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ARTIGO ORIGINAL

Risk factors for pressure injuries in critically ill adults: an umbrella review protocol

Fatores de risco para lesões por pressão em pacientes críticos adultos: protocolo de revisão guarda-chuva

Factores de riesgo de lesiones por presión en pacientes adultos críticos: protocolo de revisión paraguas

Larissa Cassiano Bernardo[1]

Bruna Cristina Velozo[1]

Meire Cristina Novelli e Castro[1]

Susana Maria da Silva Gaspar[2]

Luciana Patrícia Fernandes Abbade[1]

[1]Universidade Estadual Paulista. São Paulo, Brazil.
[2]Universidade de Coimbra. Coimbra, Portugal.

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Corresponding Author
Name: Larissa Cassiano Bernardo
E-mail: larissa.c.bernardo@unesp.br

ABSTRACT

Objective: to summarize the evidence on risk factors for pressure injuries identified in systematic reviews of adult patients admitted to Intensive Care Units. **Method:** this is an umbrella review protocol for systematic reviews. This research will be conducted in accordance with the guidelines of the JBI Evidence Synthesis Manual and the guidelines established by the Journal of Clinical Nursing. Two independent reviewers will select and extract the data, as well as assess the methodological quality and bias of the studies, with a third reviewer checking for inconsistencies. **Results:** risk factors associated with different populations and contexts in Intensive Care Units will be identified, enabling the identification of more vulnerable groups and environments that require specific interventions. The methodological quality of the reviews will also be assessed. **Conclusion:** this umbrella review will contribute to strengthening knowledge of risk factors, ensuring the methodological quality of reviews, and supporting evidence-based clinical practices, as well as the development of more effective preventive strategies.

***Keywords*:** *Intensive Care Units; Risk Factors; Pressure Injury; Adult; Systematic Review.*

RESUMO

Objetivo: sintetizar as evidências sobre os fatores de risco para lesões por pressão identificados nas revisões sistemáticas realizadas com pacientes adultos internados em Unidades de Terapia Intensiva. **Método:** trata-se de um protocolo de revisão guarda-chuva de revisões sistemáticas. A condução da pesquisa seguirá as orientações do Manual para Síntese de Evidências do JBI e as diretrizes estabelecidas pelo *Journal of Clinical Nursing*. Dois revisores independentes realizarão a seleção e a extração dos dados, bem como avaliarão a qualidade metodológica e o viés dos estudos, contando com o apoio de um terceiro revisor em caso de inconsistências. **Resultados:** serão identificados os fatores de risco associados a diferentes populações e contextos das Unidades de Terapia Intensiva, possibilitando a identificação de grupos mais vulneráveis e de ambientes que demandam intervenções específicas. A qualidade metodológica das revisões incluídas também será avaliada. **Conclusão:** esta revisão guarda-chuva contribuirá para fortalecer o conhecimento sobre os fatores de risco, assegurando a avaliação da qualidade metodológica das revisões incluídas e subsidiando práticas clínicas baseadas em evidências científicas, bem como o desenvolvimento de estratégias preventivas mais eficazes.

Descritores: *Unidades de Terapia Intensiva; Fatores de Risco; Lesão por Pressão; Adulto; Revisão Sistemática.*

RESUMEN

Objetivo: sintetizar las pruebas sobre los factores de riesgo de lesiones por presión identificados en las revisiones sistemáticas con pacientes adultos ingresados en unidades de cuidados intensivos. **Método:** se trata de un protocolo de revisión general de revisiones sistemáticas. La realización de esta investigación seguirá las orientaciones del Manual para la síntesis de evidencias del JBI y las directrices establecidas por el Journal of Clinical Nursing. Dos revisores independientes llevarán a cabo la selección y extracción de los datos y evaluarán la calidad metodológica y el sesgo de los estudios, contando con un tercer revisor para detectar inconsistencias. **Resultados:** se identificarán los factores de riesgo entre diferentes poblaciones y contextos de unidades de terapia intensiva, identificando posibles grupos más vulnerables y entornos que requieren intervenciones específicas. También se evaluará la calidad metodológica de las revisiones. **Conclusión:** esta revisión general contribuirá a reforzar el conocimiento de los factores de riesgo, garantizando la calidad metodológica de las revisiones, respaldando las prácticas clínicas y el desarrollo de estrategias preventivas más eficaces basadas en la evidencia científica.

