

Pressure injury prevention in an intensive care unit: implementing the best practices

Prevenção de lesão por pressão em unidade de terapia intensiva: implementação de melhores práticas

Prevención de lesiones por presión en unidad de cuidados intensivos: implementación de las mejores prácticas



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ABSTRACT

Objective: to implement the best evidence in preventing pressure injuries in patients in the intensive care unit of a university hospital in the city of São Paulo/Brazil.

Method: a quasi-experimental study whose intervention was implementing evidence based on the Joanna Briggs Institute methodology, which includes auditing and feedback. Ten audit criteria were used, which were verified in patient records and training records of the teaching and quality service. The intervention was assessed by comparing the percentage of compliance with audited criteria before and after implementing the best practices. Pearson's chi-squared test was used.

Results: 2,677 days of baseline and follow-up audit records were evaluated, regarding 340 patients. Compliance baseline and follow-up audits differed for most criteria (p-value <0.001). The main barriers were the lack of records of essential information on pressure injuries in the medical records, and strategies for overcoming these barriers included a review of the pressure injury prevention protocol and training of the nursing team.

Conclusion: the intervention adopted contributed to improving practices regarding the prevention of pressure injuries, expressed by the increase in the rate of compliance with the criteria and the proposal of improvement strategies to overcome barriers.

Descriptors: Pressure Injury. Evidence-Based Nursing. Patient Safety. Critical Care.

RESUMO

Objetivo: implementar melhores evidências na prevenção de lesão por pressão em pacientes de unidade de terapia intensiva de hospital universitário da cidade de São Paulo/Brasil.

Método: estudo quase-experimental, cuja intervenção foi implementação de evidências baseada na metodologia Joanna Briggs Institute, que inclui auditoria e feedback. Utilizaram-se dez critérios de auditoria, que foram auditados em registros de pacientes e treinamentos do serviço de ensino e de qualidade. A intervenção foi avaliada por meio da comparação dos percentuais de conformidade dos critérios auditados, antes e após a implementação das melhores práticas. Utilizou-se teste qui-quadrado de Pearson.

Resultados: avaliaram-se 2.677 dias de registros de auditorias de base e de seguimento, relativos a 340 pacientes. A conformidade das auditorias de base e seguimento foram diferentes para a maioria dos critérios (p-valor <0,001). As principais barreiras foram ausência de registros de informações essenciais sobre lesão por pressão nos prontuários e cujas estratégias para superação incluíram revisão do protocolo de prevenção de lesão por pressão e capacitação da equipe de enfermagem.

Conclusão: a intervenção adotada contribuiu para melhoria das práticas acerca da prevenção de lesão por pressão, expressa pelo aumento da taxa de conformidade dos critérios e proposição de estratégias de melhoria para superação de barreiras.

Descritores: Lesão por Pressão. Enfermagem Baseada em Evidências. Segurança do Paciente. Cuidados Críticos.

RESUMEN

Objetivo: implementar las mejores evidencias en la prevención de lesiones por presión en pacientes de una unidad de cuidados intensivos de hospital universitario de la ciudad de São Paulo/Brasil.

Método: estudio cuasiexperimental, con una intervención para la implementación de evidencias basadas en la metodología del Joanna Briggs Institute, que incluye auditorías y su feedback. Se utilizaron diez criterios de auditoría, auditados en registros de pacientes y entrenamientos del servicio de enseñanza de cualidad. Se evaluó a la intervención por medio de una comparación del porcentaje de conformidad con los criterios auditados, antes y después que se implementaran las mejores prácticas. Se utilizó el teste qui-cuadrado de Pearson.

Resultados: Las auditorías de base y de seguimiento evaluaron a 2.677 días de registros de 340 pacientes. La conformidad con las auditorías de base y de seguimiento fue diferente para la mayoría de los criterios (p-valor < 0,001). Los principales impedimentos fueron la ausencia de informaciones esenciales sobre lesiones por presión en los registros médicos. Estrategias para superarles incluyeron una revisión del protocolo de prevención de lesiones por presión y entrenamiento del equipo de enfermería.

Conclusión: La intervención adoptada contribuyó para la mejoría de las prácticas acerca de la prevención de lesiones por presión, perceptible en el aumento de las tasas de conformidad con los criterios y la propuesta de estrategias para mejorías y la superación de barreras.

Descriptor: Lesión por Presión. Enfermería Basada en la Evidencia. Seguridad del Paciente. Cuidados Críticos.

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INTRODUCTION

Around the globe, pressure injuries (PI) are an important health issue. This undesirable and preventable event causes physical and emotional disorders, in addition to compromising the safety of the patient and the quality of assistance^(1,2).

PI is damage to the skin and/or underlying tissue, often over a bone prominence or related to the use of a medical device or other objects, including tubes, catheters, oximetry sensors, and others. It is the result of intense and/or prolonged pressure, coupled with shear⁽²⁾. This type of lesion can evolve into damage in the skin, extending to muscles, tendons, and bones, with a relevant risk for infection, potentially leading to the death of the patient^(1,2).

Globally, the prevalence and incidence of PI in hospitalized adults was, respectively, 12.8% and 5.4/10,000 patients/day⁽³⁾. In Brazil, recent reports from the Patient Safety Centers (NSP) to the National Health Surveillance Agency (ANVISA) reported 1,100,352 incidents. PIs were the second most common adverse event among these⁽⁴⁾. Considering the 26,735 notifications of never events (events that should never happen), level 3 and 4 PI corresponded to 72.21% and 21.57%, respectively. IPs directly contributed for the death of 1.21% of patients⁽⁴⁾.

