

## **MEDICAL-DEVICE-RELATED PRESSURE INJURY ON ADULTS: AN INTEGRATIVE REVIEW**

Euni de Oliveira Cavalcanti<sup>1</sup>   
Ivone Kamada<sup>1</sup> 

<sup>1</sup>Universidade de Brasília, Programa de Pós-Graduação em Enfermagem. Brasília, Distrito Federal, Brasil.

### **ABSTRACT**

**Objective:** to identify factors associated with medical-device-related pressure injury.

**Method:** an integrative review of published articles on the subject related to the adult population in the databases of PUBMED, Scopus, MEDLINE, Latin American and Caribbean Health Sciences Literature (*Literatura Latino-Americana e do Caribe em Ciências da Saúde*, LILACS), Web of Science and Nursing Database (*Banco de Dados em Enfermagem*, BDENF), between 2013 and 2018.

**Results:** medical-device-related pressure injuries were common in adults, especially in the elderly, due to capillary fragility, among other changes. Other observed factors were length of stay, critically ill patients or those requiring any type of medical device. Numerous medical devices have been associated with skin lesions; among the most frequent were breathing, feeding, and orthopedic devices, tubes, oximeters, neck collars, patches and nasogastric tubes.

**Conclusion:** the first step towards prevention is exploration in terms of identifying the types of injury-causing devices and evidence-based interventions, and disseminating information to the entire multidisciplinary team.

**DESCRIPTORS:** Pressure injury. Pressure ulcer. Medical-device-related pressure ulcer. Equipments and supplies. Adult.

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# LESÃO POR PRESSÃO RELACIONADA A DISPOSITIVO MÉDICO EM ADULTOS: REVISÃO INTEGRATIVA

## RESUMO

**Objetivo:** identificar fatores associados à lesão por pressão relacionada a dispositivo médico.

**Método:** revisão integrativa de artigos publicados sobre o tema relacionado à população adulta nas bases de dados da PUBMED, Scopus, MEDLINE, Literatura Latino-Americana e do Caribe em Ciências da Saúde (LILACS), Web of Science e Banco de Dados em Enfermagem (BDENF), entre 2013 e 2018.

**Resultados:** lesões por pressão relacionadas a dispositivo médico foram comuns em adultos, principalmente em idosos, devido à fragilidade capilar, entre outras alterações. Outros fatores observados foram tempo de permanência, pacientes críticos ou que necessitassem de qualquer tipo de dispositivo médico. Inúmeros dispositivos médicos foram associados às lesões de pele; entre os mais frequentes estiveram dispositivos respiratórios, de alimentação, ortopédicos, tubos, oxímetros, colares cervicais, adesivos e sondas nasogástricas.

**Conclusão:** o primeiro passo para a prevenção é a exploração, em termos de identificação dos tipos de dispositivos que causam a lesão e intervenções baseadas em evidências científicas, além da divulgação das informações para toda a equipe multiprofissional.

**DESCRITORES:** Lesão por pressão. Úlcera por pressão. Lesão por pressão relacionada a dispositivo médico. Equipamentos e provisões. Adulto.

# LESIÓN POR PRESIÓN RELACIONADA A DISPOSITIVOS MÉDICOS EN ADULTOS: UNA REVISIÓN INTEGRADORA

## RESUMEN

**Objetivo:** identificar factores asociados con las lesiones por presión relacionadas a dispositivos médicos.

**Método:** revisión integradora de artículos publicados sobre el tema relacionado a la población adultas en las siguientes bases de datos: PUBMED, Scopus, MEDLINE, *Literatura Latino-Americana e do Caribe em Ciências da Saúde* (LILACS), *Web of Science* y *Banco de Dados em Enfermagem* (BDENF), entre 2013 y 2018.

