ORIGINAL ARTICLE

CUBBIN & JACKSON SCALE IN THE RISK ASSESSMENT OF PRESSURE INJURY IN NEUROCRITICAL PATIENTS

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Highlights: (1) The Cubbin & Jackson Scale proved to be a valid instrument in neurocritical patients. (2) Identified low- and high-risk patients who developed pressure injuries (3) Low-risk patients developed pressure injuries at a higher rate

PRE-PROOF

(as accepted)

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CUBBIN & JACKSON SCALE IN THE RISK ASSESSMENT OF PRESSURE INJURY IN NEUROCRITICAL PATIENTS

ABSTRACT

Objective: To evaluate the risk of pressure injuries in neurocritical patients admitted to the intensive care unit, using the Cubbin & Jackson scale. **Method:** Observational study carried out in the Advanced Support Unit in Neurosurgery of a large hospital, in Recife, Pernambuco, Brazil, from August to December 2022. An instrument with sociodemographic, clinical and social data was used to collect data. application of the Cubbin & Jackson Scale every 24 hours from admission until discharge and/or the appearance of a pressure injury. For data analysis, descriptive and inferential statistics were used. **Results:** The Cubbin & Jackson scale proved to be a valid instrument when used in neurocritical patients, as it identified both high- and low-risk patients who developed pressure injuries. It was observed that being female, having a neurological disease, having difficulty repositioning in bed and using sedatives had a higher risk of developing pressure injuries. **Conclusion:** The Cubbin & Jackson scale showed that low-risk patients were subjected to pressure at a higher rate.

Keywords: Intensive Care Units. Critical Care. Pressure Injury. Risk Measurement.

INTRODUCTION

Pressure injuries (PIs) are considered the most common adverse events in hospitalized patient care, impacting on the individual's quality of life, increasing the length of hospital stay and raising health care costs. Patients affected by these skin lesions suffer high rates of hospital-acquired infections, disability, morbidity and mortality[1-3].

They are caused by intense and/or continuous pressure in combination with shear on the skin, soft tissues and bony prominences, causing damage to skin, muscle and bone tissue, reducing blood supply and causing cell death followed by tissue necrosis[4-5].

According to the National Pressure Injury Advisory Panel (NPIAP), PIs can be classified into eight categories: stage 1, 2, 3, 4, unclassifiable, deep tissue, related to medical devices and mucous membranes. Therefore, superficial, partial and/or total impairment of the skin tissues, changes in color, humidity, exudate and blistering are noticeable depending on the stage of the PIPE[4-5].

In the context of the Intensive Care Unit (ICU), patients are more predisposed to developing PIs due to hemodynamic instability, the use of invasive equipment such as

mechanical ventilators, intravenous and urinary catheters and drains. In addition to the administration of vasoactive drugs, sedatives, analgesics and muscle relaxants which cause a reduction in sensory stimuli[6-7].

Therefore, the implementation of effective actions such as skin examinations, risk assessment, the use of support surfaces in beds and chairs, changes in decubitus and adequate nutritional intake are resources that can prevent the PIs development[1].

Risk assessment stands out as a fundamental resource in the prevention of these injuries. Therefore, it is necessary to use validated and highly reliable assessment tools to screen patients with a high probability of developing PI and to carry out appropriate interventions in order to prevent the appearance of these wounds[1-8].

In view of this, the Cubbin & Jackson scale was developed specifically to stratify the PI risk in critically ill patients and has shown excellent predictive properties in intensive care. This scale, in its translation, adaptation and validation into Portuguese, showed the following scores for the indicators of sensitivity 73.3%, specificity 86.7%, accuracy 84.4%, positive predictive value 52.4%, negative predictive value 94.2% and efficiency 80%[10-11].

The Cubbin & Jackson scale is recognized for its accuracy in assessing the PI risk in critically ill patients, identifying through 12 categories (age, weight, personal history, skin, state of consciousness, mobility, hemodynamic status, respiration, oxygen needs, nutrition, incontinence and hygiene) the patients who need greater attention and specific care to prevent these skin lesion[9-10].