Descriptores: *Unidades de Terapia Intensiva; Factores de Riesgo; Lesiones por Presión; Adultos; Revisión Sistemática.*

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Introduction

Pressure Injury (PI) results from the prolonged application of pressure, often accompanied by shear or friction, leading to decreased local blood flow and tissue necrosis. According to the international panels European Pressure Ulcer Advisory Panel (EPUAP), National Pressure Injury Advisory Panel (NPIAP), and Pan Pacific Pressure Injury Alliance (PPPIA), PIs occur in the skin and underlying tissues, frequently from bony prominences or in locations where medical devices are used[1-2]. PI represents one of the most challenging clinical problems, negatively impacting patients' lives in emotional, psychological, physical and social aspects, thus reducing their quality of life[3-4]. In addition, PIs also have negative repercussions for healthcare institutions, in which their incidence and financial burden remain at high levels[5-8].

PI are one of the most common complications in hospitalized patients; however, patients admitted to Intensive Care Units (ICUs) face considerably increased vulnerability to developing hospital-acquired PIs due to the severity of their clinical condition, the presence of associated risk factors, and the prolonged period of hospitalization[9-10]. The overall prevalence is around 12.8%, and the incidence varies around 8.4% for hospital-acquired PIs[10]. In the United Kingdom, the incidence of PI varies between 4% and 10% of patients admitted to hospital units[11]. In ICUs, the incidence and prevalence vary from 10.0% to 25.9% and from 16.9% to 23.8%, respectively, as demonstrated in a systematic review with several ICUs[12].

The incidence of PI is proportionally related to the aging of the population and the increased prevalence of risk factors such as obesity, Diabetes Mellitus (DM), and cardiovascular diseases such as hypertension[13]. Moreover, the ICU environment is related to the clinical complexity of patients, encompassing other risk factors such as immobility resulting from pharmacological and therapeutic interventions, associated with hemodynamic instability[14], as well as the use of multiple invasive devices, such as mechanical ventilation[15].

The risk factors relevant to the development of PIs can be divided into two main categories. Extrinsic factors include prolonged pressure, friction and/or shear, moisture, inadequate patient handling, and the use of medical devices. Intrinsic factors, on the other hand, refer to the individual characteristics of the patient, such as advanced age, clinical conditions, reduced mobility, incontinence, impaired hemodynamic status, and malnutrition[2,16]. Identifying risk factors is essential for the prevention and management of PIs. Monitoring the individual risk of each patient allows for the planning and implementation of effective preventive strategies[17-18]. International guidelines recommend the use of

validated and reliable tools, comprehensive skin assessment, and the adoption of sound and consistent clinical judgment[1-2].

Considering that the ICU environment is unique, specific instruments have been developed, based on risk factors specific to this context and validated for use in critically ill patient populations. Risk prediction scales, for example, the Critical Care Pressure Ulcer Assessment Tool Made Easy (CALCULATE), which include criteria such as compromised circulation, immobility, dialysis, mechanical ventilation, prolonged surgery or cardiac arrest, as well as low protein intake, among other factors, support the clinical judgment of the healthcare team, aiming to promote a care-focused approach and mitigate the risks inherent in the development of PIs[19-20].

Although these scales cover some risk factors, there are still gaps that justify conducting an umbrella review, aimed at synthesizing the evidence from systematic reviews on the main risks inherent to patients in the intensive care setting. During a preliminary search, carried out in the Scopus, Web of Science, Embase, CINAHL (Cumulative Index to Nursing and Allied Health Literature), Cochrane Library (The Cochrane Central Register of Controlled Trials – CENTRAL), SciELO via Web of Science, PubMed (Public Medical Literature Database) and Virtual Health Library (VHL) databases, an umbrella review focusing on risk factors for PIs, regardless of the care setting, was identified[16]. This review demonstrated that length of stay in the ICU increases the risk for PIs; however, the study did not present specific analyses focused on the intensive care setting, nor did it consider the interaction with other risk factors, such as the use of vasopressors and mechanical ventilation, thus reinforcing the need for an umbrella review specifically focused on this topic[16].