**Resultados:** las lesiones por presión relacionadas con dispositivos médicos fueron comunes en adultos, principalmente en ancianos, debido a la fragilidad capilar, entre otras alteraciones. También se observaron otros factores como tiempo de permanencia, pacientes críticos o que necesitaban cualquier tipo de dispositivo médico. Se asoció un sinnúmero de dispositivos médicos a las lesiones de piel; entre los más frecuentes se pueden mencionar los dispositivos respiratorios, de alimentación y ortopédicos, los tubos, los oxímetros, los collares cervicales, los adhesivos y las sondas nasogástricas.

**Conclusión:** el primer paso para la prevención es la exploración, en términos de identificar los tipos de dispositivos que causan la lesión y las intervenciones basadas en evidencias científicas, además de divulgar la información a todo el equipo multiprofesional.

**DESCRITORES:** Lesión por presión. Úlcera por presión. Lesión por presión relacionada con un dispositivo médico. Equipamientos y suministros. Adulto.

## INTRODUCTION

Pressure Injuries (PIs), as well as wounds, have become a major public health problem as an important morbidity and mortality cause, in addition to the major impact on the health of patients, families and society. Even with technological developments and improved prevention techniques, there is still an increase in the prevalence of cases, which encourages research and a deeper investigation of this event, and translates as a quality indicator in the care provided, involving both the interventions incorporated in the treatment, as in the prevention of new cases.<sup>1</sup>

The literature describes a PI as an injury to the skin or underlying tissue, involving mainly bone prominence spots resulting from pressure associated with frictional or shear forces. It is classified into six categories according to its evolution, affected tissue and depth, in addition to categories called non-gradable and suspected deep tissue injury.<sup>2-3</sup>

The *National Pressure Ulcer Advisory Panel* (NPUAP) has recently refined the definition of the test system for PI, including Medical-Device-Related PIs (MDRPIs). MDRPI was defined as resulting from the use of devices designed and applied for diagnostic or therapeutic purposes. The resulting PI conforms to the device's pattern or shape.<sup>4</sup>

Since patients admitted to intensive care are more prone to PI due to hemodynamic instability, changes in blood circulation, use of vasoactive drugs (which alter skin integrity through peripheral vasoconstriction), among other factors, PIs have been tracked for decades on sacral and heels region, but the incidence or the acquired rates resulting from medical devices are not yet widely reported. However, many institutions have reduced the number of traditional PIs (sacral, buttocks and calcaneus). Thus, the increase in device-related injuries was noticed.<sup>5</sup>

These PIs developed in Intensive Care Units (ICUs) may also be related to the fact that the professionals pay more attention to the patient's pathologies and care with other organs than to the skin. However, it is observed that the patients recover from their illnesses, but some will have to live with the injuries resulting in the hospitalization period, for months or years. Thus, it is essential that the professional assumes his responsibility when the patient develops lesions, observing possible failures occurred in the care provided, aiming at improving the quality of care.<sup>6</sup>

A study conducted in the United States with 104,266 patients on the prevalence of PIs showed a 19.9% MDRPI rate, while 14.3% were PIs in the sacral region, 10.2% in the calcaneus and 8.8% in the buttocks. In this study, the devices that correlated with the lesion were not described.<sup>7</sup>

The patients with higher risks of MDRPI generation are those with impaired sensory perception, such as neuropathy and communication deficit (oral intubation, language barriers, unconsciousness or nonverbal state).<sup>8</sup> Therefore, the evaluation and prevention of the PIs are paramount, so that professionals use the systematization of care by means of scales, as a reference to the Braden scale, which is scientifically based on the pathophysiology that involves PI development, allowing the evaluation of aspects inherent to the process of injury generation, addressing six parameters: sensory perception, moisture, mobility and activity, nutrition, friction and shear.<sup>9</sup>

As the term "medical-device-related pressure injury" was included in the new NPUAP guidelines in 2016, research should contribute scientifically to knowledge of the topic and its exploration in the field of nursing and related fields, which provide direct or indirect assistance to ICU patients. PI indicators reveal important points about the provided quality of care.

Thus, this paper purpose was to identify associated factors with MDRPI in the adult population.