Therefore, this study is justified by the need to investigate the applicability of the Cubbin & Jackson scale in neurocritical patients in the ICU, in order to elucidate and prove the potential of this scale in the PI prevention in neurointensive care. The aim is to develop nursing interventions aimed at preventing these injuries, in order to minimize the risks of care in intensive care.

In view of the above, the research question of this study was: What is the risk of neurocritical patients admitted to the ICU developing PI when assessed using the Cubbin & Jackson scale? The aim of the study was to assess the PI risk in neurocritical patients admitted to the ICU using the Cubbin & Jackson scale.

METHOD

This is a quantitative, observational, analytical, cross-sectional study carried out in the Advanced Neurosurgery Support Unit (*Unidade de Suporte Avançado em Neurocirurgia*, USAN) of a large hospital located in Recife, Pernambuco, Brazil. The hospital where the study was carried out is highly complex, a reference in trauma, neurosurgery, neurology, general surgery, clinical medicine and orthopedics in Pernambuco state. It has a total of 830 hospital beds, 20 of which are for neurointensive care.

The study sample consisted of 53 individuals. The inclusion criteria were: over 18 years of age, with a nursing diagnosis according to the North American Nursing Diagnosis Association (NANDA) taxonomy: "impaired bed mobility"[12]. The exclusion criteria were: patients with PI diagnosed on admission.

Data collection took place between August and December 2022, using a questionnaire with sociodemographic and clinical data and the application of the Cubbin & Jackson Scale every 24 hours from admission to discharge and/or the onset of PI in patients admitted to the USAN. The instrument contained identification data, diagnostic hypothesis, nursing diagnosis, underlying diseases, medications in use, classification and region of PI onset.

In addition, the Cubbin & Jackson scale adapted to the Brazilian version by Sousa[10] was used to assess the PI risk. This instrument assesses age, weight, personal history, skin, consciousness state, mobility, hemodynamic status, breathing, oxygen needs, nutrition, incontinence and hygiene (Chart 1).

The items on the scale are scored from one to four points, where one shows conditions that increase the risk of developing PI and four indicates better conditions. The total score ranges from 12 to 48 points, reducing one point in cases where the patient has undergone surgery in the last 48 hours, requires blood products and/or is hypothermic, classifying patients as high (≤ 29) or low risk (≥ 30) of developing PI[10].

In addition, the weight and personal history categories were based on specific classifications to define the score during the evaluation. To measure weight, a nutritional assessment was used, which consisted of calculating ideal weight, reported and/or estimated height and body mass index (BMI), calculated using body weight in kg and height in square

meters² (BMI: kg/m²). The BMI classification was divided into: underweight (<18.5), normal weight (18.5-24.9), overweight (25.0-29.9), obesity (>30) and extreme obesity (35>)[13–14].

The scale classified personal history as: None; Moderate: skin alterations affecting areas susceptible to pressure; Severe: corticoids, rheumatoid arthritis, type 2 diabetes mellitus (DM), autoimmune diseases, chronic obstructive pulmonary disease (COPD), diseases that limit mobility, congestive heart failure and Very Severe: peripheral vascular disease, type 1 DM, compartment syndrome, person who fell at home prior to admission[10].

Chart 1– Cubbin & Jackson Scale. Recife, PE, Brazil, 2023.