Identifying and analyzing these risk factors is crucial for improving PI predictive scales, for health management, and for personalizing care according to the needs of each patient[18]. In addition, knowledge of risk factors enables health professionals to implement early and specific preventive interventions, contributing to mitigating the development of severe PIs and their complications[21-22].

Therefore, this umbrella review's objective is to synthesize the evidence on risk factors for PIs identified in systematic reviews conducted with adult patients admitted to ICUs. By understanding these specific risks, healthcare professionals can implement targeted strategies for PI prevention, ensuring early detection and the adoption of appropriate, evidence-based interventions.

Method

Study Design

This protocol refers to the development of an umbrella review. The review will be conducted based on a rigorous methodological design, centered on the integration of findings from previously published systematic reviews, in order to offer a comprehensive, thorough, and up-to-date view on the subject. The conduct of this synthesis will follow the guidelines of the JBI Evidence Synthesis Manual[23-24] and will additionally adopt the guidelines established by the Journal of Clinical Nursing[25] for systematic reviews. The review will be reported according to the recommendations of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Protocols (PRISMA-P) and the PRISMA 2020 guidelines[26-27]. Additionally, to ensure transparency, traceability, and reproducibility of the process, this protocol was duly registered in the International Prospective Register of Systematic Reviews (PROSPERO), under reference CRD 420250635920, and on the Open Science Framework (OSF) platform, under reference osf.io/6y4rt.

For the construction of the research question, the acronym Population, Exposure, and Outcome (PEO) was used[23-24]. In this context, the population (P) consists of critically ill adult patients admitted to the ICU; the exposure (E) corresponds to the risk factors; and the outcome (O) refers to the development of PI. The adoption of the PEO in this umbrella review is justified because the exposure (E) corresponds to the component of interest or phenomenon investigated (I/Co), while the outcome (O) maintains methodological correspondence with the clinical outcome (O). Thus, the use of the PEO preserves methodological coherence with the guidelines of the JBI Evidence Synthesis Manual for questions derived from the adaptation of the PICO mnemonic (or PICo), while also being suitable for the nature of the question in this review. Therefore, based on this structured model, the guiding question formulated is: what evidence is available, and what is the methodological quality of systematic reviews that analyze risk factors for PI in adult patients hospitalized in the ICU?

Eligibility criteria

The selection of studies was guided by previously established inclusion and exclusion criteria.

Original systematic reviews, with or without meta-analysis, that investigate risk factors associated with the development of PI in critically ill patients will be considered eligible for inclusion. The reviews should focus primarily on identifying factors related to or predictive of the occurrence of these injuries in adults admitted to ICUs.

Narrative or scoping reviews will be excluded, as well as those that exclusively address pediatric populations or clinical contexts outside the intensive care setting. Systematic reviews whose objective is the evaluation of therapeutic interventions will also be excluded, as well as those that do not specify whether the PIs were acquired in the hospital setting (hospital-acquired PI – HAPI). Studies that do not allow the extraction of specific data from the population of patients admitted to the ICU will be excluded, since they make the targeted analysis proposed by this review unfeasible.

In addition, studies that have not undergone a formal peer review process will be excluded, thus ensuring the selection of evidence with adequate methodological rigor. Articles whose full version is not available, even after attempts to contact the responsible authors, will also be excluded, since this unavailability compromises the detailed and transparent analysis of the data. Finally, there will be a restriction regarding language, with only articles published in English, Portuguese, or Spanish being included, without temporal delimitation.

Regarding grey literature, no systematic search will be conducted in specific sources, as the objective is to synthesize evidence originating exclusively from systematic reviews published in peer-reviewed scientific journals. In accordance with the JBI Manual, the reference lists of the included studies will be examined manually, with the aim of identifying potentially eligible systematic reviews that have not been retrieved in the electronic search[23]. Records from grey literature will not be included if they do not meet the peer review criterion.

Search Strategy

This strategy aims to exclusively identify published systematic reviews. In accordance with the three steps recommended by the JBI Manual, an exploratory search was initially conducted in the JBI Database of Systematic Reviews and Implementation Reports, the Cochrane Database of Systematic Reviews, and Scopus, as well as in the PROSPERO review registry, to map the available literature, analyze titles, identify relevant descriptors, and refine the search terms and combinations to be used in this umbrella review.