## METHOD

This is an integrative review, developed in six stages: theme identification and elaboration of the guiding question, sampling (definition of inclusion and exclusion criteria), categorization of the studies (definition of the data to be extracted from the selected studies), evaluation of the studies (critical analysis of the selected studies), results interpretation (discussion of the main results) and review/synthesis of knowledge presentation.<sup>10</sup>

For the development of the guiding question and for the definition of the research problem, the PICO method (P: population; I: intervention; C: control or comparison; and O: outcome), which is based on the construction of research questions of a diverse nature, enabling the formulation of a research question that has validity and applicability, based on evidence, to solve current clinical questions.<sup>11</sup>

The theme developed was MDRPIs in adults. The guiding questions of the interviews were the following: What does the literature present about MDRPIs in adults? What research is needed to explain the phenomena of MDRPIs in adults? Thus, P corresponded to adults, I to MDRPI, C to hospital environment and O to publications in the literature on the subject.

Articles were searched through the Central Library system of the University of Brasilia and the CAPES Journal Portal, which provides access to the main national and international databases in various areas. To select the articles, the following databases were used: PUBMED, Scopus, MEDLINE, Latin American and Caribbean Health Sciences Literature (LILACS), Web of Science and Nursing Database (BDENF).

To search the selected articles, the descriptors with the following Boolean operators “*Pressure injury*” OR “*pressure ulcer*” AND “*medical device*” AND “*adult*” were used, which are contained in the Health Sciences Descriptors (*Descritores em Ciências da Saúde*, DeCS) and in the *Medical Subject Headings* (MeSH).

The inclusion criteria were indexed articles published in the last 5 years (between January 2013 and July 2018), due to the consensus on theme updates being released in 2016; and in all languages, and articles related to the guiding question.

The extracted data from the studies after pre-screening, by reading the title and summary of each article, were author/year, title, design and country/language. Thematic synthesis was performed, which contained information about the purpose, population and place of the study, and pertinent result for our research.

The procedures related to the search, selection and analysis of the articles were performed almost entirely by two examiners. When necessary, a third examiner was introduced to the investigation to solve cases of disagreement regarding the selection of the studies.

To evaluate the articles' methodological quality, the classification was used of scientific papers based on the design used in the generation of evidence<sup>12</sup> as observed in Chart 1.