	Age (years old)	**Weight**	**Personal Background**	**Skin**
4	<40	Normal	None	Intact
3	40-55	Obesity	Moderate	Erythema (Potential loss of continuity)
2	55-70	Cachexia	Severe	Abrasion (superficial)
1	>70	Any of the above + edema/anasarca	Very severe	Necrosis / Exudative (Deep)
	State of Consciousness	**Mobility**	**Hemodynamic status**	**Breathing**
4	Awake and Alert	Walking with help	Stable without inotropic support	Spontaneous
3	Agitated/ Restless/ Confused	Very Limited / Armchair Lift	Stable with inotropic support	CPAP/Tube
2	Sedate/Apathetic but reactive	Immovable but tolerates positions	Unstable without inotropic support	Mechanical Ventilation
1	Coma/ Unresponsive/ Sedated and Cured	Do not tolerate positioning/ Totally dependent/ Ventral decubitus	Unstable with inotropic support	Respiratory Exhaustion
	Oxygen needs	**Nutrition**	**Incontinence**	**Hygiene**
4	O2<40%. Stable on mobilization.	Complete diet	Continent/Anuria/Bladder Catheter	Independent
3	40%>O2<60%. Stable to mobilization.	Light Diet, Liquid Diet, Enteric Nutrition	Urinary/ profuse sweating	Semi-dependent

2	40%>O2<60%. Stable blood gas analysis. Desaturation on mobilization.	Parenteral nutrition	Fecal/occasional diarrhea	Very dependent
1	≥60% O2. Unstable blood gas. Desaturation at rest.	Sorotherapy only	Urinary and Fecal Prolonged Diarrhea	Completely dependent

Source: Jackson, 1999; (adapted by Souza, 2013).

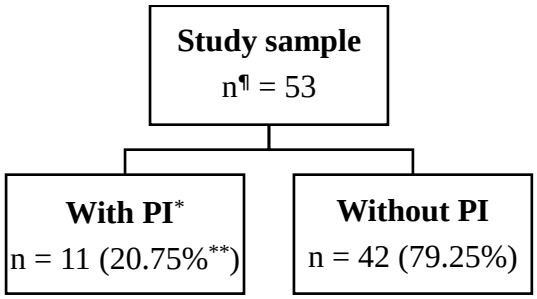
The data was tabulated in Microsoft Excel spreadsheets and then analyzed using the Statistical Package for the Social Sciences® (SPSS) software, version 26.0, which found that the data was non-parametric. Descriptive measures such as mean and standard deviation were analyzed for the quantitative variables and frequency analysis for the qualitative variables. In addition, Pearson's Chi-square test was used to assess the association between the variables, considering a significance level of less than 0.05, in which case the Odds Ratio and its confidence interval were calculated.

The study was authorized by the institution and approved by the Research Ethics Committee of Hospital Universitário Oswaldo Cruz (HUOC) and Pronto-Socorro Cardiológico Universitário de Pernambuco Prof. Luiz Tavares (PROCAPE) of the University of Pernambuco, under CAAE: 60611922.5.0000.5192, with Hospital da Restauração Governador Paulo Guerra as co-participant, under CAAE: 60611922.5.3001.5198, complying with all the ethical precepts set out in resolutions nº 466/2012[15] and nº 510/2016[16].

RESULTS

Of the 53 neurocritical patients who took part in the study, 11 (20.75%) developed PI. The mean length of stay was the same for both groups, 12 days, with a difference only in the standard deviation, with PI (8) and without PI (11), with a p-value of 0.661, thus demonstrating that the length of stay did not show a statistical difference in the PI appearance (Figure 1).

Figure 1– Flowchart of study participants. Recife, PE, Brazil, 2023. (n=53)



Key: ¶Absolute number; *Pressure injury; **Percentage. **Source:** The author, 2023.

In relation to the sociodemographic characteristics analyzed, there was a predominance of females, of whom 54.5% had PI and 59.9% did not. The mean age and standard deviation for the individuals who appeared with PI was 61 years (15) and for those who did not appear with PI it was 52 years (13), with a p-value of 0.480, thus showing a significant difference in age for the appearance of PI. The predominant race/color in the study was brown, with 63.6% of individuals with PI and 81.0% without PI (Table 1).

