

Skin lesions associated with invasive devices in highly complex neonatal and pediatric patients

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Abstract

The skin is the largest organ of the human body. It has three layers: epidermis, dermis and hypodermis. The epidermis performs multiple functions in the body, standing out as a defensive barrier and internal integrity in addition to containing the evasion of moisture, and exogenous substances. Injury is by definition any interruption in the continuity of the skin regardless of its extent and may be chronic or acute. A newborn's skin is delicate and vulnerable, and the use of invasive devices in highly complex care can negatively affect its integrity. This review study addressed data from Brazilian research on newborn skin in intensive hospital treatment units. The studies evaluated were obtained from the SciELO, Medline and Lilacs, Google Scholar and Elsevier databases. The inclusion criteria were articles, monographs, dissertations and theses published in the period between 2018 and 2023, in Portuguese with a pre-established theme, and the exclusion criteria were articles, monographs, dissertations and repeated theses, incomplete manuscripts and with unauthorized access free of charge. As results, 3 categories were obtained: Category 1 – Main causes of skin lesions in newborns and highly complex children. Category 2- Prevention measures in newborns and highly complex children with skin lesions. Category 3- Highly complex skin care strategies for newborns and children. It is evident that due to the high susceptibility of newborns and children to develop highly complex skin lesions, it requires greater attention from the nursing team. Early detection of the risk of skin lesions and the use of prophylaxis enable a better quality of life for newborns hospitalized in high complexity, avoiding and minimizing skin lesions caused by the care provided.

Keywords: nursing care, nursing diagnosis, emergencies, intensive care unit, neonatal, lesion.

Lesões de pele associados a dispositivos invasivos em pacientes neonatos e pediátricos em alta complexidade

Resumo

A pele é o maior órgão do corpo humano. Ela possui três camadas: epiderme, derme e hipoderme. A epiderme exerce múltiplas atribuições no organismo, destacando-se como barreira defensiva e da integridade interna além de conter a evasão de umidade e de exógenos. A lesão é por definição, qualquer interrupção na continuidade da pele independente da extensão, podendo ser crônica ou aguda. A pele do neonato é delicada e vulnerável, e o uso de dispositivos invasivos no cuidado de alta complexidade pode afetar negativamente sua integridade. Este

estudo de revisão, abordou dados de pesquisas brasileiras sobre a pele do neonato em unidade intensiva de tratamento hospitalar. Os estudos avaliados foram obtidos das bases de dados SciELO, Medline e Lilacs, Google Acadêmico e Elsevier. Os critérios de inclusão foram artigos, monografias, dissertações e teses publicadas no período entre 2018 e 2023, em idioma Português com a temática pré-estabelecida, e os critérios de exclusão foram, artigos, monografias, dissertações e teses repetidas, manuscritos incompletos e com acesso não autorizado de forma gratuita. Como resultados foram obtidos 3 categorias: Categoria 1 – Principais causas de lesões de pele em recém-nascidos e crianças em alta complexidade. Categoria 2- Medidas de prevenção em recém-nascidos e crianças em alta complexidade com lesões de pele. Categoria 3- Estratégias de cuidado com a pele de recém-nascidos e crianças em alta complexidade. Ficando evidenciado que devido a alta suscetibilidade em neonatos e crianças desenvolverem lesões de alta complexidade na pele, requer maior atenção da equipe de enfermagem. A detecção precoce dos riscos de lesões de pele e o emprego de profilaxias possibilitam maior qualidade de vida aos neonatos internados em alta complexidade, evitando e minimizando lesões cutâneas ocasionadas pela assistência prestada.

Palavras-chave: cuidados de enfermagem, diagnóstico de enfermagem, emergências, unidade de terapia intensiva, neonatal, lesão.