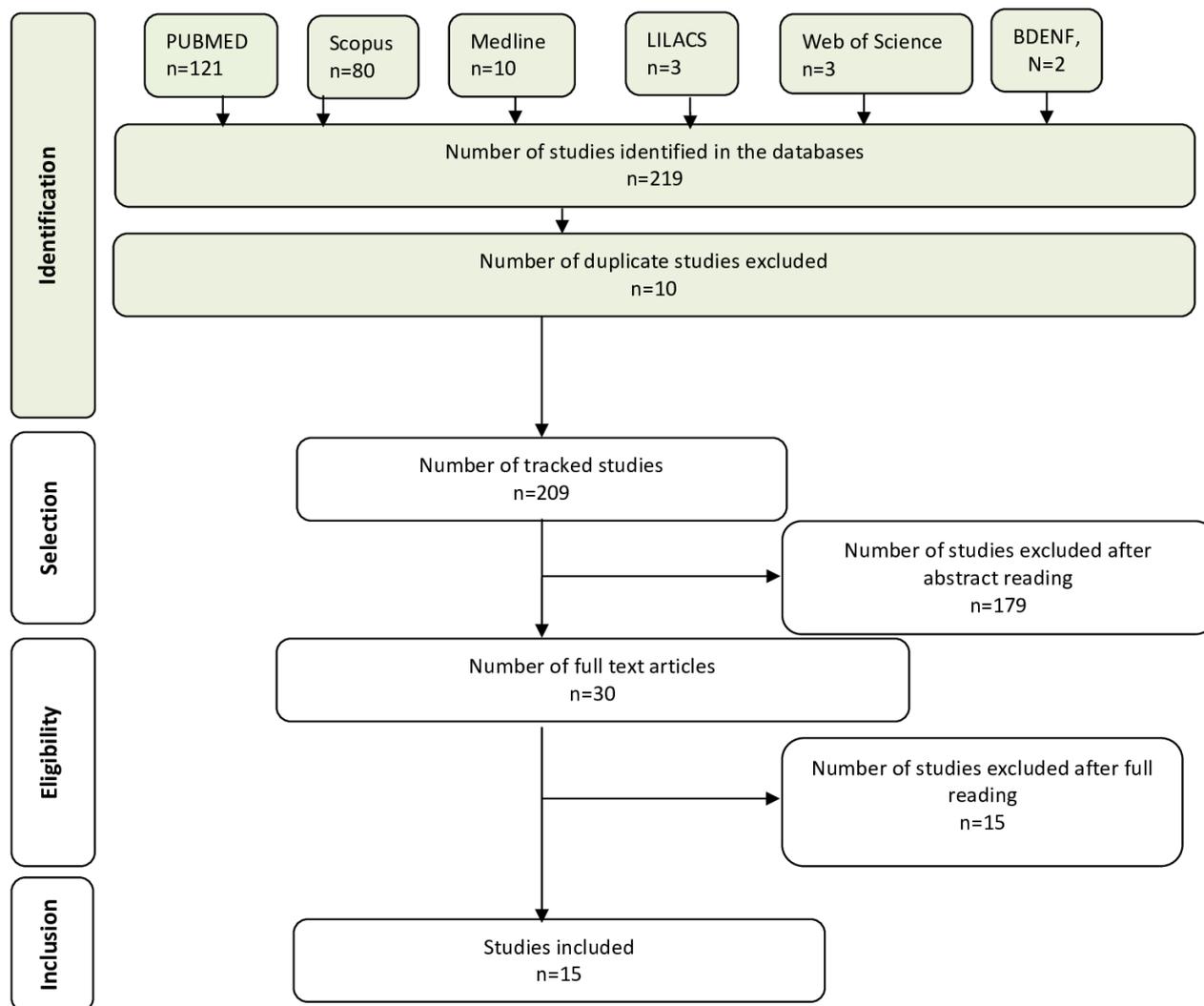
**Chart 1** – Hierarchy of evidence. Brasília, DF, Brazil, 2018.

Level	Description
I	Evidence from systematic review or meta-analysis of all relevant randomized controlled trials or from clinical guidelines based on systematic reviews of randomized controlled trials
II.	Evidence from at least one well-designed randomized controlled trial
III.	Evidence from well-designed clinical trials without randomization
IV.	Evidence from well-designed cohort and case-control studies
V	Evidence from systematic review of descriptive and qualitative studies
VI.	Evidence derived from a single descriptive or qualitative study
VII	Evidence from expert opinion and/or expert committee report

Subsequent to the completion of these phases, the studies were evaluated, interpreted and synthesized. The results are presented descriptively and by flowcharts and tables to capture evidence on MDRPI in adults.

## RESULTS

After searching the databases, 219 articles were retrieved. Of these, 15 articles remained, selected by manual search and evaluation of the exclusion criteria, according to the stages described in Figure 1. The results are presented in Chart 2.



