JURNAL
REKONSTRUKSI DAN ESTETIK

PRESSURE INJURY PATIENTS CHARACTERISTIC IN SOUTH EAST INDONESIA WARRANTS IMMEDIATE INITIATION OF PREDICTIVE ASSESSMENT TOOLS: A CHART REVIEW

Angela Djunaedi[a*], Robertus Arian Datusanantyo[b]

[a] Department of Surgery, Prof. Dr. W. Z. Johannes Regional General Hospital, Kupang, East Nusa Tenggara, Indonesia.

[b] Department of Surgery, Faculty of Medicine and Veterinary Medicine, Universitas Nusa Cendana / Prof. Dr. W. Z. Johannes Regional General Hospital, Kupang, East Nusa Tenggara, Indonesia.

ARTICLE INFO

Keywords: Pressure injury, braden scale, unstageable pressure injury, reduced inequalities, good health and well-being

***Corresponding author*:**
Angela Djunaedi
Email address:
angeladjunaedi@gmail.com

***History*:**
Received: January 6, 2025
Revised: March 12, 2025
Accepted: May 4, 2025
Published: June 1, 2025

JRE : Jurnal Rekonstruksi dan Estetik
e-ISSN:2774-6062; p-ISSN: 2301-7937
DOI: 10.20473/jre.v10i1.65076
Open access :

Available at:
https://e-journal.unair.ac.id/JRE/

***How to cite*:** Djunaedi A & Datusanantyo RA. PRESSURE INJURY PATIENTS CHARACTERISTIC IN SOUTH EAST INDONESIA WARRANTS IMMEDIATE INITIATION OF PREDICTIVE ASSESSMENT TOOLS: A CHART REVIEW. Jurnal Rekonstruksi dan Estetik. 2025;10(1):20-31.

ABSTRACT

Introduction: Pressure injury (PI) is a worldwide health problem, a burden in many aspects, and influences life quality. Every PI case would be different due to several underlying factors and conditions which hindered the prevention strategies. We share the overview of PI patients on South East Indonesia.
Method: A descriptive-retrospective study with chart review approach was held to review all case of PI consulted to plastic surgery from 2021-2023. Basic demographic data was collected along with the wound area, PI stage, and referrer department.
Result: PI was more frequent in Male patients insignificantly (p=0.069) developed more PI (55.13%) than female patients (44.87%). Almost half of PI case occurred in patients with more than 60 years old of age (48.71%). Most case were referred by the internal medicine, pulmology and cardiology department (43.59%) and mostly located in sacral region, (64.10%). Unstageable PI was found the most (48.72%) while no stage 1 PI was consulted.
Discussion: The study validates known pressure injury risk factors such as sensory and motor deficits and immobility. The absence of stage 1 PI highlights the need for the implementation of standardized assessment tools and prompt detection strategies. Visual inspection, palpation on a daily basis, and education to caregivers during discharge planning are needed to reinforce prevention.
Conclusion: PI incidence corresponds with known risk populations. Hospital leadership should implement predictive PI assessment tools and incorporate PI education into discharge planning to improve early detection and intervention.

Highlights:

1. The absence of Stage 1 pressure injuries reflects the need for a predictive assessment tool.
2. The majority of patients were aged 60–71 and had unstageable pressure injuries.
3. The main referring departments were Internal Medicine, Cardiology, and Pulmonology.

INTRODUCTION

Pressure injury (PI) is a global concern, impacting quality of life, society, and healthcare management. Previously known as pressure sores, pressure ulcers, or decubitus ulcers, PI is defined as a localized injury to underlying tissue over a bony prominence due to prolonged pressure, often in combination with shear forces. It can also be associated with medical devices or other objects.[1] The injury results from reduced capillary perfusion due to constant pressure, excess moisture, and shear stress.[2] Although impaired perfusion is the primary pathological mechanism, no single factor is solely responsible for the development of pressure injuries. Risk factors include, but are not limited to, patient age, inactivity, immobility, a history of vascular disease, diabetes, skin moisture, and nutritional status.[3]

According to the National Pressure Injury Advisory Panel NPIAP, pressure injuries are classified into four stages, with two additional categories: unstageable and deep tissue pressure injuries.[4] Globally, 12.8% of hospitalized adult patients experience pressure injuries. In Indonesia, the prevalence is 8%, with 44% of patients already having them upon admission. Nosocomial pressure injuries account for 4.5%.[5]

Certain populations are at a higher risk of developing pressure injuries. Palliative care patients, for instance, have a reported incidence of 71.1%.[1,6] The development of PI before or during hospital admission increases healthcare costs. A U.S. study analyzing the national cost burden of hospital-acquired pressure injuries (HAPI) estimated an average cost of $10,708 per patient.[7] In Indonesia, a stroke unit reported an all-stage PI risk of 28%, higher than the 12.2–20.3% risk observed in general inpatients.[8] As a preventable burden, PI prevention should involve not only healthcare workers but also home caregivers, utilizing predictive assessment tools.[9]