1. Introduction

The skin is the largest organ in the human body and represents about 16% of the total mass. Its main function is to protect the internal parts of the body from the external environment. This organ has three layers: epidermis, dermis and hypodermis (or subcutaneous tissue). The outermost part of the skin is called the epidermis and has no blood vessels. Its thickness varies from 75 to 150 micrometers, being thicker between 0.4 and 0.6 mm on the palms of the hands and soles of the feet. The epidermis is made up of flat cells stacked on top of each other, organized into different layers: germinal or basal, spinous, granular, lucid and horny, when viewed from the inside out (Bernardo et al., 2019; Walker, 2022; Quan, 2023).

The epidermis performs multiple functions in the body, standing out primarily as a defensive barrier, on internal integrity against the influences of exogenous agents, in addition to containing the evasion of moisture and other essential substances. In newborns, the dermis appears thin and has a gelatinous texture, resulting from its incomplete maturation. Added to this is the immaturity of other systems, notably the immune system, which predisposes the newborn to susceptibility to the development of infectious processes (Cunha et al., 2021; Kaya; Zengin, 2023).

A particularity of newborns lies in the coverage of their epidermis with a fatty, milky substance called vernix caseosa. This substance facilitates transit through the vaginal canal, while providing lubrication and hydration to the epidermis, regulating thermal balance and pH. This substance serves as a defensive barrier against bacterial infections (Monteagudo et al., 2011; Cunha et al., 2021).

The injury is, by definition, the rupture of the protective barrier, being explained by any interruption in the continuity of the skin regardless of the extent. It may result from harmful actions acting on an organ or living tissue, causing deviations in its functions or due to physical injuries, or even trauma. The injury can be classified as acute or chronic, the primary distinctions between chronic and acute injuries are delineated through temporal duration and provenance/causality (Diniz et al., 2021; Trompette; Ubags, 2023).

The newborn's skin qualifies as excellent in its delicacy and vulnerability. When combining these particularities with the incipient maturity of organic systems and the need to use invasive devices, inherent to the preservation of existence in this community, we are faced with a scenario where the propensity for worsening skin damage increases substantially (Machado et al., 2022; Bişgin et al., 2022).

Although neonatal care has reached a more refined level due to technological progress, dermal injuries persist due to iatrogenic repercussions. Many of these occurrences emanate from the use of medical devices such as heart monitors, pulse oximeters and phototherapy, among others. Where they can cause damage to skin integrity. The outbreak of such injuries can occur in all age groups but tends to be more prevalent at the extremes of the age curve, regardless of the current health status (Ahmadizadeh et al., 2022; Machado et al., 2022).

Newborns who require hospitalization especially in long-term settings are subjected to an excess of invasive procedures, ranging from heel punctures to assess capillary blood glucose to intubations and central venous access procedures. These interventions cause a sensation of intense pain and can cause neurological changes especially in premature cases (Mendonça et al., 2022; Coppo et al., 2023).

Hospitalization in the Pediatric Intensive Care Unit (PICU) introduces a range of intricate subtleties for both the

child and the family circle, causing profound changes in domestic dynamics. Contemplating a loved one immersed in an environment intended for critical patients in the early stages of life, connected to various invasive devices, subject to incessant manipulations, evokes a complexity of feelings, encompassing doubts, distress and fears about mortality, given the uncertainty that surrounds the evolution of cases (Pereira et al., 2020; Freedman et al., 2023).

The nurse has a fundamental role in highly complex care for neonatal patients. The Systematization of Nursing Care (SNCA) is essential for an effective care plan. The SNCA perpetuates its commitment to offering support for the provision of care culminating in auspicious achievements corroborated by scientific bases. This function assumes an essential nature as it facilitates the professional nurse to carry out, a comprehensive approach to the particular needs regarding the care of the newborn and their family members (Prazeres et al., 2021; Alvarez et al., 2024).

The primary theme faced by nursing professionals working in the Neonatal PICU encompasses the implementation of measures designed to establish dignified prerogatives so that there is a holistic approach in relation to the health of the newborn, with the nurse being responsible for providing efficient and empathetic care, ensuring excellence treatment, while promoting and endorsing care with invasive devices, guaranteeing the newborn's quality of life (Prazeres et al., 2021; Barr, 2023).