**Figure 1** - Selection of the articles for integrative review. Brasília, DF, Brazil, 2018.

**Chart 2 – Articles Summary. Brasília, DF, Brazil, 2018.**

Authors	Country	NE	Sample	Number/etiology	Results
Kayser et al., <sup>13</sup>	Canada	V	99,876 ICU patients, long-term care, rehabilitation, long-term acute care hospitals and palliative care centers.	Prevalence of 601 injuries. Nasal oxygen tubes, splints, non-invasive ventilation, positive pressure masks	Medical-device-related pressure injuries occur in the face and head region, specifically the ears. Efforts should be ongoing for assessment and prevention in critically ill patients who require these devices.
Zhao et al., <sup>14</sup>	China	V	697 patients, four tertiary hospitals (three general and one cancer hospital).	137 fixing stickers.	The prevalence and the risk factors associated with medical-device-related pressure injuries caused by the skin patch used to fix the peripheral insertion central catheter provided epidemiology and identification of the high-risk population, as well as improved care and patient safety.
Arnold-Long et al., <sup>15</sup>	United States	VI.	304 patients in three long-term acute care hospitals.	142 breathing devices, splints, straps and tubes.	Injuries caused by devices were discharged from long-term inpatients.
Otero et al., <sup>16</sup>	Spain	II.	152 patients, hospital emergency department.	74 caused by non-invasive ventilation, nasal mask.	The incidence of facial injury was significantly lower in the group receiving hyper oxygenated fatty acid solution when compared with direct mask, thin patch and foam patch.
Barakat-Johnson et al., <sup>17</sup>	Australia	VI.	179 patients, tertiary referral hospital with acute, subacute care and ICU.	50, 34 of them in intensive care/with endotracheal tube, CPAP (Continuous Positive Airway Pressure) and nasal parts, nasogastric probe, pulse oximeter	The most common sites are in the ear due to the endotracheal tube in intensive care unit patients. Additional support, education and monitoring are required for nurses to prevent injury.
Coyer et al., <sup>18</sup>	United States	IV.	483 patients, six intensive care units in Australia and the United States.	20 injuries were followed-up for seven days continuously. Endotracheal devices and nasogastric tube	They were identified in overweight white men, low risk of organ failure and long stay in the intensive care unit.
Asti et al., <sup>19</sup>	Italy	IV.	2,131 patients who underwent surgery.	102 nasogastric probes	Secondary injuries due to the nasogastric probe in surgical patients, which can cause irreversible sequelae in the patient's nasal wing.

**Chart 2 – Cont.**

Authors	Country	NE	Sample	Number/etiology	Results
Ambutas et al., <sup>20</sup>	United States	III.	205 patients in the operating room and hospitalization.	5 injuries using a nasogastric probe-specific fixative and 19 lesions with a conventional fixative	Comparison between the use of 2 nasogastric probe fixatives, in which the evaluation of the underlying skin and nursing intervention are fundamental for the recognition of a potential injury.
Schallom et al., <sup>21</sup>	United States	IV.	Two groups of 100 patients who used the nasal-oral mask or the face mask in five ICUs.	20 pressure injuries in the nasal-oral mask group and two in the face mask group	The facemask resulted in a smaller number of pressure injuries and was more comfortable for patients, being a good alternative for non-invasive ventilation.
O'Toole et al., <sup>22</sup>	United States	III.	155 patients for tracheostomy protection protocol intervention and 183 pre-intervention patients for comparison.	20 pre-intervention injuries and two post-intervention injuries. Tracheostomy	The adoption of the preventive care package resulted in a significant reduction in the incidence of the pressure injury related to hospital tracheostomy
Glasgow et al., <sup>23</sup>	United Kingdom	VII	One patient, clinical case report after extensive cardiac surgery.	One injury due to tube fixation at the cervical posterior, stage 4	Injuries are reported in nursing journals, but rarely in medical journals, so multidisciplinary care is important for injury prevention and for reducing patient stay length.
Ham et al., <sup>24</sup>	Netherlands	IV.	254 patients at the trauma center.	88 cervical collars and immobilizers, urinary tubes, endotracheal tube and nasogastric probe	16 different spots with medical-device-related pressure injuries found; in trauma patients, it is very high
Ham et al., <sup>25</sup>	England	V	88 patients, trauma and surgical ICU.	One injury, stage 4, in the occipital region, resulting from the use of cervical collar	In this study, the incidence of pressure injury due to the cervical collar was low, but prevention for this device cannot be ruled out. Further research studies should be conducted to obtain data for future effective interventions
Padula et al., <sup>26</sup>	Iceland	III.	130 patients in ICU.	Five injuries in the study intervention period, 12 months	With incorporation of multiple interventions, including health education, interdisciplinary follow-up and analysis of the main causes for subsequent intervention, are factors that reduce the incidence of medical-device-related pressure injury in the intensive care unit.
Monarca et al., <sup>27</sup>	United States	III.	250 patients, project intervention for 12 months for prevention of PI due to GNS. Midsize Hospital	42 injuries before the intervention and 33 injuries after the project.	Health education, development of a scientific evidence-based preventive intervention package, documentation and tracking of pressure injuries combination has resulted in reduced cases