In the subsequent step, the complete search strategy was developed in each database, including the selection of controlled descriptors from different specialized vocabularies, namely Health Descriptors (DeCS), Medical Subject Headings (MeSH), and EMTREE (Embase thesaurus). Among the selected descriptors, the following stood out: "Intensive Care Units", "Adult", "Young Adult", "Aged", "Aged, 80 and over", "Middle Aged", "Pressure Ulcer", and "Systematic Review". The choice of these terms was guided by the essential elements of the research question, and the descriptors were combined using

Boolean operators, namely ‘AND’ and ‘OR’, in order to maximize the sensitivity and specificity of the search.

Table 1 - Example of a search strategy for CINAHL, during the period of February 2025. Brazil, 2025.

Database	Search strategy
CINAHL	(MH "Pressure Ulcer+") OR "Pressure Ulcer*" OR "Bed Sore*" OR "Bedsore*" OR "Decubitus Ulcer*" OR "Pressure Injury" OR "Pressure Injuries" OR "Decubitus" OR "Decubital ulcer*" AND ((MH "Adult+") OR (MH "Aged+") OR Adult* OR "Young Adult*" OR "Senior citizen*" OR Elderly OR Aged OR "Middle Age*" OR Centenarian* OR Nonagenarian* OR Octogenarian* AND ((MH "Intensive Care Units+") OR "Intensive Care Unit*" OR "ICU" OR "ICUs" OR "Critical Care Unit*" OR "Intensive Therapy Unit*" OR "Special Care Unit*" AND ((MH "Systematic Review") OR "Systematic Review*")

After formulating the search strategies, according to the respective requirements of each database, these were applied to the following sources: Scopus, Web of Science, Embase, Cumulative Index to Nursing and Allied Health Literature (CINAHL), Cochrane Library, The Cochrane Central Register of Controlled Trials (CENTRAL), SciELO via Web of Science, Public Medical Literature Database (PubMed), and Virtual Health Library (BVS). As an illustration, Table 1 presents the formulation of one of the strategies developed for the CINAHL database.

In addition to the initial exploratory search and refinement of the complete strategies in each database, a third stage will be conducted at the end of the searches, consisting of a manual examination of the reference lists of the included systematic reviews, to identify potentially relevant additional studies that were not retrieved by the electronic strategies.

Study Selection

The selection of studies will be carried out from the selected databases, with the results initially organized in the Rayyan software, developed by the Qatar Computing Research Institute (QCRI), which will be used for removing duplicates and for the screening stage of the records. After this stage, the eligible studies will be exported to the EndNote software (version 21.4), where the final organization of the references will be carried out.

The titles and abstracts of the studies identified by the bibliographic search will be evaluated independently and in pairs by the two reviewers. Disagreements will be resolved by consensus or, when necessary, with the assistance of a third reviewer.

Studies that meet the eligibility criteria will be retrieved for analysis of the availability of the full text, provided it is in full access. After this stage, a calibration will be carried out between the two reviewers, corresponding to 10% of the selected articles. Next, data collection will be carried out independently and in double-blinding, using a form developed on the Google Forms platform, which will be structured according to the topics of the standardized instrument in the JBI manual. All screening steps will be documented in a flowchart compatible with JBI/PRISMA 2020, detailing the number of records identified, included, and excluded, as well as the respective reasons.

After the data collection is complete, the blinding will be lifted for comparative analysis and discussion of the results. In case of disagreement, a third reviewer will be called upon to resolve conflicts. Finally, after the data collection stage, the Assessment of Multiple Systematic Reviews-2 (AMSTAR 2) and Risk Of Bias In Systematic reviews (ROBIS) tools will be applied, through the Google Forms platform, to assess methodological quality and risk of bias.

Data Extraction and Synthesis

Data extraction from the selected reviews will be conducted using a standardized instrument developed by the JBI Manual (2024)[23-24]. This tool will allow the collection of information such as: author names, year of publication, analytical methods applied (narrative synthesis or meta-analysis), number and type of primary studies included, types of ICU environments, risk factors identified, sample size, demographic characteristics of participants, and main findings.