Table 1 – Sociodemographic and clinical characteristics of patients with and without pressure injuries. Recife, PE, Brazil, 2023. (n=53)

		PI Appearance*								
		Yes				No				
		Me§	SD‖	n¶	%**	Me§	SD‖	n¶	%**	p-value††
Hospitalization time		12	8			12	11			0.661
Age		61	15			52	13			0.480
Gender	Female			6	54.5%			25	59.5%	0.765
	Male			5	45.5%			17	40.5%	
Race/Skin color	Black			1	9.1%			1	2.4%	0.387
	White			3	27.3%			7	16.7%	
	Brown			7	63.6%			34	81.0%	
Diagnostic hypothesis	Trauma							4	9.5%	0.485
	Neurological			11	100%			37	88.1%	
	Metabolic							1	2.4%	

Diagnosis nursing	Difficulty repositioning in bed	11	100%	28	66.7%	0.026[p] RP[‡‡] = 0.72 CI95%[‖] = 0.59 – 0.87
	Difficulty turning from side to side			14	33.3%	
Doença de Base						
SAH[†]	Yes	6	54.5%	19	45.2%	0.582
	No	5	45.5%	23	54.8%	
DM[‡]	Yes	3	27.3%	4	9.5%	0.122
	No	8	72.7%	38	90.5%	
Medication						
Sedative	Yes	8	72.7%	29	69.0%	0.813
	No	3	27.3%	13	31.0%	
Analgesic	Yes	8	72.7%	28	66.7%	0.701
	No	3	27.3%	14	33.3%	
Antibiotic	Yes	7	63.6%	12	28.6%	0.031[p] OR[†††] = 4.38 CI95%[‖] = 1.08 – 17.27
	No	4	36.4%	30	71.4%	

Key: [*]Pressure injury; [†]Systemic Arterial Hypertension; [‡]Diabetes Mellitus; [§]Mean; [‖] Standard Deviation; [¶]Absolute number; [**]Percentage; [††]p-value; [‡‡] Prevalence Ratio; [‖] 95% confidence interval; [†††]Odds ratio. **Source:** The author, 2023.

As for the clinical aspects examined, the diagnostic hypotheses of the individuals admitted to the USAN were related to neurological causes, which corresponded to 100% of the cases of PI and 88.1% of those who did not present PI.

The defining characteristics of the nursing diagnosis “Mobility in bed impaired” in this study were divided into "difficulty in repositioning in bed", corresponding to 100% of the group with PI and 66.7% of the group without PI and “difficulty in turning from one side to the other”, in which only 33.3% emerged in the group without PI.

In relation to the defining characteristics of the nursing diagnosis, those who had no difficulty repositioning in bed were more likely not to have a pressure injury than those who had difficulty turning from one side to the other, so this probability was 0.72 higher (95%CI: 0.59 - 0.87).

The most common underlying diseases in the group were systemic arterial hypertension (SAH), which was present in 54.5% of the patients who developed PI, while 45.2% of the individuals who did not develop PI had SAH.

In relation to the risk of developing PI and the diagnostic hypothesis, it was observed that the patients who developed PI 54.5% had subarachnoid hemorrhage as their medical diagnosis, while brain tumor was the diagnosis that appeared most often in patients who did not have PI 31.0% (Table 2).

Table 2 – Relationship between diagnostic hypothesis and the risk of developing a pressure injury. Recife, PE, 2023. (n=53)

		PI Appearance*				
		Yes		**No**		**p-value†††**
		n¶	**%****	**n¶**	**%****	
Diagnostic hypothesis	SAH†	6	54.5%	9	21.4%	0.262
	Brain tumor	1	9.1%	13	31.0%	
	Brain aneurysm	1	9.1%	6	14.3%	
	AVCi‡	1	9.1%	2	4.8%	
	Cervical myelopathy			2	4.8%	
	LEIC§	1	9.1%	1	2.4%	
	Others	1	9.1%	9	21.4%	

Key: *Pressure injury; ¶Absolute number; **Percentage; ††p-value; †Subarachnoid hemorrhage; ‡Ischemic stroke; § Intraventricular expansive lesion. **Source:** The author, 2023.