The research studies related to the topic focused abroad. Of the 15 articles included in this review, several Levels of Evidence were found, as observed in (Chart 3).

**Chart 3** – Levels of evidence found in the articles included in the review. Brasília, DF, Brazil, 2018.

Level I	Level II	Level III	Level IV	Level V	Level VI	Level VII
0	One randomized clinical trial	Three well-designed clinical trials without randomization	Four prospective cohort studies	Three systematic review of descriptive studies	Two descriptive studies	A case report study

## DISCUSSION

Studies show that the MDRPIs are common in adults, especially in the elderly, in which capillary fragility, among other changes, influences the development of skin lesions. Other observed factors include length of stay, critically ill patients or those requiring any type of medical device are more susceptible. Numerous medical devices have been associated with skin lesions, especially respiratory, feeding, and orthopedic ones, tubes, oximeters, neck collars, patches and nasogastric probes.

A study from retrospective data available from the *International Pressure Ulcer Prevalence*, created in 1989 to conduct the Pressure Injury Prevalence Survey, included 102,865 adult patients; 99,876 had complete data and were the focus of the analysis. The overall prevalence of PI was 7.2% (n=7,189) and that of MDRPI was 0.60% (n=601); 58% were in stages 1 or 2 (superficial) and 22% in stages 3 and 4, or were unclassifiable. The most common anatomical locations were the ears (29%) and the feet (12%). The most common devices associated were nasal oxygen tubes (26%), other (19%), splints (12%), and continuous positive pressure/two-level positive pressure masks (9%).<sup>13</sup>

These epidemiological data are essential indicators of the quality of the care provided and are used as a tool for evaluating and proposing new strategies and protocols for their prevention.<sup>28</sup>

Another important issue is the differentiation between PI and MDRPI. PI is more related to immobility, localization and bony prominences; MDRPI, on the other hand, often mirrors the device location. Thus, it is crucial that the nursing practice includes prevention to reduce the risk of the patient developing these injuries by focusing on evidence-based practices.<sup>29</sup>

PI also differs from MDRPI in that the devices are well adhered to the fixation location, and make it difficult to observe the underlying skin. This long-term contact with skin and mucous membranes is a risk factor for lesion generation. At the time of care, the professionals should carefully observe the place and make changes of fixation, leaving the place always dry and free of dirt.<sup>14</sup>

In a retrospective descriptive study at three long-term care facility units, which examined 304 adult patients in the United States, 142 MDRPIs were observed, totaling 47%, and stage 2 had 58 cases (51%). The most frequently associated devices were respiratory (endotracheal tube, continuous positive airway pressure and positive airway pressure at two levels), splints or support and tubes. The most common location was the ear, which is thinly covered with cartilage and develop wounds quickly.<sup>15</sup>

Thus, medical devices cannot be considered harmless in contributing to the development of a PI, especially a full thickness injury. Although medical and fixation devices are required, the nursing team should dispense their care, based on scientific evidence, to prevent such injuries, taking care to observe the proper fit, the effective need for the device, and the safety of medical devices as well as the appropriate implementation of prevention strategies.<sup>30</sup>

Regarding critically ill patients, an increased risk of lesion formation due to poor tissue perfusion caused by vasoactive drugs was observed in the group of patients receiving vasoactive drugs (54.8%) when compared to people who did not receive (47.5%). The incidence of two or more MDRPIs the same patient was 15.2% in the vasoactive drug group, and 12.7% in the non-drug patients.<sup>16</sup>