Pressure injuries (PI) is crucial as it impacts patients' quality of life, increases healthcare costs, requires better prevention strategies, helps evaluate intervention effectiveness, and improves care standards to prevent serious complications. Patients with pressure injuries (PI) experience a decreased quality of life (QoL), limited activity and mobility, social isolation, emotional issues, and persistent pain. QoL reflects the functional impact of a disease and is considered an indicator of unmet needs. Additionally, it is used to assess the effectiveness of healthcare services, nursing interventions, and cost-benefit analyses. QoL is influenced by an individual's perspective on life satisfaction and can change over time. The effectiveness of PI treatment, which has a significant global impact, is evaluated through QoL indicators.[10-13]

The main goal of pressure injury treatment is to improve quality of life. Treatment options include surgical sharp debridement and autolytic debridement, with the choice depending on the patient's overall condition.

In this study, we reviewed the characteristics of pressure injury patients in our tertiary referral hospital. Previously, PI data was not regularly recorded because its incidence was no longer a mandatory hospital report. The aim of this study is to present the characteristics of PI over a three-year observation period and describe current issues in PI prevention strategies at our hospital. This study provides insights into the burden of pressure injuries, focusing on sex, age distribution, staging, referral sources, and the severity of anatomical regions affected. Additionally, it highlights the challenges in PI management, particularly in the absence of predictive assessment tools. This research aligns with the STROBE initiative.[14]

METHODS

This descriptive study utilized a chart review approach to analyze all cases of

pressure injuries recorded in the plastic surgery registry at the Department of Surgery from January 1st, 2021 to December 31st, 2023, at a tertiary referral hospital in East Nusa Tenggara, Indonesia. Data were collected retrospectively using medical records.

The inclusion criteria encompassed all pressure injury patients in the hospital who were referred for consultation with the plastic surgery department. Patients who declined consultation and/or passed away before undergoing a plastic surgery examination were excluded. This study examined sex, age distribution, staging, referral sources, and the anatomical regions affected by pressure injuries.

Diagnosis and staging of pressure injuries were determined by plastic, reconstructive, and aesthetic surgeons based on the National Pressure Injury Advisory Panel (NPIAP) classification (Table 1).[1]

Table 1. The Classification of Pressure Injury[1]

Classification	Definition
Stage 1	Intact skin with non-blanchable redness over a localized area on a bony prominence.
Stage 2	Partial-thickness loss of dermis, presenting as a shallow open ulcer or a serum-filled blister without bruising or slough.
Stage 3	Full-thickness loss of dermis with exposed subcutaneous fat. The injury does not expose tendon, muscle, or bone. Often presents with epibole (rolled wound edges) and slough.
Stage 4	Full-thickness loss of dermis with exposed or directly palpable tendon, muscle, or bone. Often presents with slough and eschar.
Unstageable	Full-thickness ulcer with slough or eschar completely covering the wound base, preventing assessment of its true depth until the covering material is removed.
Deep tissue injury	Purple or maroon discoloration with intact skin, caused by underlying tissue damage.
Device – related pressure injury	Injury resulting from prolonged pressure applied by medical equipment or everyday objects.
Mucosal membrane pressure injuries	Pressure injuries occurring on moist mucosal surfaces due to sustained compressive and shear forces from medical devices.

Univariate and bivariate data were analyzed using the open-source PSPP software. This study was approved by the Universitas Nusa Cendana Ethical Committee (No: 342/UNIS.21/TU/2024).

RESULTS

Based on our registry, there were seventy-eight cases of pressure injury consultations over a three-year period. The average age was 51.44 (22.12) years for males and 60.2 (19.12) years for females. Male patients accounted for 55.13% of cases, while female patients made up 44.87%, though the difference was not statistically significant ($p > 0.069$) (Table 2).

Table 2. Sex Distribution

Sex	Frequency	%
Male	43	55.13
Female	35	44.87

Age distribution analysis revealed that pressure injuries were most common in older adults, with the highest prevalence in the 61-70 age group (25.64%), followed by 51-60 years (19.23%) and 71-80 years (14.10%). In contrast, younger patients (< 40 years) were less frequently affected, comprising only 23.07% of cases. Notably, the proportion of cases increased with age, peaking in the 61-70 age group, suggesting that aging is a significant risk factor for pressure injuries (Table 3).

Most cases were classified as unstageable (48.72%), followed by Stage 2 (21.79%), Stage 4 (17.95%), and Stage 3 (11.54%), with no cases categorized as Stage 1 (Table 4). This indicates that a significant proportion of pressure injuries were already advanced or difficult to classify upon consultation.