In an Intensive Care Unit (ICU), patients have a higher risk of developing PI, due to the complex integration between extrinsic and intrinsic factors, including immobility, tissue pressure, high potential for friction, and shearing⁽⁵⁾. Evidence has suggested that the cumulative incidence of PI in adults varied from 10 to 25.9%, with a cumulative prevalence from 16.9 to 23.8%⁽⁶⁾. A prevalence study involving six continents in hospitals from 90 countries found 6,747 PIs, 59.2% of which were acquired during ICU hospitalization. The general prevalence was 26.6%⁽⁷⁾. These investigations showed that nearly one in every four or five ICU patients can present PI^(6,7).

The development of PI causes a multidimensional negative impact. PI patients spend more time hospitalized, with high rates of complications and deaths, and use health services more often after discharge, including in readmissions and visits to the emergency service⁽¹⁾. Moreover, the costs are very high. In Australia, the cost of PI was estimated in US\$9.11 billion, with US\$3.59 billion spent in the treatment⁽⁸⁾. In the USA, the annual cost of PI treatment can exceed US\$26.8 billion⁽⁹⁾.

Considering the countless repercussions of PI that are harmful to the lives of individuals, health serviced, and society at large, health institutions must implement good,

evidence-based care practices, employing effective action to prevent PI. International organizations, such as the Joanna Briggs Institute (JBI), which is recognized for producing, disseminating, and implementing evidence-based practices, are unanimous in their recommendation that an approach with multiple interventions should be used to prevent PI, including in the case of ICU patients^(2,10). Best practices, according to these documents, including a risk assessment of PI using the validated tool; daily examination of the skin and of devices used by the patient; triage and nutritional evaluation using a validated tool; scheduled mobilization of patients; and others^(2,10).

Therefore, nursing interventions should be “bundles” based on the best practices, being adapted to the needs of the patients and services. Thus, it is essential to implement evidence to improve the local safety of the patient and the indicators of health care quality⁽¹¹⁾.

Nonetheless, the practice of care based on solid evidence is still an obstacle to care, including in the prevention and management of PI⁽¹²⁾. In this context, the programs to educate and train professionals are essential to prevent PI⁽¹¹⁾. This makes it possible to update the knowledge of professionals, contributing to develop critical competences and abilities necessary for reading research, applying evidence, and assessing outcomes according to proven information⁽¹³⁾.

Implementing evidence to prevent PI, be it in the context of ICUs or hospitalization units, is based on baseline and follow-up audit criteria. This has led to successful results, improving conformity in the use of evidence in clinical practice, in addition to decreasing the incidence of PI^(14,15).

In the hospital that was the setting of this research, although there were institutional protocols and continuing education, reports regarding PI were unsatisfactory. The lack of records about the risk assessment of ICU patients, coupled with an 18% incidence of PI, were determinant to the formulation of the question that guides this research, which is “What is the current rate of conformity of the clinical practice of the nursing team with the best practices for the prevention of pressure injury in ICU patients?” The improvement of health care indicators is in line with the proposal of interventions that can integrate global evidence from international guidelines and the JBI into real-world data, available in the record about the patients and the clinical practice.

Thus, the goal of this study was to implement the best evidence to prevent PI in hospitalized ICU patients in a teaching hospital. The specific objectives were to evaluate the conformity of current health care practices with the best

practices to prevent PI, ascertain which are the obstacles to do so, and implement strategies to address non-compliance and evaluate the impact of the implementation of evidence.

■ METHOD

Quasi-experimental before-and-after study⁽¹⁶⁾, whose intervention was the implementation of evidences based on the JBI methodology, using a process of audit and feedback. To do so, specific tools were adopted, such as the JBI Practical Application of Clinical Evidence System (PACES), which was used to obtain audit criteria (best evidence for the prevention of PI) and the Getting Research into Practice (GRiP), used to document barriers, strategies, and resources used to implement the best evidence⁽¹⁷⁾.

The study was carried out in three stages. Stage I – Planning of the implementation; Stage II – Baseline audit (BA) and implementation of strategies to overcome any barriers identified; and Stage III – Impact of the evaluation (follow-up audit (FA)) and sustainability. Each stage comprises seven substages for the implementation of evidence, according with the JBI approach⁽¹⁷⁾. For each of them, specific procedures were adopted.

Stage I – Planning the implementation

This stage comprised three substages: (1) identification of the areas to enact the change; (2) involvement of the agents of change; (3) evaluation of the context and readiness for change⁽¹⁷⁾.

The **area to enact the change** (1) was identified by the high incidence of PI in the adults hospitalized in a teaching hospital ICU. Although this institution has a protocol to prevent PI, from October 2021 to March 2022, there was an incidence of 18%, above expectations. Other key elements that contributed for the development of the study were: lack of systematization when filling in data in the PI management print-out and in the nursing process, and low compliance in the risk assessment records for PI, both in admission and in day-to-day work.