In addition, the lack of movement, inherent to the use of sedatives or inability to reposition, is visualized in critically ill patients, being important the constant inspection of the skin. In a study conducted with 179 patients, 21 cases of ear injuries resulting from endotracheal tube fixation were observed. The nurses reported that the fixation behind the ear was not an area they routinely inspected.<sup>17</sup>

Importantly, the number of devices present in the patients also increases the risk of injury. Patients who developed the lesions had a mean of six to eight devices installed. This number of devices is observed in critically ill patients. The most aggressive devices were the endotracheal tube and the nasogastric probe.<sup>18</sup>

In the critical patient context, with the use of multiple medical devices, use of vasoactive and sedative drugs, which influence the increased risk for the generation of MDRPIs and other injuries, it is worth highlighting the need for an interdisciplinary approach to establish shared responsibility for care, awareness of emerging problems and to promote quality-based care.<sup>31</sup>

A study conducted in Italy shows a prevalence of 4.8% of lesions in the nostrils. The pressure in the nostril due to the tube and its fixation causes severe tissue damage and evolution to necrosis, especially in patients with prolonged anesthetic duration.<sup>19</sup>

A non-randomized descriptive study compared the incidence of MDRPI with the use of conventional fixation (23% of cases) and a new type of more anatomically shaped adhesive (4% of cases) in the nostril. There was a significant decrease in lesions with the use of the anatomical fixator between the conventional fixator. The authors emphasize the need for evaluation and intervention of the nursing team for the recognition and prevention of injuries.<sup>20</sup>

The use of non-invasive mechanical ventilation is also observed in ICU patients, in a randomized clinical trial of 152 patients using NIV showed that 74 developed 87 MDRPIs at the nasal bridge, face, and chin. The incidence of injuries was 44% with the use of unprotected mask, 57% with protection of thin patch adhesive, 72% with foam patch adhesive and 23% with hyper oxygenated fatty acid. Thus, the protective factor of the use of hyper oxygenated fatty acid is observed.<sup>16</sup>

Emphasis is placed on the need for the interdisciplinary team to conduct patient assessment, including a review of all the devices used on the patient, appropriate skin protection, and treatment plan addressing the management of medical devices that may cause MDRPI.<sup>32</sup>

A comparative study on the use of nasal-oral mask and full-face mask revealed that the time to develop the lesions ranged from 1.25 to 74 hours on average after using the device. Facial masks are a reasonable alternative, compared to traditional nasal-oral masks, to decrease MDRPI cases due to their larger surface area for pressure distribution.<sup>21</sup>

Another device that comes as a risk factor for the development of injuries is tracheostomy. An incidence of MDRPI of 10.95% (n=20) was observed in 183 tracheostomy patients. Already after implantation of the protocol of hydrocolloid placement as protection, the incidence was 1.29% (n=2) in the group of 155 patients. The number of injuries decreased after the protocol was installed, which included hydrocolloid placement under the tracheostomy flange in the postoperative period, suture removal within seven days of the tracheostomy procedure, placement of a polyurethane foam dressing after suture removal and neutral head positioning.<sup>22</sup>

Stay length in the ICU makes the patient more susceptible to new infections and various adverse events. The mean length of hospital stay was longer in patients with MDRPI (28 to 59 days) vs. those without injury (22 to 35 days). In the specific case of stage 4 injuries, the patient was discharged with a longer hospitalization time of ten days or more.<sup>22,24</sup>

In cases of critically ill patients resulting from trauma, MDRPI is developed during the first days of hospitalization, with a rate of 87.5%. The explanation for the early onset is based on risk factors such as severity of the underlying disease, surgical interventions, malnutrition, ICU admission and pre-hospital immobilization.<sup>24</sup>