Table 3. Age Distribution

Age Group (years old)	Frequency	%
< 20	6	7.69
21 - 30	5	6.41
31-40	7	8.97
41-50	7	8.97
51-60	15	19.23
61-70	20	25.64
71-80	11	14.10
> 80	7	8.97

Table 4. Staging Distribution

Stage	Frequency	%
Stage 1	0	0
Stage 2	17	21.79
Stage 3	9	11.54
Stage 4	14	17.95
Unstageable	38	48.72

Regarding referral sources, the majority of cases (43.59%) were referred from the internal medicine, cardiology, and pulmonology departments, followed by neurology and neurosurgery (25.64%), oncology (17.95%), surgery and urology (8.97%), and obstetrics and gynecology (3.85%) (Table 5). This distribution suggests that pressure injuries were more prevalent among patients with chronic or debilitating conditions, particularly those with cardiovascular, pulmonary, and neurological diseases.

In terms of anatomical distribution, more than half of the cases (64.10%) were located in the sacral region, making it the most common site of pressure injuries. Other affected areas included the gluteal region (11.54%), the major trochanter of the femur (6.41%), and various other regions (5.13%), with 12.82% of cases involving multiple sites (Table 6). This finding highlights the sacrum as the primary pressure injury site, likely due to prolonged immobility and sustained pressure in bedridden patients.

These results are consistent with previous studies that identify the sacral area as highly vulnerable in patients with limited mobility. The bony prominence and superficial soft tissue cushioning in this area leave sacral area vulnerable to tissue damage due to pressure. Understanding this distribution pattern is critical for certain preventative practices, which involve regular turning and use of pressure redistributing devices.

Table 5. Referer Department Distribution

Referer Department	Frequency	%
Internal Medicine, Cardiology, & Pulmonology	34	43.59
Neurology & Neurosurgery	20	25.64
Obstetrics & Gynaecology	3	3.85
Oncology	14	17.95
Surgery & Urology	7	8.97

Table 6. Anatomic Region Distribution

Anatomic Region	Frequency	Percent
Gluteal	9	11.54
Sacrum	50	64.10
Major Trochanter of Femur	5	6.41
Other Region	4	5.13
Multipel Site	10	12.82

DISCUSSION

Historically, in 1777, the term “decubitus” was coined by Wohlleben, referring to “dead tissue due to lying down.” In 1859, Florence Nightingale documented the term “bedsore,” which later became widely used. The term “pressure sore” gained popularity in the 1980s, followed by “pressure ulcer,” which became commonly used in the early 1990s. Nowadays, the term “pressure ulcer” is still being used in European meanwhile the term “pressure injury” is now more popular in South-East Asia, Australia, and New Zealand.[1]

The term “ulcer” does not include deep tissue injuries and stage 1 pressure injuries because these conditions involve intact skin. Therefore, in April 2016, the National Pressure Injury Advisory Panel (NPIAP) officially replaced “pressure ulcer” with “pressure injury”. [15] This change redefined “deep tissue pressure injury” and “stage 1” as

injury stages that do not involve soft tissue ulceration. Additionally, the revised terminology introduced "medical device-related pressure injury" and "mucosal membrane pressure injury" as specific causes of pressure injuries, rather than staging classifications.[1,15]

The current NPIAP classification system categorizes pressure injuries based on the visual appearance and extent of skin tissue damage (Table 1). The exact stage of a pressure injury is determined through visual inspection and palpation of the wound, based on the anatomical level of skin involvement.

The pathophysiology of pressure injuries occurs due to prolonged pressure, friction, and shear forces that reduce blood flow (ischemia), leading to oxygen deprivation and ultimately cell death. Prolonged pressure on bony areas compresses blood vessels, restricting the supply of oxygen and nutrients to the tissues. If the pressure is not relieved, ischemia develops and begins to damage the tissue. Additionally, shear and friction worsen the condition by damaging the skin and underlying tissue, making it more susceptible to injury. Oxygen deprivation triggers inflammation, causing swelling that further impairs blood flow. If the pressure continues, cells begin to die (necrosis), which can progress to open wounds and infection. If left untreated, pressure injuries will worsen, progressing from early stages of redness and irritation to involving deeper tissues and bone. Therefore, prevention is crucial, including frequent repositioning, maintaining skin hygiene, and using support devices to reduce pressure.[16]

Pressure injuries occur due to ischemia, which happens when external pressure exceeds capillary pressure, leading to impaired capillary blood flow.[2] Immobility is the most significant risk factor, making intensive care unit (ICU) patients and spinal cord injury (SCI) patients particularly vulnerable to developing pressure injuries (PI) due to their impaired sensory and motor function. It is estimated that the incidence of PI development in ICU patients can be as high as 40% during hospitalization.[17] Among SCI patients, one PI case is found for every three SCI patients.[18]

Besides ICU and SCI patients, obese individuals are also considered at risk of PI development, although this remains a topic of debate. The increased shear and friction experienced when moving or getting out of bed is thought to contribute to this risk. [1,19,20] Additionally, children and neonates have been reported to be at high risk of developing PI, primarily due to nutritional deficiencies and prolonged use of medical devices in neonatal intensive care units (NICU).[21]

Regarding sex distribution, male patients (55.13%) were more frequently affected than female patients (44.87%) (Table 2). This pattern may be influenced by differences in muscle mass, mobility, and comorbidities that predispose men to a higher risk of PI.