To avoid double-counting of primary studies potentially included in more than one systematic review, a careful analysis of the reference lists of each included review will be performed.

Data synthesis will be performed narratively, complemented by tables and figures that will present the main risk factors for PIs, the methodological quality of the included reviews, and the available quantitative results. Considering that this is an umbrella review, no additional statistical analyses will be performed.

It will be assessed whether the included systematic reviews performed subgroup analyses to investigate the variability of risk factors, considering intrinsic patient characteristics such as age, body mass index, nutritional status, comorbidities, degree of immobility, and length of stay, as well as extrinsic factors such as pressure, friction, skin moisture, positioning, and quality of nursing care.

The main measures of association between the identified risk factors and PIs will be extracted, including results indicating increased risk, greater injury severity, prolonged length of stay, or other clinical consequences. Whenever results related to potential adverse outcomes arising from exposures or interventions associated with risk factors are presented, these will also be recorded and summarized. During extraction, if there is incomplete or missing information, this will be identified and recorded as "not reported," and this limitation will be considered in the analysis and discussion of the results.

The overlap of primary studies among the included systematic reviews will be assessed systematically and transparently. To this end, all primary studies from each review will be identified and organized into a matrix of primary studies x systematic reviews. From this matrix, the Corrected Covered Area (CCA) will be calculated, which quantifies the degree of overlap between systematic reviews in an umbrella review, as recommended by the JBI Manual[28]. In this matrix, primary studies will be arranged in rows and systematic reviews in columns, allowing the frequency with which each study is included in the different reviews to be identified. The degree of overlap will be classified as slight (0%–5%), moderate (6%–10%), high (11%–15%), or very high (>15%)[29].

The quantitative results of the included meta-analyses will be extracted and presented in descriptive tables, including the final reported measures of association, such as Odds Ratios (OR), Hazard Ratios (HR), and Relative Risks (RR), as well as their respective 95% confidence intervals and p-values, when available. When different reviews present different measures for the same risk factor, the values will be presented separately, with a clear indication of the original review. For reviews that present only narrative syntheses, the findings will be organized comparatively, highlighting the direction and magnitude of the association reported in each review, as well as any convergences and divergences identified.

Finally, conflicting results between reviews will be critically analyzed, considering methodological differences, population characteristics, the designs of the underlying primary studies, statistical strategies, and the methodological quality of the included reviews, assessed by AMSTAR 2[30]. This procedure will ensure transparency in the interpretation of the strength and consistency of the available evidence on each risk factor for PIs.

Methodological quality assessment and risk of bias

The methodological quality of the systematic reviews included in this study will be assessed using the Assessment of Multiple Systematic Reviews-2 (AMSTAR 2) tool, which verifies the transparency of the review process, the clarity of the study selection criteria, and

the adequacy of the data synthesis methods[30]. For the analysis of the risk of bias of the included reviews, the Risk Of Bias In Systematic reviews (ROBIS) tool will be used, which consists of three assessment phases: i) assessment of relevance; ii) identification of potential risks of bias during the review process; and iii) assessment of the overall risk of bias. The domains will be classified as having a “high”, “low”, or “uncertain” risk of bias[31].

These instruments were selected because they have been widely used internationally and have adequate sensitivity for evaluating reviews of risk factors and clinical exposures, allowing the identification of critical domains that impact the validity of syntheses. Although this protocol follows the JBI methodological guidelines for umbrella reviews, it was decided not to use the JBI instrument as the main tool, since the focus of this review is on evaluating the methodological quality and risk of bias of systematic reviews of observational and experimental studies, a scope in which AMSTAR 2 and ROBIS have a more consolidated recommendation. However, in accordance with the JBI Manual, the JBI checklist for systematic reviews will be applied in a complementary way, in order to verify the consistency of the methodological evaluation and ensure adherence to the principles and quality standards recommended by the JBI.

Both methodological quality and risk of bias will be assessed independently by two reviewers and, if there are discrepancies at this stage, these will be resolved by discussion and consensus or with the assistance of a third reviewer.