In order to guarantee quality in nursing processes, the Federal Nursing Council of Brazil (COFEN) implemented resolution 272/2002 (Decree Law 94.406/1987 and Law 7498), with excellent support for raising awareness among nursing professionals and healthcare staff. The SNCA an exclusive prerogative of the professional nurse which adopts a method and approach of scientific work for the delimitation of health and illness contexts, providing a basis for carrying out nursing interventions that can contribute to the promotion, prevention, restoration and rehabilitation of health of individuals, families and communities (Cofen, 2002; Seltzer; Thompson, 2024).

The institutionalization of SNCA as a practice inserted in a labor process aligned with the demands of the community, is a care paradigm to be implemented in all spheres of health care by nurses as described by Cofen (2002). In order to make the process even more effective, resolution 272/2002 was revoked and resolution 358/2009 was established, considering the progression of paradigms concerning Nursing Consultation and the Systematization of Nursing Care; due to the SNCA conceiving structuring of professional activity in methodological and individual terms, encompassing tools making the carrying out of the Nursing procedure feasible (Oliveira et al., 2012).

In this way, it establishes guidelines on the Systematization of Nursing Care and the Nursing Process in areas, public or private, in which professional Nursing care is provided. It also includes other provisions inherent to Law 358/2009. The Federal Nursing Council (COFEN), in full exercise of its legal prerogatives, conferred by Law No. 5,905, dated July 12, 1973, and in accordance with the Regulations of the aforementioned Entity, duly ratified through COFEN Resolution No. 242, dated August 31, 2000 (Cofen, 2009).

This study aimed to review the main causes, prevention measures and strategies for caring for newborns and children at risk of skin lesions.

2. Materials and Methods

A theoretical-reflective study was carried out, based on an exploratory literature review with a qualitative approach. The inclusion criteria used were established for articles, monographs, dissertations and theses published in a period of time between 2018 and 2023, in Portuguese and that are related to the pre-established theme, which was carried out by reading the titles and respective summaries.

In turn, articles, monographs, dissertations and repeated theses, incomplete manuscripts and those with unauthorized free access were excluded. In view of the above, it is justified that the exclusion of studies in other languages was due to the authors' concern in exploring the theme in question, only in the national panorama, which made the search more cohesive, palpable and reliable, with the non-inclusion of other languages. The following databases were used: Latin American and Caribbean Literature in Health Sciences (LILACS); Scientific Electronic Library online (SciELO); Medical Literature Analysis and Retrieval System Online (MEDLINE) and Google Scholar.

3. Review

3.1 Category 1: Main causes of skin lesions in newborns and highly complex children

The skin is the largest organ in the human body and forms a barrier between the internal organs and the external environment, providing protection against invasions by microorganisms. Considering the difference in sensitivity of the skin in its various evolutionary stages, the newborn's skin has a constant surface, is not very thick, critical, delicate and is easily damaged. Even though this structure is similar to adult skin, it has several functions that are not completely developed and are more sensitive to chemical irritants and permeable to toxic agents, being susceptible to the appearance of injuries in response to minimal trauma (Leite et al., 2021).

From the moment of admission until the moment of hospital discharge, critically ill newborns are subjected to a series of handlings, which can favor the appearance of injuries, due to their repetitive frequency, the fragility of their skin and even the presence of medicinal patches. Furthermore, it is considered that the integrity of the skin is of great importance for the survival of the newborn, as it is known that skin lesions are one of the main causes of prolonged hospital stays for newborns, with an average of 37.2 days in hospitalizations (Teófilo et al., 2018; Girão et al., 2018).

As demonstrated above, the risk factors for skin lesions in newborns are associated with procedures carried out in hospital care that lead to risks of formation of skin lesions and their specificities, namely: venipuncture, use of medical adhesives to fix a catheter Oxygen and probes, frequent electrode changes, lack of position change at the correct frequency (Teófilo et al., 2018; Girão et al., 2021; Leite et al., 2021). There are still other associated factors such as excessive use of chemical and cosmetic products in body hygiene and washing children's clothes, which can cause skin irritation, as well as insect bites that can cause itching and local irritation, which can evolve into papule and vesicle-type lesions (Teófilo et al., 2018).