In our study, PI distribution was higher in older age groups, with the majority of cases occurring in individuals aged 61–70 years (25.64%), followed by 51–60 years (19.23%) and 71–80 years (14.10%) (Table 3). We believe this finding aligns with the effects of aging on skin integrity. As people age, the skin becomes more fragile and heals more slowly, a process further exacerbated by comorbidities and other predispositions.[22] Notably, younger patients (<40 years) accounted for only 23.07% of cases, indicating that PI is more prevalent in older individuals. Additionally, the proportion of PI cases increased with age, peaking in the 61–70 years group, suggesting that aging is a significant risk factor.

A significant number of PI cases (43.59%) were referred from the internal medicine, cardiology, and pulmonology departments, followed by neurology and neurosurgery (25.64%) (Table 5). This trend may be explained by prolonged bedridden status, limited physical activity, and sensory impairment in patients with systemic and neurogenic conditions. A similar pattern has been observed in other Indonesian hospitals, where PI predominantly affects patients with

diabetes, neurogenic disorders, and respiratory conditions.[5]

The findings of this study indicate that the majority of pressure injury (PI) cases were diagnosed at the unstageable stage (48.72%), followed by Stage 2 (21.79%), Stage 4 (17.95%), and Stage 3 (11.54%), with no recorded cases at Stage 1 (Table 4). The absence of Stage 1 cases suggests a lack of early recognition and delayed consultation, as skin discoloration without an open wound is often overlooked. Additionally, the absence of a standardized predictive assessment tool, such as the Braden Scale, forces healthcare providers to rely solely on subjective clinical judgment, increasing the risk of underdiagnosis and delayed intervention in the early stages. Without a systematic early screening method, high-risk patients,such as those in the ICU, individuals with neurological disorders, or those with systemic comorbidities are more vulnerable to the progression of PI to more severe stages. Consequently, hospitals face an increased burden of care, more complex patient complications, and prolonged hospital stays. Therefore, the implementation of evidence-based predictive tools is an urgent necessity to enhance early detection and prevent PI progression.

In terms of anatomical distribution, the sacral region (64.10%) was the most commonly affected site, likely due to prolonged immobility and sustained pressure in bedridden patients. Other affected areas included the gluteal region (11.54%), major trochanter of the femur (6.41%), and various other regions (5.13%), while 12.82% of cases involved multiple sites (Table 6). These findings emphasize the importance of pressure redistribution strategies, particularly for high-risk anatomical sites.

The goal of surgical intervention is to close the wound, either through flap surgery or surgical debridement, to promote wound healing. However, in this study, most PI patients were unsuitable for surgical debridement or flap surgery due to severe clinical conditions, such as hemodynamic instability. As a result, autolytic debridement was performed in almost all cases of unstageable PI with severe or critically ill conditions to maintain the patient's overall stability.Another alternative treatment to autolytic debridement is negative pressure vacuum therapy. Unfortunately, this option is not available in our region.

A pressure injury prediction tool is an instrument used to assess a patient's risk of developing pressure injuries, allowing healthcare professionals to implement preventive measures earlier. These tools evaluate various risk factors such as mobility, moisture, sensory perception, activity level, and nutritional status. Early identification of at-risk patients enables timely interventions, such as repositioning, pressure-relieving devices, and skin care management, to reduce the incidence of pressure injuries. Regular reassessment using these tools is essential, especially for hospitalized and long-term care patients, to ensure ongoing preventive care. Several commonly used assessment tools include the Braden Scale, Norton Scale, Waterlow Scale, and Cubbin & Jackson Scale.[23]

The Braden Scale evaluates various factors contributing to pressure injury risk, including sensory perception, moisture levels, activity, mobility, nutritional status, and friction/shear forces. The maximum score on this scale is 23, with risk categories as follows: a score of 20 or higher indicates low risk, 16-20 represents moderate risk, 11-15 signifies high risk, and a score below 10 indicates very high risk.[24] This tool is widely used in clinical settings due to its reliability and ease of use in identifying at-risk patients. Regular assessment with the Braden Scale allows healthcare providers to implement targeted preventive measures, such as pressure redistribution strategies and specialized support surfaces, to reduce the likelihood of pressure injuries.

Tabel 7. Braden Scale for Predicting Pressure Injury Risk[25]