The setting was the ICU of a teaching, public, secondary-level hospital in the city of São Paulo. This is a general ICU, with 12 beds. It attends 15-year-old or older patients clinical and surgical patients coming from the adult emergency

units, surgical center, and inpatient units. In 2023, the mean occupation rate was 92.1%, with a mean hospitalization time of 6.8 days and a mean mortality rate of 22%. In this ICU, patient care is carried out by a multidisciplinary team, that is, a team with physicians, physical therapists, a nutritionist, a pharmacist, a speech therapist, and a nursing team. The distribution of the medical team takes place according to the dynamic of activities throughout the day, in a ratio of one physician for every 4, 6, or 12 patients, in the morning, afternoon, and night shifts, respectively. The nursing team accounts for more than 50% of the multidisciplinary team, with one chief, 13 direct care nurses, and 26 nursing technicians, distributed in four shifts: morning, afternoon, evening, and night. In the dynamic of attention per shift of work, the patient-professional ratio is, on average, one nurse to six patients and one technician per 2 to 3 patients.

The ICU has institutional protocols to prevent PI and treat wounds. PIs, when found, are categorized according to the international classification system, according with Chart 1⁽²⁾. The treatment (for example, choice of dressing) is a responsibility of the nurse, with support from a stomatherapist if necessary. Necessary actions are registered in the nursing process (NP).

In order to **involve the agents of change (2)**, the study was led by the nurse who manages the clinical nursing division of the hospital, a member of the Patient Safety Center (PSC), and received support from ICU professionals, (technical chief of nursing), a direct care stomatherapist, and a nutritionist). This work group helped review the protocol for PI prevention, train the professionals, and supervise their actions. The team of the education and quality service helped reviewing the protocol, inserting the care package to prevent and treat PI (available in the electronic system of the nursing process (PROcEnf)⁽¹⁸⁾, and update the protocol in the nursing manual, available in the desktops of the computers of the institution.

To **evaluate the context and readiness for change (3)**, the leader of the project, together with the nursing chief of the ICU and the nutritionist, analyzed the context using the matrix SWOT (strengths, weaknesses, opportunities, and threats)⁽¹⁹⁾. This is described in the Results section. In this study, elements found by the SWOT matrix as strengths and opportunities were considered to be “facilitators”, while weaknesses and threats were considered to be “barriers”.

Chart 1 – System for the classification of pressure injury. São Paulo, São Paulo, Brazil, 2024.

Pressure injury	Definition
Stage 1	Integral skin with situated erythema that is not whitening, usually over a bone prominence, and may not present visible whitening on dark skin. The area may be painful, firm, soft, hotter or colder when compared with the underlying tissue.
Stage 2	Partial loss of skin thickness with exposure of the dermis, presenting as a superficial lesion, with a viable wound bed, colored pink or red, humid or dry, with no flaking or bruising. It may also present as ruptured blisters or intact ones (with serous exudate).
Stage 3	Loss of the entire skin thickness, with visible fat. Frequently perceivable granulation tissue and epibole (lesion with rolled edges); no fascia, muscle, tendon, ligament, cartilage, or bone are exposed). Slough and/or scab may be visible and there can be detaching and tunnels.
Stage 4	Total loss of skin, loss of tissue with direct exposure of fascia, muscle, tendon, ligament, cartilage or bone, making osteomyelitis possible. Slough or scab may be present in some parts of the bed of the wound and detachment and tunnels are common.
Not classifiable	Full loss of skin, the extent of the damage cannot be confirmed as it is covered by slough (yellow, dark, gray, green, or brown) and/or scab (dark, brown, or black).
Deep tissue lesion	Purple or brown area in the intact uncolored skin or sero-hematic/hematic phlyctena due to damage in the underlying soft tissues due to pressure and/or shearing.
Related to medical devices	Caused by the use of medical devices that applied pressure on the skin. The resulting pressure injury usually presents the form of the device which caused it.
Mucous membranes	Pressure injuries in the membranes that cover the respiratory, gastrointestinal, and genitourinary tracts. Mainly caused by medical devices (generally tubes and stabilization equipment) that apply sustained compressive force and shearing on the mucosa.

Source: European Pressure Ulcer Advisory Panel, National Pressure Injury Advisory Panel and Pan Pacific Pressure Injury Alliance, 2019⁽²⁾

Stage II – Baseline audit and the implementation of strategies to overcome the barriers identified

Stage II had two substages: (4) revision of the practice regarding evidence-based audit criteria and (5) identifying obstacles and implementing strategies to overcome these barriers to promote changes in practice⁽¹⁷⁾.

In the **revision of the practice (4)**, a baseline audit was carried out to ascertain current conformity with recommendations, using eight audit criteria to prevent PI in critical patients that are available in the JBI PACES program⁽¹⁰⁾ (Chart 2). One of the criteria, called “Patients and their families/carers receive education about the risks, prevention strategies and management of pressure injuries”, was not applied. In the ICU, the visit of relatives/caregivers is daily, and can take place in any shift, for a period of one hour. Therefore, there is no continuous presence of a relative.

Chart 2 – Evidence-based baseline audit criteria (used both in the baseline and follow-up audits) and approach to measure their compliance with the best practices for each audited criterion. São Paulo, São Paulo, Brazil, 2024.