Some risk factors were found in a study conducted with 149 patients admitted to the ICU for trauma. At admission, 92% of the patients were at risk for developing PI. According to the Braden scale (score 18), 12.5% had scores indicating high-to-high risk for PI. 25% of the trauma patients were overweight (body mass index > 27). The severity score was high and the loss of consciousness level according to the Glasgow Coma scale was <8 in 22.7% of the patients.<sup>24</sup>

The Braden scale has been used to assess the risk of developing injuries. Another scale used for PI is Norton's, which classifies as high risk the patient who has evident immobility, neural and endothelial control of blood flow impaired by the diseases, making him/her more susceptible to ischemic tissue damage, and the use of a large number of medical devices for therapeutic and monitoring purposes. It is necessary to use more specific or jointly used tools to assess MDRPI risk factors.<sup>16,18,26</sup>

Another factor of vulnerability is age. The elderly, due to capillary fragility, have decreased collagen, elastin and perfusion, in addition to altered immune response, which reduces the healing capacity. Thus, the nurse should be aware of the use of adhesives as a dressing for central catheter devices, so that the material favors the observation of the underlying skin and does not increase the pressure and friction that the device already causes.<sup>12,25</sup>

It is important to emphasize the purpose and function of the medical device, and whether it is being used following the manufacturer's rules, as well as checking the size of the device - if it is appropriate for the patient - and if it is properly fixed to avoid unnecessary skin friction and excessive pressure on the underlying tissues. The next step is skin protection and spot surveillance every 4-6 hours, rotating the fixation places if possible. In the case of non-invasive ventilation, it is important to evaluate the skin every 12 hours for early identification of skin changes.<sup>16,21</sup>

An intervention project on quality improvement and decreased incidence of MDRPI found that the combination of education, development of a preventive intervention package based on evidence of scientific evidence, improved documentation and tracking of these injuries resulted in a reduction in the entire installation of injuries in the 12-month study period.<sup>27</sup>

Thus, it is possible to observe that there are several risk factors associated with injuries. Skin inspection, device repositioning and knowledge of the entire multidisciplinary team, since the generation and the triggering factors, are important premises to promote focused and quality care.

There are few publications based on data specifically related to MDRPI. Thus, this study constitutes an important step in Brazilian information and systematic investigation.

As usual in any integrative review research, limitations may arise, such as references that may have been overlooked if they were in other databases that were not included. MDRPI is a relatively new phenomenon in key terms, which can interfere with the complete capture of all available literature within a five-year time frame.

## CONCLUSION

The articles analyzed portrayed the use of multiple medical devices in the care of critically ill hospitalized patients or in acute long-term care. Nevertheless, there are several risk factors for the development of medical-device-related pressure injuries, which include severity of the patient, length of stay, humidity, skin friction, age, and use of vasoactive drugs and sedatives, among others. In addition, the use of risk prediction scales, such as Braden's, is effective even if they are not unique to medical-device-related pressure injuries.

The articles reflect that simply placing a medical device is already the starting point for the formation of pressure injuries related to the device. The materials, most of which have a rigid and non-malleable structure, are risk factors for predisposition. Thus, the first step towards prevention should be exploration in terms of identifying the types of devices that cause injury and evidence-based interventions, and disseminating information to the entire multidisciplinary team.

Given the large number of cases based on the international articles, practice-based studies are important, especially in Brazil. There are still gaps in the knowledge of the professionals, requiring constant updating, for the empowerment of theoretical knowledge and the best association with practice.

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## NOTES

### CONTRIBUTION OF AUTHORITY

Conception of the study: Cavalcanti EO.

Data collection: Cavalcanti EO.

Analysis and interpretation of data: Cavalcanti EO.

Discussion of the results: Cavalcanti EO.

Writing and/or critical review of content: Kamada I.

Review and final approval of the final version: Kamada I.

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### CONFLICT OF INTEREST

There is no conflict of interest.

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### CORRESPONDENCE AUTHOR

Euni de Oliveira Cavalcanti

euni.cavalcanti@hotmail.com