:10.4037/ajcc2021669 <https://doi.org/10.4037/ajcc2021669>
- Fulbrook P, Anderson A. Pressure injury risk assessment in intensive care: comparison of inter-rater reliability of the COMHON (Conscious level, Mobility, Hemodynamics, Oxygenation, Nutrition) Index with three scales. *J Adv Nurs*. 2016;72(3):680-692. doi:10.1111/jan.12825
- Kim P, Aribindi VK, Shui AM, et al. Risk factors for hospital-acquired pressure injury in adult critical care patients. *Am J Crit Care*. 2022;31(1):42-50.
- Wei M, Wu L, Chen Y, Fu Q, Chen W, Yang D. Predictive validity of the Braden Scale for pressure ulcer risk in critical care: a meta-analysis. *Nurs Crit Care*. 2020;25(3):165-170. <https://doi.org/10.1111/nicc.12500>



# References

- Cox J, Rasmussen L. Enteral nutrition in the prevention and treatment of pressure ulcers in adult critical care patients. *Crit Care Nurse*. 2014;34(6):15-27.
- Munoz N, Litchford M, Cox J, Nelson JL, Nie AM, Delmore B. Malnutrition and Pressure Injury Risk in Vulnerable Populations: Application of the 2019 International Clinical Practice Guideline. *Adv Skin Wound Care*. 2022;35(3):156-165. doi:10.1097/01.ASW.0000816332.60024.05
- Serra R, Caroleo S, Buffone G, et al. Low serum albumin level as an independent risk factor for the onset of pressure ulcers in intensive care unit patients. *Int Wound J*. 2014;11(5):550-553. doi:10.1111/iwj.12004
- Caldwell S. Reducing hospital-acquired pressure injuries in a cardiothoracic intensive care unit. *Crit Care Nurse*. 2025;45(1):12-20.
- Pittman J, Gillespie C. Medical Device-Related Pressure Injuries. *Crit Care Nurs Clin North Am*. 2020;32(4):533-542. doi:10.1016/j.cnc.2020.08.004
- Cicchetti DV. Guidelines, criteria, and rules of thumb for evaluating normed and standardized assessment instruments in psychology. *Psychol Assess*. 1994;6(4):284-290. doi:10.1037/1040-3590.6.4.284
- Koo TK, Li MY. A guideline of selecting and reporting intraclass correlation coefficients for reliability research. *J Chiropr Med*. 2016;15(2):155-163. doi:10.1016/j.jcm.2016.02.012
- Alderden J, Zhao Y, Thomas D, Butcher R, Gulliver B, Cummins M. Outcomes associated with stage 2 pressure injuries among surgical critical care patients: a retrospective cohort study. *Crit Care Nurse*. 2019;39(4):13-19.

# Questions?

M.D.R Scale Presentation  
and Poster



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