Therefore, it is inferred that there is exposure to risks of skin lesions and infections for the neonate or child, who is in a complex state in a health unit, as they are subjected to various procedures and handling necessary for their care, contributing considerably to the increase in mortality in this population. Therefore, maintaining the integrity of the newborn's skin, despite being a challenge for professionals, must be prioritized during care, as it contributes to increasing the chances of survival of these vulnerable patients (Teófilo et al., 2018; Silva et al., 2023).

3.2 Category 2: Prevention measures in newborns and highly complex children with skin lesions

Pressure injuries (PI) are defined as superficial or deep injuries, which occur due to a lack of Oxygen and/or nutrients in a certain area to meet the needs of the tissues, being triggered by the pressure exerted on the tissue. Patients suffering from a certain pathology and who need to be immobilized for a longer period of time have an increased risk of developing other complications, creating a serious health problem (Feitosa et al., 2018; Severo et al., 2020).

The PI can occur in a short period of time, depending on the patient's clinical status, it can occur in up to two hours. Therefore, maintaining the integrity of the newborn's skin, despite being a challenge for professionals working in the Neonatal Unit (NU), must be prioritized during care, as it contributes to increasing the chances of survival of these patients, given the risk of acquiring infections, which can cause irreversible damage. However, for care proposals to maintain skin integrity to be developed, implemented and continued, there must be participation from the entire multidisciplinary team (Feitosa et al., 2018; Severo et al., 2020; Tavares et al., 2020).

In the first instance, the nurse must have knowledge of the anatomical and physiological characteristics of the skin, in addition to knowing how to characterize and describe the lesions detected to perform SNCa in the most effective way possible. This fact is due to the important role that the nursing team plays in the care scenario for newborn patients, considering that the care is planned and supervised by the nurse and is carried out by him and the other professionals on his team (Feitosa et al., 2018; Santos et al., 2019).

Therefore, the care provided to prevent skin lesions must meet the needs of nutrition, hydration, hygiene, safety and comfort, aiming to reduce the predisposing stimuli for diseases, injuries or harm to newborns. Therefore, the measures described by Severo et al. (2020) and Santos et al. (2021):

1. *Change of decubitus*: Its purpose is to reduce the duration and magnitude of pressure exerted on vulnerable areas of the body, and must be carried out every 2 hours with the aim of redistributing pressure and maintaining circulation in other areas of the body;
2. *When using therapeutic routes*: Pay attention to the location and method of administration; maximum volume;

rotation and preparation of the location used; device type; fixation/stabilization of the device used; asepsis; changing dressings; site assessment; method of removing stickers; assessment of application sites;

3. *Use of skin barrier dressings*;

4. *Protection of bone prominences and use of support surface*: Aims to allow pressure on vulnerable areas of the body to be reduced in duration and magnitude, providing comfort and reducing the chances of injury and,

5. *Frequent skin assessment*: Helps in the early detection of complications caused by pressure or poor installation of an invasive device, in addition to allowing appropriate interventions to be taken.

In addition to the preventive measures described above, there are others that can and should be implemented in order to reduce the incidence of this complication. As evidenced in this study so far, the skin of premature newborns deserves attention from members of the Nursing team, as intact skin performs a barrier function, protects the body's internal structures and reveals problems arising from the length of hospital stay, such as infections and metabolism disorders. Therefore, skin preservation is important during nursing care, especially in premature babies (Feitosa et al., 2018; Gomes et al., 2023).

However, as evidenced by Santos et al. (2021), there is a large knowledge gap. Unfortunately, as this is a vulnerable group, few randomized clinical trials (RCTs), mainly related to skin care, are carried out with the neonatal population. Therefore, the Nursing team that works at the NU needs to be sensitive to carry out its work, seeking alternatives that can contribute to reducing risks, safety and quality of life for newborns.