Category	1	2	3	4
Sensory Perception *(ability to respond to discomfort and pressure)*	**Completely Limited:** Unresponsive to pain, decreased consciousness, or under sedation. **Or** Limited ability to feel pain across most of the body.	**Very Limited:** Responds only to pain, unable to communicate discomfort except by moaning or restlessness. **Or** Sensory impairment that limits pain perception in half of the body.	**Slightly Limited:** Responds to verbal commands but cannot always communicate discomfort or needs assistance to reposition. **Or** Minor sensory impairment affecting one or two extremities.	**No Impairment:** Responds to verbal commands, no sensory deficit limiting pain or discomfort perception.
Moisture *(degree of skin exposure to moisture)*	**Constant Moisture:** Skin remains consistently moist due to sweat, urine, etc.; detected every time the patient is moved.	**Frequently Moist:** Skin is often but not always moist; linens need changing at least once per shift.	**Occasionally Moist:** Skin is occasionally moist, requiring extra linen changes about once per day.	**Rarely Moist:** Skin is rarely exposed to moisture, requiring only routine linen changes.
Activity *(level of physical activity)*	**Bedfast:** Confined to bed.	**Chairfast:** Severely limited or no ability to walk, unable to bear weight, must be assisted to a chair or wheelchair.	**Walks Occasionally:** Walks short distances during the day with or without assistance but spends most of the time in bed or a chair.	**Walks Frequently:** Walks outside the room at least twice daily and inside the room at least once every 2 hours while awake.
Mobility *(ability to change and control body position)*	**Completely Immobile:** Unable to make even slight movements without assistance.	**Very Limited:** Occasionally makes slight changes in body position but cannot make frequent or significant changes without help.	**Slightly Limited:** Frequently makes slight changes in body position without assistance.	**No Limitations:** Able to make frequent and significant position changes independently.
Nutrition *(daily food intake pattern)*	**Very Poor:** Rarely finishes meals, eats <1/3 of each meal, consumes <2 protein servings per day, poor fluid intake, or only receives water/IV fluids for >5 days.	**Probably Inadequate:** Usually eats only half of served meals, gets only 3 protein servings per day, occasionally takes supplements, or receives minimal enteral feeding.	**Adequate:** Eats more than half of meals, consumes 4 protein servings per day, occasionally refuses food but generally takes supplements when offered, or receives enteral feeding/TPN covering most nutritional needs.	**Excellent:** Eats nearly all meals served, never refuses food, usually eats between meals, does not require supplements.

The Norton Scale was the first tool developed to assess and monitor pressure injury risk. It evaluates five key factors: physical condition, mental status, activity level, mobility, and incontinence. Each category is scored, with a total score ranging from 5 to 20. A score below 14 indicates that a patient is at "risk" for developing pressure

injuries, with lower scores signifying higher risk. However, this scale has limitations in identifying risks among patients with more complex health conditions.[23]

The Waterlow Score is a more comprehensive tool that considers factors such as age, body weight, mobility, skin condition, nutritional status, and underlying medical conditions that may increase the risk of pressure injuries. This tool assesses ten variables and categorizes risk levels as moderate risk (10–14 points), high risk (15–19 points), and very high risk (>20 points). Its main advantage lies in its ability to accommodate a broader range of clinical factors, making it more accurate for patients with complex medical conditions.[26]

The Cubbin & Jackson Scale is specifically designed for patients in intensive care units (ICU). It evaluates factors that are particularly relevant to critically ill patients, including the level of consciousness, vascular access device (VAD) use, body temperature, oxygen saturation, hemodynamic and respiratory conditions, presence of edema, prone positioning, and length of ICU stay. The total score ranges from 10 to 40, with 10–26 classified as high risk and 27–40 as low risk. This scale is particularly beneficial for ICU patients who have unique care requirements that differ from those of general hospital patients.[27]

The use of pressure injury prediction tools is essential in clinical practice, as they enable healthcare professionals to identify at-risk patients early and implement effective preventive measures. Interventions such as frequent repositioning, the use of low-pressure mattresses, specialized cushions, and optimal skin care can significantly reduce the incidence of pressure injuries. Additionally, these tools help optimize resource allocation by ensuring that interventions are targeted at the highest-risk patients, thereby improving care efficiency.

Several studies have demonstrated varying levels of accuracy among these prediction tools. The Braden Scale, one of the most widely used, has been shown to have a sensitivity of 88.2% and a specificity of 72.7%, making it an effective tool for detecting pressure injury risk across different patient populations.[28] Therefore, implementing these predictive tools not only contributes to pressure injury prevention but also enhances healthcare quality by reducing complications, accelerating patient recovery, and lowering hospital care costs overall.

A predictive assessment tool is recognized as one of the key strategies for preventing pressure injuries (PI). [29-31] It is beneficial in reducing PI incidence and delaying its onset by assessing risk factors. [30,31] Unfortunately, our health center has not yet implemented any predictive tool system. The absence of such a tool prevents caregivers from systematically assessing and recognizing PI risk, making it difficult to plan specific preventive treatments. As a result, interventions are often delayed and primarily curative rather than preventive. By implementing a predictive assessment tool, risk factors could be evaluated for each new inpatient, allowing for the early development of targeted prevention strategies.

Currently, the Braden Scale (BS) is the most commonly used predictive assessment tool in more than 30 countries and has been translated into multiple languages. [32] Among various predictive tools, the Braden Scale has the highest predictive value. [33–35] The Braden Scale consists of six subscales that assess sensory perception, mobility, nutritional status, activity level, moisture exposure, and friction/shear forces. A lower score indicates a higher risk of developing PI, requiring greater attention and preventive measures. The Braden Scale is recommended for use alongside clinical judgment. [32] For patients with low scores in immobility, repositioning strategies should be prioritized. Similarly, for those with poor nutritional status, a specific dietary plan should be considered to improve their overall condition and reduce PI risk.