It will also be analyzed whether the reviews used the Grades of Recommendation, Assessment, Development and Evaluation (GRADE) system[32]. to classify the quality of evidence, when this information is available. The certainty of evidence for each risk factor will be extracted from the included systematic reviews when they assess the overall quality of evidence using the GRADE system. In these situations, the assigned classifications (high, moderate, low or very low) will be recorded and synthesized in a comparative way. In cases where the included reviews do not report assessment by GRADE, this information will be recorded as “not reported”. The authors of this review will not perform a retrospective application of GRADE, since such a procedure would require a detailed reassessment of the primary studies and would exceed the methodological scope of an umbrella review, according to the JBI Manual guidelines. The absence of GRADE classification will also be considered in the interpretation and discussion of the strength of the evidence available for each risk factor, being treated as a methodological limitation in the body of the synthesis.

The tool used by each systematic review to assess the risk of bias in primary studies will be recorded, including specific instruments for randomized clinical trials, such as the JBI critical appraisal tool for the assessment of risk of bias for randomized controlled trials or

Version 2 of the Cochrane risk of bias tool for randomized trials (RoB 2), as well as for observational studies, such as the JBI critical appraisal checklist for cohort studies or the Risk of Bias in Non-randomized Studies of Interventions (ROBINS-I).

Results

This umbrella review is expected to provide a comprehensive and critical synthesis of the available evidence on the main risk factors for the development of PIs in adults admitted to the ICU. The analysis of systematic reviews will allow the identification of intrinsic factors, such as age, comorbidities, nutritional status, and immobility, as well as extrinsic factors, such as prolonged use of invasive devices, mechanical pressure, skin moisture, and the quality of Nursing care, associated with increased risk and/or severity of PIs.

Additionally, it is expected to characterize the variability of these factors among different populations and care settings, contributing to the identification of more vulnerable groups and priority clinical scenarios for the implementation of specific preventive interventions.

It is also expected that the CCA calculation will allow for a systematic assessment of the overlap of primary studies among the systematic reviews included, ensuring greater methodological transparency and reducing the risk of inflated interpretations of the available evidence.

Whenever reported in the included reviews, a narrative summary of the level of certainty of evidence for each risk factor will be presented, as assessed by the original reviews (GRADE or equivalent frameworks). Potential adverse effects or unintended consequences related to the identified risk factors and/or associated care practices will also be considered.

Divergent results between reviews will be critically analyzed, considering methodological differences, the risk of bias, the characteristics of the populations evaluated, and the performance of subgroup analyses. This approach will allow us to identify and clarify gaps, uncertainties, limitations, and possible future directions for research on PI prevention in the ICU.

Final considerations

This protocol describes rigorous and transparent methods for conducting an umbrella review on risk factors for PIs in adult patients admitted to the ICU, in line with the JBI methodological recommendations for umbrella reviews.

The integrated assessment of methodological quality, risk of bias, certainty of reported evidence, and overlap among the included systematic reviews will contribute to greater interpretative robustness of the findings. It is emphasized that such assessments will not only be used descriptively but will constitute central elements in the critical analysis and discussion of the results, directly influencing the weight attributed to the evidence, the consistency of the conclusions, and the formulation of recommendations.

It is expected that the results of this review will contribute to strengthening knowledge in the area of managing risk factors for PI prevention in critically ill patients, to support clinical decisions, support institutional planning of prevention strategies, and guide research priorities, with a positive impact on the safety and quality of care provided to critically ill patients.

Authors contributions

Study conception: Larissa Cassiano Bernardo, Bruna Cristina Velozo, Meire Cristina Novelli e Castro, Luciana Patrícia Fernandes Abbade. **Manuscript writing:** Larissa Cassiano Bernardo, Bruna Cristina Velozo, Meire Cristina Novelli e Castro, Susana Maria da Silva Gaspar, Luciana Patrícia Fernandes Abbade. **Critical revision of the manuscript:** Larissa Cassiano Bernardo, Bruna Cristina Velozo, Meire Cristina Novelli e Castro, Susana Maria da Silva Gaspar, Luciana Patrícia Fernandes Abbade. **Approval of the final version of the text:** Larissa Cassiano Bernardo, Bruna Cristina Velozo, Meire Cristina Novelli e Castro, Susana Maria da Silva Gaspar, Luciana Patrícia Fernandes Abbade.

Conflict of interest

The authors declared that there are no conflicts of interest.

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