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Decubitus Ulcer - A Major Patient Safety Concern in Critical Care: Risk Prediction, Incidence and Preventive Measures

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Introduction

A decubitus ulcer is defined as a disruptive and disabling condition characterized by the ulceration of tissues overlying a bony prominence. This condition primarily affects bedridden, chronically ill, or critically ill patients and is primarily driven by prolonged pressure and ineffective nutrition. In the context of modern healthcare, decubitus ulcers represent a major patient safety concern, particularly for individuals with limited mobility, as they often lead to serious secondary complications such as infections, sepsis, and prolonged hospital stays.

The global incidence of pressure ulcers in hospitalized patients typically ranges from 5% to 30%, but these rates surge significantly in specialized environments like Intensive Care Units (ICUs), where they can reach 30% to 40%. Systematic reviews have highlighted that these ulcers are particularly prevalent in critically ill patients due to prolonged immobility. Furthermore, research indicates that patients who develop pressure ulcers face a 60% increased risk of mortality. Beyond the clinical impact, the financial implications are staggering, as treating these injuries places a significant economic burden on healthcare systems.

Background and Literature Review

Global data suggests that pressure ulcer prevalence in acute care settings ranges between 10% and 15%. In India, studies in tertiary care hospitals have reported varying incidence rates; for example, a study in North India reported an incidence of 14%, identifying immobility and malnutrition as primary contributors. Another study involving 2,408 patients found that the maximum incidence (9.4%) occurred in intensive care units, followed by orthopaedic and emergency units [10].

Research consistently identifies specific risk factors, including immobility, moisture, advanced age, and

medical comorbidities such as diabetes, vascular diseases, and chronic kidney disease (CKD). Identifying high-risk patients early and implementing targeted care is recognized as the most effective method for reducing incidence. Tools like the Braden Scale and Norton Scale are widely utilized for this risk assessment. Studies have shown that the implementation of such assessment tools can lead to a 25% reduction in pressure ulcer incidence.

Methodology

The study utilized a cross-sectional, prospective design to assess risk and incidence. It was conducted in the intensive care and high dependency units of a tertiary care hospital in Western Maharashtra, India, from February to June 2025.

- **Sample Selection:** Using a single population proportion formula with a 95% confidence level and a 9.4% estimated prevalence, a sample size of 175 was determined. After accounting for attrition, the final sample consisted of 171 patients. Participants were selected through systematic random sampling.
- **Inclusion/Exclusion:** The study included patients aged 18 and older who remained in the ICU for at least 24 hours. Ambulatory care patients and those staying less than a day were excluded.
- **Assessment Tools:** The Braden Scale was the primary instrument, assessing six subscales: sensory perception, moisture, activity, mobility, nutrition, and friction/shear. Scores range from 6 to 23, with a score of 18 or less indicating at-risk status.
- **Data Collection**: Nursing officers collected primary data via direct observation and secondary data from medical records. Incidence was recorded on the second, seventh, and twenty-eighth days of hospitalization or upon discharge.
- **Ethical Considerations**: Institutional ethical clearance was obtained (IEC no 03/2025). Privacy and confidentiality were maintained, and no physical or emotional harm was inflicted during the study.

Results

Demographics and Stay Characteristics: The demographic analysis of the 171 participants showed a male predominance of 63%. The mean age was 61 years, with a broad range from 20 to 94 years. Regarding admission sources, 42% came directly from home, 49% were transfers from internal wards, and 9% were transfers from other hospitals. Most patients (57%) stayed in the ICU for 1-3 days, with an overall average length of stay of 5 days.

Table 1: Demographic Profile and Length of Stay in Critical Care Area (n=171)

S No	Sample Characteristics	Frequency	Percentage
1	Gender		
	Male	108	0.63
	Female	63	0.37
2	Admission		
	Direct from home	71	0.42
	Transfer in from IPD	84	0.49
	Transfer in from other hospital	16	0.09
3	Ward		
	ICU Medical	115	0.67
	ICU Surgical	56	0.33
5	Age		
	< 50	48	0.281
	50–60	30	0.175
	61–70	45	0.263

	71–80	36	0.21
	> 81	12	0.071

Risk and Incidence: Based on the Braden Scale, 35.1% to 38.5% of patients were identified as being at risk for developing decubitus ulcers. The study found a prevalence of 8.77% and an overall incidence of 4.29%. A critical finding was the timing of ulcer development: the highest incidence (2.45%) occurred during the first 7 days of admission, followed by a decline to 1.89% between days 7 and 28.