Some of the pressure injuries (PI) encountered in this study developed outside the hospital, a finding consistent with several other studies. [5,36] Singh and Shoqirat (2021)

reported that only 11% of PIs originated from post-acute care settings. [37] This highlights the low level of knowledge regarding PI prevention among family members and home caregivers. In community-dwelling older adults, factors such as physical limitations, comorbidities, and cohabitation increase the risk of developing PI.[36-38]

Community-Acquired Pressure Injury (CAPI) emphasizes the need for comprehensive education for family caregivers in home care settings. Integrating continuous care training—including wound identification, wound prevention, proper wound care, repositioning and mobilization techniques, and dietary principles—into discharge planning could significantly improve both PI prevention and patients' psychological well-being. [39,40]

Despite the absence of a formal predictive assessment tool such as the Braden Scale (BS), nurses and physicians in our study were able to diagnose PI early and refer cases to plastic surgery. This represents a strength of the study, as it demonstrates the capability of healthcare providers to conduct early PI screening based on clinical expertise alone.

The strengths of this study include the ability of healthcare providers to diagnose pressure injuries (PI) early despite the absence of a formal predictive assessment tool like the Braden Scale (BS), as well as its consistency with known PI risk factors such as advanced age, ICU admission, spinal cord injury (SCI), and systemic diseases. However, limitations exist, including the inability to assess prior wound care quality before referral, the lack of predictive tools in the healthcare facility, and the retrospective nature of the study, which may limit data accuracy. This study is its reliance on chart review, which may not fully capture all PI cases due to incomplete or inconsistent documentation. This limitation suggests that some early-stage PI cases, particularly stage 1, could have been underreported or overlooked in medical records. Future studies should incorporate direct clinical assessment or prospective data collection to ensure more comprehensive and accurate identification of PI cases.

The novelty of this study lies in highlighting the failure to diagnose early-stage PI due to the absence of predictive assessment tools, emphasizing the urgent need for their implementation. Furthermore, it sheds light on the lack of education for home caregivers, contributing to the high incidence of Community Acquired Pressure Injury (CAPI). These findings underscore the necessity of integrating predictive PI assessment tools into hospital protocols and developing comprehensive education programs for both healthcare providers and family caregivers.

We believe that some unseen factors may have caused the high number of unstageable PIs found in our study, aside from the absence of predictive tool implementation. We were also unable to obtain information on prior wound care provided by the caregiver. This may be related to the severity of the PI, thus reflecting the limitation of this study. However, the fact that unstageable PI was mostly found during consultation was enough to raise awareness to implement the predictive tool assessment and to emphasize a continuous education for home care-settings as soon as possible.

CONCLUSION

The majority of cases we encountered were unstageable pressure injuries, primarily referred by the internal medicine, cardiology, and pulmonology departments. Autolytic debridement can be considered the preferred treatment option for critically ill patients with unstageable PI. The absence of a predictive assessment tool is believed to be the main contributing factor to these findings. We strongly encourage hospital leadership to implement a predictive PI assessment tool for all inpatient admissions. Additionally, for this patient population, an educational program should be established to inform family caregivers about the importance of PI

prevention, ensuring it is integrated into discharge planning.

ACKNOWLEDGEMENTS

The authors would like to express their sincere gratitude to the Department of Surgery, Prof. Dr. W. Z. Johannes Regional General Hospital, Kupang, East Nusa Tenggara, Indonesia, for providing access to the plastic surgery registry data used in this study. We also thank the Department of Surgery, Faculty of Medicine and Veterinary Medicine, Universitas Nusa Cendana, for their academic and administrative support. We would also like to thank the Universitas Nusa Cendana Ethical Committee for granting ethical approval for this study, and we acknowledge their role in ensuring the ethical conduct of this research.

CONFLICT OF INTEREST

The authors have no conflicts of interest to declare. This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors

FUNDING DISCLOSURE

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

AUTHOR CONTRIBUTION

All of the authors have contributed to conceptualization, data Acquisition, analysis of data, manuscript writing, and final approval of manuscript.