Audited criteria (JBI level of evidence)	Method used to measure the % of compliance with best practices
Criterion 01 – Patients are evaluated using valid and reliable tools to ascertain the risk of pressure injury. (Grade A)	Risk assessment: • Check whether the PI risk was ascertain using Braden⁽²⁰⁾ scale at admission and once every 24h until discharge/death. • Compliant if the score in the Braden scale is registered in the nursing records.
Criterion 02 – Patients' skin is evaluated, including inspections of areas with devices (e.g. tracheal tubes, urinary catheters), within two hours from admission and at least once a day, to check for PI signs. (Grade B)	• Check whether there are records about the characteristics of the skin and the presence/absence of injury. • Compliant if, at admission or later, once a day, there is any description of the characteristics, skin aspect, and presence/absence of lesion.
Criterion 03 – Patients are submitted to triage and nutritional evaluations using a validated evaluation instrument. (Grade A)	• Check whether there are records of the triage and nutritional assessment. • Compliant if the triage and nutritional evaluation using a validated instrument are registered at admission.
Criterion 04 – When necessary, patients at the risk of developing PI receive nutritional interventions to reach their caloric needs. (Grade A)	• Check whether nutritional interventions to reach caloric needs are registered. • Compliant if there are records about the nutritional interventions used to reach caloric needs.
Criterion 05 – Patients at risk of developing PI are on a constant low-pressure support foam mattress or, in case of high risk, on an alternating-pressure support mattress. (Grade A)	• Check whether nursing activities document include the type of mattress the patient needs to use. • Compliant if the nursing activity of placing/maintaining the mattress is in accordance with the risk for PI (Braden score ≤ 14 points – moderate to high risk), prescribed and double-checked.
Criterion 06 – Stable patients at risk of developing PI are repositioned at least once every two hours. (Grade A)	• Check for records regarding the positioning of the patient. • Compliant if there are nursing activity records regarding the change of patient position at least once every 2 hours, every 24 hours, and if the position is verified every time in patients at risk for PI (moderate or high).

Chart 2 – Cont.

Audited criteria (JBI level of evidence)	Method used to measure the % of compliance with best practices
Criterion 07 – When necessary, patients at risk of developing PI get additional interventions (for example, dressings, multilayer polyurethane foam and silicone, heel protector). (Grade A)	• Check for the presence of additional interventions prescribed (protective cream, polyurethane foam, systems for fecal incontinence control) for patients at risk of PI. • Compliant if the additional interventions carried out in patients under PI risk (moderate or high) are registered.
Criterion 08 – Nurses are trained on how to evaluate pressure lesions and prevention strategies. (Grade A)	• Verify the records of the teaching and quality service regarding training for PI assessment and prevention strategies. • Compliant if some form of training took place in the prior 12 months.
Criterion 09 – Records of the nursing diagnosis (ND) ⁽²¹⁾ risk for pressure injury in adults OR risk for impaired skin integrity OR risk for impaired tissue integrity for patients with risk for PI.	• Ascertain whether potential NDs from the nursing process are in the records. • Compliant if one of the following NDs was recorded in patient records: “risk of pressure injury in adults” OR “risk for impaired skin integrity” OR “risk for impaired tissue integrity for patients with risk for PI”.
Criterion 10 – Records of a plan of care with nursing activities prescribed for patients with risk for PI.	• Check whether there is a care plan to prevent PI in the nursing prescription. • Compliant if there was a nursing plan prescribed for PI prevention involving at least three nursing activities.

Source: Eric Fong, 2020⁽¹⁰⁾
 Caption: Criteria 9 and 10 – audit criteria elaborated by the authors.
 Degree of recommendation⁽²²⁾: **Grade A** – Strongly recommended for a certain health strategy, with desirable effects outweighing the undesirable ones. There is sufficient evidence of the quality of its use; there is a benefit or no impact on the use of resources and values. The preferences and experience of the patient were considered. **Grade B** – Weak recommendation for a certain health strategy, with desirable effects seeming to outweigh desirable ones, although this is not perfectly clear. There is evidence support its use, but the evidence might not be of a high quality. There are benefits, no impact, or minimal impacts on the use of resources. The values, preferences, and experience of the patient may or may not have been taken into consideration.

The authors elaborated two additional criteria related to nursing documents that included Nursing Diagnoses (ND) and nursing activities related to the prevention and/or care for PI, according with the standards of the system of electronic filing of the PI of the Universidade de São Paulo, called PROCEnf⁽¹⁸⁾. Despite the existence of the PROCEnf, which allows maintaining records of patient data in a computerized system, documents about nursing records (nursing evolution and prescription) are available in the patients' physical records.

For criteria from 1 to 7 and from 9 to 10, the convenience sample was formed by the records of patients hospitalized in the ICU for medical or surgical treatment, who were in accordance with eligibility criteria. We included 18 years old or older patients, in the ICU for more than 24 hours and at risk of developing PI, according to the Braden scale⁽²⁰⁾. In this scale, 16 to 15 points indicate low risk; 14 to 12 indicate moderate risk, 11 indicate a greater or lower high risk. We excluded records from patients who presented signs of PI at the time of admission, as long as the degree was I or higher. Patient records were analyzed daily until they left the ICU (death or discharge).

For criterion 8, the sample was formed using records of the training from the teaching quality service of the hospital. These were registered by nurses and nursing technicians in the ICU who were trained for direct patient care.

The baseline audit (BA) took place from October 2021 to March 2023. Data collection was an instrument with demographic (sex, age, origin, type of hospitalization, destination, time of permanence) and clinical variables (PI risk scale, development of PI or no), and a checklist for the criteria audited, recording compliance or lack thereof, according to the evidence-based recommendations.