The relationship between the onset of PI and high or low risk on the Cubbin & Jackson scale was not significant. Among the patients who developed PI, 27.3% were high risk on the scale, while 72.7% were low risk. In addition, among the patients who did not develop PI, 73.8% were at low risk (Table 3).

Table 3 – Pressure injury risk assessment in intensive care patients according to the Cubbin & Jackson Scale.. Recife, PE, 2023. (n=53)

		PI Appearance*				
		Yes		No		p-value††
		n¶	%**	n¶	%**	
	Cubbin & Jackson Scale					
Total	High risk	3	27.3%	11	26.2%	0.942
	Low risk	8	72.7%	31	73.8%	

Key: *Pressure injury; ¶Absolute number; **Percentage; ††p-value. **Source:** The author, 2023.

In relation to the classification of PI and the anatomical region of the individuals, it was observed that 87.5% had stage 1 PI in the sacral region, 75.0% had deep tissue PI in the calcaneal region and 50.0% developed stage 1 or 2 PI in the trochanter region, with a p-value of 0.021 (Table 4). (Table 4).

Table 4 – Classification and anatomical region of pressure injury onset in intensive care patients. Recife, Pernambuco, 2023. (n=53)

		Anatomical Region						
		Trochanter		Sacra		Calcaneus		p-value††
		n¶	%**	n¶	%**	n¶	%**	
PI Classification*	PI* Stage 1	1	50%	7	87.5%	1	25%	0.021p
	PI* Stage 2	1	50%	1	12.5%			
	PI* Deep Tissue					3	75%	

Key: ***Pressure injury; ¶Absolute number; **Percentage; ††P-value. **Source: The author, 2023.

DISCUSSION

In this study, there was a predominance of PI in older adults, brown, female patients with a length of stay of around 12 days. Similarly, studies in the literature already point to the older adult being at greater risk of PI, due to the physiological changes resulting from their senescence process[4,17,20].

Thus, a case control which analyzed the appearance of PI in ICUs in the state of São Paulo revealed that of the 189 PI cases, 51.3% (97) were aged between 61 and 80. Thus, there is a directly proportional relationship between age and the PI risk, i.e. the older the individual, the more likely they are to develop PI[18].

In relation to the race/color variable, the participants in this study were predominantly brown and had a higher PI incidence. This finding is similar to a study carried out in the north-east of Brazil which assessed the prediction of developing these injuries using a risk assessment scale. The brown population had a higher PI incidence, which is justified by the increase in the self-declaration of this population during the 2010 census.

Furthermore, scientific evidence indicates that male patients are at a higher risk of developing PI, which is different to the results found in this study. In this context, there is a divergence in terms of the risk of developing PI in relation to gender. In view of this, some studies have identified male individuals with a higher PI risk, while others have pointed to females as being more predisposed, as well as others whose evidence did not differ between the genders. Thus, there is no universal consensus as to which gender is at greater risk of developing PI[4,17-19].

In relation to length of stay, the mean was 12 days, and there was no significant difference between individuals who did or did not come down with PI. However, it is an aspect that can contribute to the PI occurrence in hospitalized patients. In view of this, it can be seen that days spent in hospital are risk factors for PI development[17-18].

Thus, the longer the hospital stay, the greater the likelihood of PI appearing in hospitalized patients. This can be seen in the study carried out in São Paulo, with 189 individuals with PI, where 53.4% of the patients followed up had been hospitalized for more than 30 days and developed PI[18].

In addition, of the clinical aspects investigated, most were neurological causes, thus presenting a greater risk of developing PI given the clinical picture, diagnosis and/or surgical intervention, or prescribed medication. Therefore, in an intensive care center of a university hospital in the south of the country, the incidence and factors associated with PI were investigated. Of the 178 patients, 17.4% (31) had neurological problems, of these 17.2% (11/64) appeared with PI and 17.2 (20/114) without PI, with no significant statistical difference[20].

