ECRONICON OPEN ACCESS

EC PAEDIATRICS
Research Article

Prevalence of Skin Integrity-Related Injuries in a Tertiary Paediatric Hospital

Gemma Pérez-Acevedo[1], Joan Enric Torra-Bou[2]*, Mireia Urrea-Ayala[3] and Alejandro Bosch-Alcaraz[4]

[1]*Pediatric Nurse Practitioner, Sant Joan de Deu Hospital, Barcelona, Spain*

[2]*Nurse, Universitat de Lleida, Facultat d'Infermeria i Fisioteràpia, Researcher at the "Grupo de Investigación en Reparación y Regeneración Tisular (TR2Lab), Institut de Recerca i Innovació en Ciències de la Vida i de la Salut a la Catalunya Central (IrisCC)", Vic, Barcelona, Spain*

[3]*Head of Clinical Safety Area, Sant Joan de Deu Hospital, Barcelona, Spain*

[4]*Pediatric Nurse, Professor, Department of Public Health, Mental Health and Maternal and Child Health Nursing, School of Nursing, Faculty of Medicine and Health Sciences, University of Barcelona (UB), Barcelona, Spain*

***Corresponding Author:** Joan Enric Torra-Bou, Nurse, Universitat de Lleida, Facultat d'Infermeria i Fisioteràpia, Researcher at the "Grupo de Investigación en Reparación y Regeneración Tisular (TR2Lab), Institut de Recerca i Innovació en Ciències de la Vida i de la Salut a la Catalunya Central (IrisCC)", Vic, Barcelona, Spain.

Received: March 20, 2023; **Published:** April 26, 2023

Abstract

Introduction: Pressure injuries (PI) and incontinence-associated dermatitis (IAD) are two actual and potential health problems for paediatric patients admitted to acute hospitals, with consequences at different levels and with scarce epidemiological information.

Patients, Materials and Methods: A cross-sectional study was conducted to determine the prevalence of PI, incontinence, IAD, medical adhesive related injuries (MARSI), surgical wound complications and extravasation skin lesions in a tertiary maternal and child university hospital in Barcelona, Spain.

Results: The prevalence of IP was estimated at 1.9% in paediatric inpatient units and 14.29% in intensive care units. All LPP identified in the study were incident. The prevalence of incontinence was 46.79% in inpatient units and 85.19% in intensive care units, with ADI prevalence of 1.92% and 14.29% respectively.

Keywords: *Paediatric Patients; Pressure Injuries; Incontinence; Incontinence-Associated Dermatitis; Clinical Device-Related Pressure Injuries. Extravasation Injuries*

Introduction

Pressure injury (PI) is the term used to refer to "a localized injury to the skin and/or underlying tissues, usually over a bony prominence, as a result of isolated and continuous pressure on an area or combined with the shear mechanism"; more recent terminology determined to refer to pressure or decubitus ulcers, according to the National Pressure Injury Advisory Panel (NPUAP) of the United States in 2016 [1,2].

A pressure injury is one of the most analyzed patient safety events, being considered an adverse event directly related to the nursing care performed and the degree of patient dependency, with serious consequences both for the patients who suffer them and their families

and for healthcare institutions, healthcare professionals, the healthcare system and society in general [3]. This adverse event is not the only one; within skin lesions, there are other injuries that could be avoided with a care plan focused on prevention. Among these injuries we can consider incontinence-associated dermatitis (IAD), surgical wound complications, skin injuries due to extravasation of peripherally administered drugs, skin tears, and medical device-related skin injuries (MARSI) as adverse safety events.

As their definition indicates, PIs usually appear on a bony prominence, although sometimes they can also appear on cartilage (nose or ears), in soft tissues subjected to external pressure exerted by clinical materials or devices inserted in the patient during treatment, such as venous catheters, probes, monitoring devices and even respiratory and vascular support devices, both invasive and non-invasive.