The stage **identifying obstacles and implementing strategies to overcome these barriers to promote changes in practice (5)** occurred from January to September 2023. The results of the BA were presented to the ICU nursing team and strategies were discussed to increase the level of compliance of audited criteria. We used the tool "Getting Research in Practice" (GRiP)⁽¹⁷⁾ to register any barriers, with the goal of identifying strategies and resources to overcome them and improve the level of compliance. The product of the GRiP is in Table 1 (in the results section).

Stage III – Impact of the evaluation (follow-up audit) and sustainability.

Stage III comprised two substages, which were: (6) reevaluating the practice through a follow-up audit (evaluation impact) and (7) considering the sustainability of changes in practice⁽¹⁷⁾.

During the **follow-up audit** (6), we adopted the same criteria as in the baseline audit (Chart 2), as well as the data

collection instrument from stage II (instrument with demographic and clinical variables, and a checklist for the criteria audited, recording compliance or lack thereof, according to the evidence-based recommendations). Data collection took place from October 2023 to March 2024.

The **sustainability of changes in practice** is related to the continuity of evidence-based practices in clinical practice⁽¹⁷⁾. As a result, a new audit was scheduled for the second semester of 2024.

The results of the BA and the FA were presented in tables and in an image showing absolute and relative frequencies. The data found in the BA and the FA, regarding the categorical variables sex, pressure injury, and audit criteria were compared using Pearson's chi-squared. Categorical variables, type of hospitalization, and destination were compared using Fisher's exact. Quantitative data (age, length of stay) of BA and FA were compared using Wilcoxon-Mann-Whitney'.

This project was approved by the Research Ethics Committee of the hospital (No. 5.241.190) via Plataforma Brasil. It was carried out according to Resolution No. 466/2012, by the National Council of Health, ensuring the confidentiality and secrecy of data, as well as the anonymity of participants. The need for a consent form was waived.

■ RESULTS

Assessment of the context and readiness for change

Before the execution of the study, the context and readiness of change were assessed using the SWOT matrix. We considered the following elements: **Strengths**: Structured and computerized NP – PROCEnf⁽¹⁸⁾, participation and collaborative work from a multiprofessional team; leadership, knowledge, and team skills; **weaknesses**: unavailability of resources, lack of systematization in care records, lack of systematic professional training; **opportunities**: support from high management, use of evidence in protocols, presence of specialists; **threats**: deficit of human resources and lack of motivation in the team.

Demographic and clinical profile of patients

The demographic and clinical profile of the patients admitted to the ICU, in the BA and the FA is shown in Table 1. The BA sample was formed by the records of 169 patients, who added up to 1,343 days of analysis. In the FA, 171 patients were observed, adding up to 1,334 days of analysis. There was a statistically significant difference in the BA and FA groups in the variables mean age ($p < 0.001$) and type of hospitalization ($p = 0.001$).

Table 1 – Demographic profile of patients hospitalized in an Intensive Care Unit, in the stages of baseline audit and follow-up audit. São Paulo, São Paulo, Brazil, 2024.

Variables	Baseline audit (N=169)	Follow-up audit (N=171)	p-value ^a
Sex	n (%)	n (%)	0.674
Male	97 (57.4)	102 (59.7)	
Female	72 (42.6)	69 (40.3)	
Type of hospitalization	n (%)	n (%)	0.001
Medical	79 (46.7)	59 (34.5)	
Surgical	90 (53.3)	112 (65.5)	
Destination	n (%)	n (%)	0.493
Inpatient ward	133 (78.7)	134 (78.4)	
Death	29 (17.2)	28 (16.4)	
Another service	3 (1.8)	4 (2.3)	
Others	4 (2.4)	5 (2.9)	
Pressure injury	n (%)	n (%)	0.207
No	139 (82.2)	144 (87.1)	
Yes	30 (17.8)	22 (12.9)	
Mean age (years)	66.4	58.9	< 0.001
Mean occupancy rate	90.9%	94.3%	
Mean length of stay in the ICU (days)	7.05	7.02	0.590
Mean length of stay in the hospital (days)	18.60	18.40	0.691
Nursing team-patient ratio (professionals/patient)	2.6	2.5	
Mean nursing care hours/patient (hours)	13.4	12.8	

Note: All patients in the baseline and follow-up audits are at risk of PI.

^a. E. Pearson's Chi-squared test, Fisher's Exact test for categorical variables, and Wilcoxon-Mann-Whitney for quantitative data.

Source: Research data, 2021 to 2024.

Implementation of strategies to improve practice

Starting with the BA results, there were five barriers to the achievement of compliance with best practices. Strategies were proposed to overcome these obstacles, as described below.

Barrier 1. Lack of records related to the evaluation of the risk of PI, skin examination, use of specific mattresses according with PI risk, and repositioning every two hours.

We reviewed the institution's protocol of PI prevention, incorporating into it the best practices for the prevention of PI. Information was inserted into the nursing manual, available in the desktops of the computers of the institution. A flowchart was created to direct nursing activity after a patient at risk for PI is identified. To improve the NP regarding PI prevention and treatment, a Braden score ≤ 16 points was associated with specific NDs ("risk of pressure injury in adults", "risk for impaired skin integrity", and "risk for impaired tissue integrity") and nursing care in the PROCEn^{f(18)}. The care included inspecting and recording the state of the skin of the patient, hydrating the skin with moisturizing cream, repositioning therapeutic devices regularly, and others. All these activities can be considered at the time of nursing prescription. Educational folders were elaborated to facilitate the visualization of best practices regarding the prevention of PI and the updates of the PROCEn^{f(18)}. A strategy to prevent PI was approved that involved a chart showing the risk to patient safety and a clock for guidance about repositioning. There was also a revision of the control sheet of the ICU, in such a way as to structure the repositioning events.