Therefore, both newborns and children require increased attention from both the Nursing team and the Multidisciplinary Team regarding the care to be implemented in this population group, given their high susceptibility to developing highly complex injuries. in the skin. Therefore, there must be greater encouragement regarding techniques, or equipment, that assist in these preventive implementations to provide greater comfort and quality of life for these patients (Santos et al., 2020; Gomes et al., 2023).

3.3 Category 3: Highly complex skin care strategies for newborns and children

Clinical care as the essence of nursing is presented in the interpersonal relationship built in the responsible clinic and is evident in its social commitment. However, in care practice, this care process must occur with the prevention of incidents and adverse events in mind, reflecting on patient health and safety indicators (Domingos et al., 2022).

The newborn, due to his linguistic disability and inadequate condition, is exposed to the procedures that need to be carried out and also at the mercy of those around him in the Neonatal Intensive Care Unit. This fact makes caring for the skin of newborns, especially premature ones, a challenge for nursing in maintaining its integrity (Araújo et al., 2022; Soares et al., 2023).

A viable strategy for skin care is the implementation of Nursing Care Systematization (NCS), which organizes and standardizes care. Furthermore, this practice is not limited only to keeping the newborn alive, but also to monitoring and monitoring its evolution and particularities through Nursing Diagnosis (ND), which highlights the risks to the integrity of the skin, among others (Prazeres et al., 2021).

As portrayed by Domingos et al. (2022) around 50% of incident cases in newborns admitted to the Intensive Care Unit were related to failures in monitoring the clinical status or nursing care during the period of hospital stay. Still in the study by Prazeres et al. (2021) the work process of the nursing team in the development of the newborn makes it possible to guarantee professional practice in a resolute, standardized and humanized way, which makes it a strategic aspect of excellence. However, the lack of studies with strong levels of evidence regarding safe care for newborn skin, so that there is standardization of care, enabling the improvement of the practice of the multidisciplinary team, is still a limitation (Tavares et al., 2020) . In view of this, it becomes difficult to provide care that generates real effectiveness in preserving the integrity of the skin in newborns or children in a highly complex state (Lima et al., 2020).

Therefore, when it comes to care for the neonatal group specifically, care techniques and maneuvers need to be delicate, careful and with scientific support, where risks to child safety are often associated with adverse events and are responsible for deaths that could be avoided. , when preventive care was carried out responsibly (Prazeres et al., 2021; Araújo et al., 2022).

It is noticeable that knowledge quickly becomes the most modern possible. Therefore, it is necessary that professionals who work in this delicate and highly complex sector always seek updates and expansion of their knowledge, which requires professional aptitude to face difficult situations and guarantee comprehensive and

resolute care for vulnerable patients. Therefore, they need to be prepared to deal with the hemodynamic instabilities of patients in critical situations and surviving adverse conditions (Nascimento et al., 2018; Prazeres et al., 2021).

4. Conclusions

Newborn and pediatric patients with high complexity are at greater risk for the formation of skin lesions associated with invasive devices making it, necessary for nursing to systematize care by developing care techniques for the integrity of the skin of newborns, consolidating short and long-term goals to which in this way can minimize and reduce damage to skin integrity.

5. Authors' Contributions

Wanderson Alves Ribeiro: data collection, article writing, corrections, submission and publication. *Ane Raquel de Oliveira*: reading the articles, describing the topics and writing. *Gabriel Nivaldo Brito Constantino*: reading, corrections and description of topics. *Larissa Christiny Amorim dos Santos*: description of topics and corrections. *Miriam Maria Ferreira Guedes*: reading, description of topics and corrections. *Érica Motta Moreira de Souza*: reading and description of topics. *Elcio Gomes dos Reis*: reading, data compilation, writing and topic corrections.

6. Conflicts of Interest

No conflicts of interest.

7. Ethics Approval

Not applicable.

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