REFERENCES

1. European Pressure Ulcer Advisory Panel, National Pressure Injury Advisory Panel, Pan Pacific Pressure Injury Alliance. Prevention and treatment of pressure ulcers/injuries: clinical practice guideline: the international guideline. 2019. 405 p.
2. Thaller SR. Grabb and Smith's Plastic Surgery, Seventh Edition. *Plast Reconstr Surg* [Internet]. 2014; 133(5). Available from: https://journals.lww.com/plasreconsurg/fulltext/2014/05000/grabb_and_smith_s_plastic_surgery,_seventh_edition.43.aspx
3. Coleman S, Gorecki C, Nelson EA, Closs SJ, Defloor T, Halfens R, et al. Patient risk factors for pressure ulcer development: systematic review. *Int J Nurs Stud.* 2013; 50(7): 974–1003. DOI:10.1016/j.ijnurstu.2012.11.019
4. Yusharyahya SN, Legiawati L, Astriningrum R, Jonlean R, & Andhira V. Characteristics of pressure injuries among geriatric patients at an Indonesian tertiary hospital: a cross-sectional study. *Med J Indones [Internet].* 2023; 32(3):183-189.[cited 2025 Feb 21] Available from: https://mji.ui.ac.id/journal/index.php/mji/article/view/7092.
5. Amir Y, Lohrmann C, Halfens RJ & Schols JM. Pressure ulcers in four Indonesian hospitals: prevalence, patient characteristics, ulcer characteristics, prevention, and treatment. *Int Wound J.* 2017; 14(1): 184–93. DOI: 10.1111/iwj.12580.
6. Usanma Koban B, Tuzcular Vural EZ, Özkaya H & Gönenç I. Factors affecting pressure sores in palliative care patients. *Haydarpasa Numune Training and Research Hospital Medical Journal.* 2024; 64(1):1–7. DOI: 10.14744/hnhj. 2022.81567
7. Padula WV & Delarmente BA. The national cost of hospital-acquired pressure injuries in the United States. *Int Wound J*. 2019; 16(3): 634–40. DOI:10.1111/iwj.13071
8. Amir Y, Halfens RJG, Lohrmann C & Schols JMGA. Pressure ulcer prevalence and quality of care in stroke patients in an Indonesian hospital. *J Wound Care.* 2013; 22(5): 254–260. DOI:10.12968/jowc.2013.22.5.254

9. Kennerly SM, Sharkey PD, Horn SD, Alderden J & Yap TL. Nursing assessment of pressure injury risk with the Braden Scale validated against sensor-based measurement of movement. *Healthcare*. 2022; 10(11): 2330. DOI: 10.3390/ healthcare1011233 0
10. McGinnis E, Nelson EA, Gorecki C & Nixon J. What is different for people with MS who have pressure ulcers: a reflective study of the impact upon people's quality of life? *J Tissue Viability.* 2015;24(3):83-90. DOI: 10.1016/j.jtv.20 15.05.003
11. Shiferaw WS, Akalu TY, Mulugeta H & Aynalem YA. The global burden of pressure ulcers among patients with spinal cord injury: a systematic review and meta-analysis. BMC Musculoskelet Disord. 2020;21(1):334. DOI: 10.1186/ s12891-020-03369-0.
12. Gül Ş, Demir AS, Karadağ A & Karaçay P. Determining the quality of life and associated factors in patients with pressure injury. *J Tissue Viability.* 2025; 34(1): 100835. DOI:10.1016/j.jtv.2024. 11.007.
13. Meaume S, Dompmartin A, Lok C , Lazareth I, Sigal M, Truchetet F, et al. Quality of life in patients with leg ulcers: results from CHALLENGE, a double-blind randomized controlled trial. *J Wound Care.* 2017; 26(7):368-379. DOI: 10.12 968/jowc.2017.26.7.368.
14. von Elm E, Altman DG, Egger M, Pocock SJ, Gøtzsche PC & Vandenbroucke JP. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement: guidelines for reporting observational studies. *J Clin Epidemiol.* 2008; 61(4): 344–9. DOI: 10.1157/13119325
15. Edsberg LE, Black JM, Goldberg M, McNichol L, Moore L & Sieggreen M. Revised National Pressure Ulcer Advisory Panel Pressure Injury Staging System. *J Wound Ostomy Continence Nurs.* 2016; 43(6): 585–597. DOI: 10.1097/ WON.0000000000000281
16. Gustinerz. Skala Braden untuk memprediksi risiko luka akibat tekanan [Internet]. Gustinerz.com; 2018 May 5 [cited 2025 Feb 25]. Available from: https://gustinerz.com/skala-braden-untuk-memprediksi-risiko-luka-akibat-tekanan/
17. Tayyib N, Coyer F, & Lewis P. Saudi Arabian adult intensive care unit pressure ulcer incidence and risk factors: a prospective cohort study. *Int Wound J*. 2016; 13(5): 912–9. DOI: 10.1111/iwj. 12406
18. Shiferaw WS, Akalu TY, Mulugeta H & Aynalem YA. The global burden of pressure ulcers among patients with spinal cord injury: a systematic review and meta-analysis. *BMC Musculoskelet Disord.* 2020; 21(1): 334. DOI:10.1186/ s12891-020-03369-0
19. Chen F, Wang X, Pan Y, Ni B & Wu J. The paradox of obesity in pressure ulcers of critically ill patients. *Int Wound J.* 2023; 20(7): 2753–63. DOI: 10.1111/iwj.14152
20. Alipoor E, Mehrdadi P, Yaseri M & Hosseinzadeh-Attar MJ. Association of overweight and obesity with the prevalence and incidence of pressure ulcers: a systematic review and meta-analysis. *Clin Nutr.* 2021; 40(9): 5089–5098. DOI: 10.1016/j.clnu.2021.08.006
21. Visscher M & Taylor T. Pressure ulcers in the hospitalized neonate: rates and risk factors. *Sci Rep.* 2014; 4(1): 7429. DOI: 10.1038/srep07429
22. Payne D. Skin integrity in older adults: pressure-prone, inaccessible areas of the body. *Br J Community Nurs.* 2020; 25(1): 22–6. DOI:10.12968/bjcn.2020.25.1.22
23. Waterlow J. Pressure sores: a risk assessment card. *Nurs Times.* 2018; 81 (48): 49-55. PMID: 3853163
24. Picoito R, Manuel T, Vieira S, Azevedo R, Nunes E & Alves P. Recommendations and statements of good practice for risk assessment of pressure injuries in adults admitted to intensive care units. 2025; 1-20. DOI: 10.20944/preprints202502.10 10.v1.