Barrier 2 – Lack of periodical and systematic training about the prevention of PI in critical patients.

At first, meetings were conducted with the nursing team to present BA results as a strategy to raise awareness. Later, we applied an educational program comprising a class and case studies about the "best practices for PI prevention". The dynamic took place *in loco* during shifts, lasting for at most one hour. In addition to the training session, the head nurse of the ICU carried out weekly rounds and discussions with the nurses, in order to reiterate the strategies to prevent PI.

Barrier 3 – Insufficient resources, such as bed rails; moisturizing cream; hydrocolloid dressing, and protective cream.

Meetings were held with the nursing head of the ICU to adapt the share of material resources available. Then, after adjustments, these resources were requested from the central warehouses. Regarding the inclusion of new technologies to prevent PI (tools for positioning and dressings made of multi-layered polyurethane foam and silicone, sacral-format-dressing), meetings were carried out with the service of material standardization in the hospital. Tests were performed using positioning tools provided by manufacturers, technical descriptions were elaborated, and a purchase process through public bidding is taking place. In order to temporarily solve the issue of not enough repositioning rails, temporary ones were handcrafted.

Barrier 4 – Lack of standardization in PI-related records.

An educational program comprising a class and case studies about the stages of PI was created, and a treatment for each stage was given to the ICU nursing team.

Barrier 5 – Lack of records in triage/nutritional evaluation records and nutritional interventions.

The records about nutritional assessments, which usually are not permanently available in physical records or in the system, are undergoing changes. Specific nutrition-related documents and print-outs will be elaborated for incorporation into the patient record, in order to improve multi-professional communication regarding nutritional aspects.

Chart 3 illustrates the GRiP matrix, synthesizing barriers, strategies to overcome them, necessary resources, and outcomes achieved.

The actions described were entirely carried out in a partnership involving the project team and the professionals from specific services, namely, the services responsible for nutrition, teaching and quality, material standardization, and communication.

Baseline and follow-up audits comparison

The analysis of compliance criteria found that the BA and FA groups were statistically different for almost all criteria (1,2,4,5,7,8, 9 and 10 [p-value 0.001]). The exceptions were criterion 3 (screening and nutritional assessment), whose level of compliance was 100% in both audits, and criterion 6 (stable patients at risk of developing PI are repositioned at least once every two hours) (Figure 1).

Chart 3 – Getting Research into Practice matrix. São Paulo, São Paulo, Brazil, 2024.

Barriers	Strategies	Resources	Outcomes
Barrier 1 lack of records: - PI development risk assessment; - skin examination; - type of mattress used; - repositioning.	• protocol review ; • revision of nursing activities in the electronic PI system, and association of nursing diagnosis to a score ≤ 16 points in the Braden scale; • preparation of an educational poster; • confection of a board for the identification of risks and the incorporation of a clock to guide changes in position; • revision of the ICU control sheet.	• institutional protocol; • communication service; • computer; • NP electronic system (PROEnf).	revised protocol inserted in the nursing manual; elaboration of an educational poster on the prevention of PI and the NP; nursing interventions and activities input into the system; New control sheet being used risk identification table being purchased.
Barrier 2 lack of systematic periodic training for PI prevention in critically ill patients.	• training; • supervision.	• Computer; • classroom/meeting room; • daily rounds.	94.8% of the staff was trained; Conversations were held with 100% of nurses
Barrier 3 insufficient resources: rails; moisturizing cream; hydrocolloid dressing; protective cream.	• meetings with the head of nursing; • meetings with the party responsible for standardization and purchases; • handcrafted rain cushions.	• classroom/ meeting room; • materials to handcraft temporary cushions (nappa and styrofoam balls); • seamstress; • computer.	Adaptation of moisturizing cream, protective cream, and hydrocolloid dressing quotas; 20 bed rail cushions were made; technical descriptions were made for the purchasing of the cushions.
Barrier 4 – lack of standardization in PI records.	• training; • preparation of educational poster.	• Computer; • classroom/meeting room; • communication service.	Ongoing
Barrier 5 – Lack of medical records of nutritional screening/assessment and nutritional interventions	• meeting with the ICU nutritionist responsible for presenting the project.	• Meeting room • Computer.	Ongoing