The most prevalent underlying disease was SAH, both for the group with and without PI. Thus, the data in the literature collaborates with the results found, indicating SAH as one of the main comorbidities identified in critically ill patients, corresponding to 50.6% (90/178) of a sample of these patients admitted to a clinical and surgical ICU[20].

In addition, the most common nursing diagnosis was difficulty in repositioning the bed, in both groups. A similar study carried out in an ICU of a general hospital in Maranhão, which assessed the risk of pressure injuries, found that the most frequent nursing diagnosis was difficulty in changing decubitus in 83.3% (20/24) of PI cases[4].

The medications administered to patients during their stay in intensive care in this study were sedatives, analgesics and antibiotics. In relation to the use of sedatives, the study that analyzed the PI incidence in critically ill ICU patients found that prolonged use of sedatives contributes to the PI development, since it interferes with the patient's sensory perception and mobility in bed[21]. Thus, patients with PI used more sedation (75.8%) as a therapeutic support measure during their ICU stay[22].

The use of antibiotics in the intensive care setting is quite common. Similar to the study analyzed here, antibiotics were one of the most prescribed medications in a study that assessed factors associated with PI, with a mean of 90.6% (58/64) of patients with PI[22].

Neurological diseases were predominant in this study. Thus, an epidemiological study that examined the clinical profile of patients with and without PI found that neurological diseases were the main cause of the need for admission to intensive care, corresponding to 60% of PI cases during the hospitalization period[23].

It is clear, therefore, that the Cubbin & Jackson scale proved to be a valid and reliable instrument for screening the PI risk in neurocritical ICU patients, when compared to other risk assessment scales, as proven in other studies[11,24].

In this sense, this investigation showed that both high- and low-risk patients had PI, but in greater proportion the low-risk patients. A study of 366 surgical trauma ICU patients showed that the mean score on the Cubbin & Jackson scale was 32 points, indicating a low risk of developing PI. However, 185 developed PI and had the following characteristics: they were older adults, using vasopressors and mechanical ventilation, urinary incontinence, reduced mobility and dependent on hygiene[11].

In summary, it was possible to observe a higher percentage of stage 1 PIs in the sacral region. Similar data was identified in a study carried out in a hospital in Recife in which 53.01% of these lesions were classified as stage 1 and the anatomical region with the highest frequency was the sacral region (80.72%)[20].

In relation to the study's limitations, the sample size is a factor that could limit the expected outcomes in terms of the PI risk in the public studied. This study's contributions to the nursing field are highly relevant as it generates scientific evidence on the applicability of the Cubbin & Jackson scale in assessing the PI risk in neurocritical patients.

CONCLUSION

The Cubbin & Jackson scale identified a higher percentage of neurocritical patients at low risk who developed PI.

Therefore, it is essential to look for tactics and actions in intensive care that can minimize the dangers associated with the PI development, including the use of scales for risk assessment, evaluation of the patient's skin, standardization of clocks for changing positions, pressure relievers, fixing medical equipment, hygiene routines, changing diapers and the use of barrier products to prevent the disease.

In addition to this, it is important to encourage ongoing education in health institutions, with the aim of training professionals in methods for preventing PI, publicizing the monthly PI indicators and promoting actions to encourage the reduction of rates in ICUs, based on a collective practice that includes professionals, family members and companions.

Finally, it is necessary to implement the Cubbin & Jackson scale in hospital institutions and use it as a work routine by the nurses who work in the researched scenario, as an alternative for early identification and implementation of nursing care in the PI prevention.

Furthermore, it is essential to promote new studies capable of generating scientific evidence of high reliability, with new methodological designs, an increase in the population investigated, different scenarios and locations, in order to collaborate in screening, prevention measures and the development of new technologies in the care of patients with PI in the ICU.

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CUBBIN & JACKSON SCALE IN THE RISK ASSESSMENT OF PRESSURE INJURY IN NEUROCRITICAL PATIENTS

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