25. Purwanto YP. Perbedaan Skala Braden dan Skala Norton Untuk Mendeteksi Resiko Luka Tekan Pada Pasien Tirah Baring di RSUD dr. R Goeteng Taroenadibrata Purbalingga [Doctoral dissertation]. Universitas Muhammadiyah Purwokerto; 2020.
26. Soares FM de A, Vieira TVC, Mazocoli E & Souza RCS. Instrumentos preditores de risco para lesão por pressão em pacientes críticos. Acta Paul Enferm. 2023; 36:eAPE008032. DOI: 10.37689/acta-ape/2023AO008032.
27. Kale ED, Nurachmah E & Pujasari H. Penggunaan skala Braden terbukti efektif dalam memprediksi kejadian luka tekan. J Keperawatan Indones. 2014;17(3):95-100.
28. Bhoki MW, Mardiyono M & Sarkum S. Braden scale and Norton in predicting risk of pressure sores in ICU room. *J Riset Kesehatan.*2014;3(2):576-586. DOI:10.31983/jrk.v3i2.226
29. Mallah Z, Nassar N & Kurdahi Badr L. The effectiveness of a pressure ulcer intervention program on the prevalence of hospital-acquired pressure ulcers: controlled before and after study. *Appl Nurs Res.* 2015; 28(2): 106–13. DOI: 10.1016/j.apnr.2014.07.001
30. Liu Z, Meng J, Jing N & Liu X. Effects of predictive nursing interventions on pressure ulcer in older bedridden patients: a meta-analysis. *Int Wound J.* 2024; 21(3). DOI: 10.1111/iwj.14676
31. Deng G, Lei Y, Tan H, Geng B & Liu Z. Effects of predictive nursing interventions on pressure ulcer in elderly bedridden patients. *Int Wound J.* 2024; 21(3). DOI: 10.1111/iwj.14690
32. Braden BJ. The Braden Scale for predicting pressure sore risk: reflections after 25 years. *Adv Skin Wound Care*. 2012; 25(2): 61. DOI: 10.1097/01.ASW.0000411403.11392.10
33. Šáteková L, Žiaková K & Zeleníková R. Predictive validity of the Braden scale, Norton scale, and Waterlow scale in the Slovak Republic. *Cent Eur J Nurs Midwifery.* 2015; 6(3): 283–90. DOI:10.1111/ijn.12499
34. Pang SM & Wong TK. Predicting pressure sore risk with the Norton, Braden, and Waterlow scales in a Hong Kong rehabilitation hospital. *Nurs Res.* 1998; 47(3): 147–53.
35. Kwong E, Pang S, Wong T, Ho J, Shao-ling X & Li-jun T. Predicting pressure ulcer risk with the modified Braden, Braden, and Norton scales in acute care hospitals in Mainland China. *Appl Nurs Res.* 2005; 18(2): 122–128. DOI:10.1016/j.apnr.2005.01.001
36. Sari SP, Everink IH, Sari EA, Afriandi I, Amir Y, Lohrmann C, et al. The prevalence of pressure ulcers in community-dwelling older adults: a study in an Indonesian city. *Int Wound J.* 2019; 16(2): 534–41. DOI: 10.1111/iwj.13081
37. Singh C & Shoqirat N. Community-acquired pressure injuries in the acute care setting. *Adv Skin Wound Care.* 2021; 34(3): 1–4. DOI: 10.1097/01.ASW.0000732748.56041.cf
38. Corbett LQ, Funk M, Fortunato G & O'Sullivan DM. Pressure injury in a community population. *J Wound Ostomy Continence Nurs.* 2017; 44(3): 221–7. DOI:10.1097/WON.0000000000000320
39. Han C, Yang F & Liu L. Effectiveness of continuous care interventions in elderly patients with high-risk pressure ulcers and impact on patients' activities of daily living. *Altern Ther Health Med.* 2024; 30(3): 118–23.
40. Rafiei H, Vanaki Z, Mohammadi E & Hosseinzadeh K. The role of family caregivers in pressure injury prevention guidelines: a scoping review. *Home Healthc Now.* 2021; 39(5): 253–60. DOI: 10.1097/NHH.0000000000001000