Source: Research data, 2021 and 2023

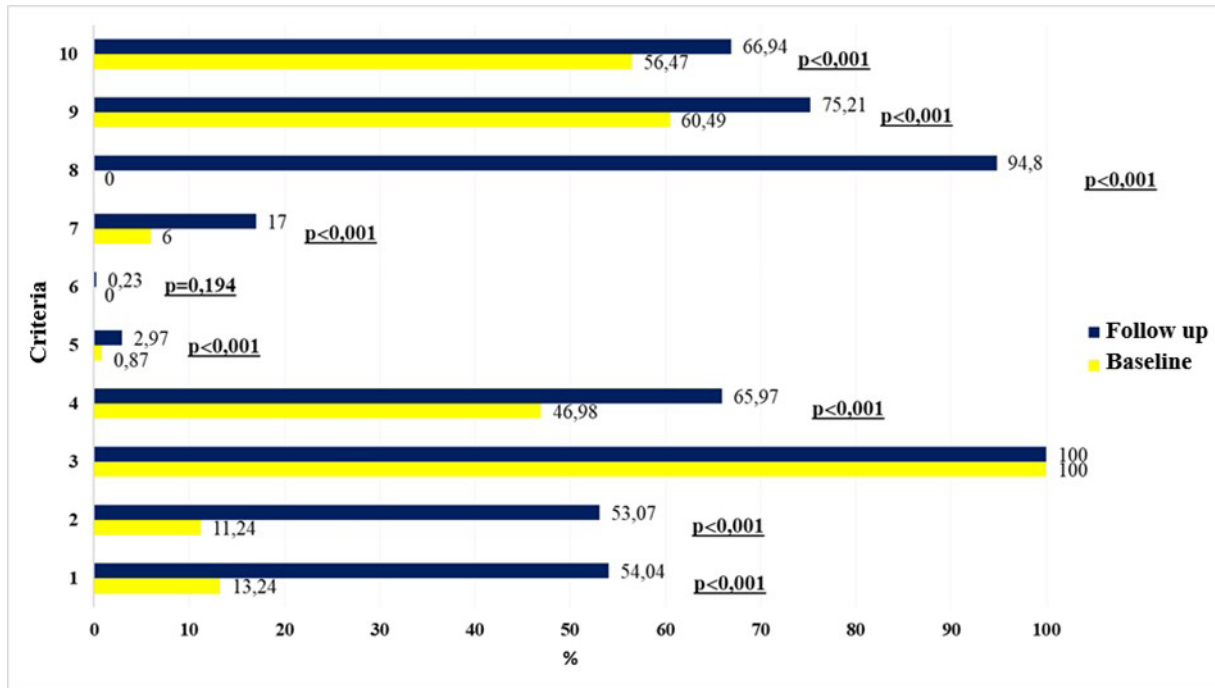


Figure 1 – Rate of compliance with best practice criteria to prevent pressure injuries in the baseline and follow-up audits. São Paulo, São Paulo, Brazil, 2024.

Note: 1. Patients are evaluated using a valid and reliable tool to determine the risk of pressure injuries; 2. Patients are submitted to skin examinations, including the inspection of areas with devices (such as tracheal tubes, urinary catheters) within two hours of admission and at least once a day, to check for signs of PI; 3. Patients are submitted to nutritional triage and assessment using a validated instrument; 4. When needed, patients at risk of developing PI receive nutritional interventions to reach their caloric needs; 5. Patients at risk of developing PI are on a constant low-pressure support foam mattress or, in the case of high-risk patients, on an alternating-pressure support mattress; 6. Stable patients at risk of developing PI are repositioned at least every two hours; 7. When needed, patients at risk of developing PI receive additional interventions (e.g., multilayer polyurethane foam and silicone dressings, heel protector); 8. Nurses are trained in how to evaluate pressure lesions and prevention strategies; 9. Records of the nursing diagnosis “risk for pressure injury in adults” OR “risk for impaired skin integrity” OR “risk for impaired tissue integrity for patients with risk for PI”; 10. Records of a care plan with nursing activities prescribed for patients at risk for PI.
p-value: E. Pearson’s chi-squared test.

DISCUSSION

The findings of this study, whose setting was a teaching hospital certified by the JBI quality standards of “commitment with evidence-based health, continuous improvement of professional quality and training”⁽²³⁾ showed that the multiprofessional team participated and there was substantial improvement to clinical practice, expressed in the increased compliance rates after the “evidence implementation” intervention to prevent PI.

These standards pushed forward the implementation of evidence-based practices and improved the quality and health outcomes of previous practices. This must involve the team, professionals with clinical and leadership capabilities, and be supported by the management and administration of the institution⁽²³⁾.

In the hospital context, the implementation of best practices of PI prevention is influenced by many barriers and facilitators, and can include individual and organizational issues, such as the ones found in this study⁽²⁴⁾.

In the hospital studied, along the lines of other studies, we found facilitators that helped the success of the intervention. Among them, the electronic NP system, PROCEnf, structured as a tool to support decision-making, was essential to prevent PI; communication and work involving the multi-professional team was orchestrated, including continuing education; leadership supported the implementation of best practices; and the ICU nursing team showed its clinical experience⁽²⁴⁾.

In accordance with previous reviews, the existence of integration and the sharing of information among health workers were some of the main facilitators of the implementation of evidence for the prevention of PI, since communication (for example, the training and revision of the protocol) was the main strategy used in the implementation process^(12,2). However, one must consider that interrelations can be barriers or facilitators, depending on communication and leadership support, often associated with motivation^(12,25).

Most barriers found were related to the absence of essential information about PI in medical records. Their transposition was based on actions that included a revision of

the PI prevention protocol, the PROCEnf⁽¹⁸⁾, construction of visual material, training of the nursing team regarding the protocol and changes of NP regarding PI, and support from leadership to supervise the team. The participation of the professionals, including nurses with clinical leadership abilities, management support, and the administration of the institution, was active and collaborative, from the time barriers were found to the implementation of strategies to promote change, which contributed to improving the quality of practice.

The revision of the previous PI prevention protocol, from 2016, was essential. It allowed incorporating current evidence for PI prevention, with the inclusion of new definitions, nomenclatures, and classifications of the stages of PI, as well as an inclusion of the recommendations from the current ANVISA technical note about Patient Safety Practices in Health Services: PI prevention and alignment with the guidelines of ANVISA's Patient Safety Plan^(2,10,26). This strategy allowed updating evidence-based practices, in order to strengthen the institutional policy of patient safety⁽²⁶⁾.