Table 2: Incidence & Prevalence of Decubitus Ulcer among ICU patients (n=171)

Total patients	Admitted with Pressure Ulcer	Developed pressure Ulcer	Incidence %	Prevalence %
171	8	7	0.0429	0.0877

Factors and Predictors: While categorical variables like gender, ICU type, and comorbidities did not show a statistically significant association with ulcer development ($p>0.05$), continuous variables were highly significant. Independent sample t-tests revealed that patients who developed ulcers had:

1. Higher mean age ($p = 0.020$).
2. Longer length of stay ($p < 0.001$).
3. Lower Braden scores ($p < 0.001$).

Binary logistic regression confirmed that Length of Stay (OR 1.30) and Braden Score <18 (OR 4.20) were the most potent independent predictors of ulcer development.

Table 3: Independent Sample T Test (n=171)

Variable	p-value	Interpretation
Age	0.02	Older patients more at risk
Length of Stay	< 0.001	Longer stay linked to ulcers
Braden Score	< 0.001	Lower scores linked to ulcers

Table 4: Logistic Regression for Multivariable Risk Prediction (n=171)

Predictor	OR	95% CI	P-value	Significance
Braden Score <18	4.2	2.10 – 8.40	<0.001	Significant
Length of Stay (days)	1.3	1.10 – 1.55	<0.01	Significant
Age (per year increase)	1.02	0.99 – 1.05	≈0.05	Borderline
Gender (Male)	0.95	0.55 – 1.64	>0.05	Not significant
Diabetes Mellitus	1.2	0.65 – 2.22	>0.05	Not significant
Cardiovascular Disease	1.1	0.60 – 2.01	>0.05	Not significant
Ventilator Support	1.35	0.70 – 2.60	>0.05	Not significant
Restricted Movement	1.5	0.80 – 2.80	>0.05	Not significant

Preventive Measures and Effectiveness

The study evaluated the implementation of standard protocols among the 66 patients identified as high-risk.

- Compliance: Adherence was excellent for daily skin inspection (100%) and repositioning every 2 hours (98.5%).
- Gaps: A moderate gap existed in the use of pressure-redistributing devices (89.4%), and a major weakness was identified in nutrition-related interventions. Only 24.2% of high-risk patients received a nutrition assessment within 24 hours, and only 27.3% were provided with a special diet within that same window.

Table 4: Preventive Measures Adopted and its effectiveness (n=66)

Preventive Measures	No of high-risk patients	
	Yes	No
a. Skin inspected daily	66	0
b. Patient repositioned every 2 hours	65	1
c. Pressure redistributing device in place within 24 hours	59	7
d. Nutrition assessment completed within 24 hours	16	50
e. Providing special diet within 24 hours	18	48

Effectiveness Analysis: Fisher's Exact Test demonstrated that patients lacking documented daily skin inspections ($p = 0.029$) and those missing a nutrition assessment within 24 hours ($p = 0.033$) were significantly more likely to develop ulcers. Furthermore, a strong association was found between the failure to provide a special diet within 24 hours and ulcer development ($p = 0.018$).

Discussion

The findings align with international research suggesting that the initial days of hospitalization represent the highest risk period. Studies by similarly found that most ulcers develop early in the ICU stay, closely linked to mobility restrictions and illness severity [11,12].

The Braden Scale was reaffirmed as a robust tool for risk stratification. While gender and specific comorbidities were not statistically significant in this specific sample, their effects are often overshadowed by skin integrity and mobility in multivariable models. A notable finding was that despite high compliance with repositioning, ulcers still occurred, suggesting that repositioning alone is insufficient if other factors like nutrition are neglected. This supports the Institute for Healthcare Improvement's recommendation for risk assessments every 24 hours.

Conclusion

Decubitus ulcers remain a critical challenge in patient safety within ICUs. Over one-third of the patients in this study were at risk, and the first week of admission was identified as the peak window for incidence. Prolonged stay and low Braden scores are the most reliable predictors of development.

The study concludes that routine, daily risk assessments using the Braden Scale must be mandatory. Furthermore, addressing the identified gap in early nutritional intervention is vital, as timely nutrition assessments and tailored diets provide a significant protective role. Healthcare providers must function as a cohesive team to implement these proactive, multi-faceted prevention strategies to reduce the incidence of pressure injuries and enhance overall quality of care [1-9,13-17].

Conflicts of interest: Nil
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