The FA indicated improvements in compliance with almost all criteria, showing the intervention that was applied was successful. This finding is in line with other projects for the implementation of best practices in the ICU, which showed that educational interventions for the nursing team had a positive impact on the implementation of PI prevention strategies^(14,27).

Records about PI risk assessments (criterion 1) using the Braden scale⁽²⁰⁾ and related to skin examination (criterion 2), at the time of admission and on every day, showed an increased compliance in the FA. Professional training and support from local leadership were essential to improve these criteria, as made clear by implementation processes conducted in hospitals⁽¹⁵⁾.

The criteria related to triage and nutritional evaluation (criterion 3) and nutritional interventions (criterion 4) showed, respectively, full compliance (100%) and superior compliance (65.97%) in the FA. In the ICU, which was the setting of the implementation, there is one nutritionist that is exclusively dedicated to the sector. Nutritional support is a potentially cost-effective intervention, associated with a lower risk of PI⁽²⁸⁾. The nursing team also supports nutritional care to help lower the risk of PI, providing care such as reducing unnecessary fasting, following institutional policies regarding nasogastric tubes, and being attentive to the screening of PI development in mucous membranes associated with a therapeutic device⁽²⁹⁾.

Regarding criteria 5, addressing the mattresses of the patients at risk of developing PI, despite a statistically significant

difference, compliance was low. This may be due to the lack of nursing records about the use of mattresses or lack thereof, since ICU beds have multidensity foam mattresses and alternating air surface. Moreover, this criterion is conditioned by financial resources, especially considering the high cost of mattresses. This can make the incorporation of this technology unfeasible, especially in public hospitals. In addition to the fact that there is no clear evidence in regard to which support surface – mattress (foam, reactive air surfaces, alternating pressure, general air surfaces, and reactive gel surfaces) would be the most effective to prevent PI⁽³⁰⁾.

For criterion 6, which is associated with the records of how often the patient is repositioned, there was no improvement to compliance, although the control sheet passed through a revision. Thus, to improve compliance with this criterion, it will certainly be necessary to propose further discussions with the local health team in order to identify new strategies. Despite the repositioning recommendations, evidence is insufficient regarding how often it should take place and which specific positions should be used to prevent PI^(30,31). International PI organizations recommend evaluations of the level of activity of the patient and their individual capabilities of changing position as indicators of professional conduct about frequency⁽²⁾.

Both NP related criteria showed improved compliance (criteria 9 and 10). The electronic NP documentation system was reviewed, linking nursing care to potential NDs⁽²¹⁾ to optimize the work of nurses and ensure that records will be in compliance with current recommendations. Complete information in the records about any activities carried out to prevent PI is essential to evaluate whether safe practices are being adopted by professionals and managers of health institutions⁽²⁶⁾. However, records are a challenge to daily health care.

Support from local leadership and the use of educational strategies for nursing workers were essential for the success of implementation, with positive results in the compliance with most of the audit criteria and in the reduction of patients with PI. The success of this intervention is also intrinsically related to teamwork and to the integration of clinical, educational, and managerial elements^(12,25,26).

Regarding the implementation of the best health care practices, the evaluation of the results is a necessary step to verify the efficiency of interventions and acquire subsidies to improve the strategies implemented⁽²³⁾. Thus, the findings of this study are important in the perspective of international goals and of the National Patient Safety Policy; especially, they enable improvements about how to integrate global and local evidence as agents to promote practical changes.

Furthermore, the study can encourage other nurses to follow the model of evidence implementation, with a general perspective of barriers and strategies to transpose them, and the resources needed to promote the best practices to prevent PI in critical patients.

Despite these contributions, this study has some limitations that should be made explicit, so they can be considered for future investigations. Data collection about criteria 5 and 6 may have been affected by the analysis of the information in the records, as, despite portraying reality, they may be biased, especially due to the lack of information. We also must consider that two projects were simultaneously conducted in the ICU, with repercussions on the dynamics of training of human resources, in efforts to supervise the strategies implemented, and managerial and health care activities in the unit.

Future activities to continue the implementation of best PI prevention practices include further, periodical clinical audits to ensure the quality of care and the sustainability of actions⁽¹⁷⁾, assessments of the electronic NP system (PROEnf) regarding the new strategies adopted in nursing activities, and the systematic training of the multiprofessional team to prevent and treat PI. Finally, it is important to evaluate the cost-effectiveness ratio of the implementation, in order to evaluate the clinical benefits and their associated costs.

■ CONCLUSION

The intervention “best evidence implementation” contributed to improving practices related to pressure injuries. This was made clear by increased compliance with the criteria of an evidence-based audit, and the proposal of strategies to overcome the barriers found by these audits, anchored upon an educational intervention.

Nevertheless, results suggest the need to adjust the best practices available in guidelines (global evidence) and local practices (local evidence), especially concerning the programmed mobilization of the nurse and the use of specific mattresses, according to the risk of PI. Thus, it is necessary to carry out new periodical clinical audits, to ensure the quality of care, the improvement, and the sustainability of the results.

Producing evidence about the impact of implementing the best practices in PI prevention is a professional challenge, especially considering the multicomponent nature of this preventive process. Thus, this study contributed with the professional and scientific community, presenting a model of evidence implementation and the resources needed to promote the best practices of PI prevention in critical patients.

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