Taking into account that the causal mechanism of IP, there are different elements with the capacity to produce pressure, highlighting:

1. The weight of the person when supported continuously or for a prolonged period of time on a resting surface (mattress and/or seat).
2. Therapeutic or diagnostic devices used during patient care (splints, immobilizers, collars, catheters, monitoring sensors, masks, interfaces for non-invasive ventilation, endotracheal tubes, compression systems, vascular lines and their accessories, etc).

According to the etiology of PI we distinguish two types of PI: those related to patient support (IPSPr), and those caused by medical devices or clinical products (IPMd). The correct differentiation of the causal mechanism of PI is essential to apply effective prevention measures and to complement the information provided by pressure ulcer risk assessment scales, both in adults and pediatric patients [4,5].

PI can affect all types of patients with prolonged immobility, as would be the case of pediatric patients admitted to hospitalization and critical care units, or pediatric patients with neuromuscular pathologies or congenital defects that reduce their sensitivity, as could be the case of children born with spina bifida, myelomeningocele [6], spinal cord injuries and with reduced mobility [7].

When studying pediatric patients, depending on their age, they present anatomical, functional and developmental characteristics that should be considered since they increase the risk of developing skin lesions. On the other hand, depending on the age of the patient, PI can develop more easily in areas such as the occiput and ears, since children under three years of age have a head that is anatomically disproportionate to their body, which exerts more pressure because it is heavier.

The pediatric population, and in particular the neonatal and premature population, have an immaturity present even in their tissue structure, which has an immature epidermal layer that can lead to a greater risk of denudation, loss of temperature and electrolytes and fluids, as well as a greater risk of toxicity when applying skin products [8].

This immaturity is very present in the neonatal patient and even more so in the premature patient, whose skin is one of the most underdeveloped organ systems, representing 13% of the total body weight compared to 3% in the case of adults, so the management and care of their skin must be different from that of the rest of the pediatric population. In addition, their admission to neonatal units increases the risk of generating PI, since the patient is exposed during clinical and care management to therapeutic interventions and the placement of different types of clinical devices [9].

Although studies have been initiated showing the existence of these lesions in the pediatric patient, research should focus mainly on the prevention and reduction of their occurrence [14,18,19]. At present, few data are available on the prevalence of this type of skin lesions in pediatrics. In the specific context of pediatric intensive care units (PICUs), the Spanish National Group for the Study and Advice on Pressure Ulcers and Chronic Wounds (GNEAUPP) reported a prevalence of 17.77% in its 2005 national study [20], a figure that increased to 33.3% in the 2009 national study [21]. In the latest 2017 national study, prevalences were calculated in pediatric inpatient units at 1.39% and in ICUs at 9.39% [10,11].

On the other hand, one of the most recurrent lesions in the pediatric population is incontinence-associated dermatitis (IAD), one of the dependence-related lesions according to the DRSI conceptual framework of García-Fernández., *et al*. [12,13] moisture-related lesions such as IAD, intertriginous dermatitis (ITD), exudate-associated perilesional dermatitis (EAPD), exudate-associated skin dermatitis (EADC), peristomal dermatitis (PED) and oral and nasal secretion dermatitis (OND) [14].

IAD is a type of irritant dermatitis that appears in patients with urinary and fecal incontinence and, in combination with immobility and friction [3,4]. The continuous contact of urine and feces on the skin, occluded with the diaper, creates the optimal conditions for a series of chemical reactions that will alter the pH of the skin, alkalizing it, altering its barrier function due to the reduction and loss of functionality of the lipid layer, a circumstance that can be aggravated by the properties of the soaps used during hygiene. The alkaline environment will favor the activation of proteolytic enzymes present in the stool, which under normal conditions would be inert, but which in an alkaline environment will favor the process of irritative dermatitis [10-15].

In the case of the pediatric population, there are two factors that can accentuate the impact of IAD. On the one hand, the presence of natural urinary and fecal incontinence until the child reaches adequate sphincter control and, on the other hand, the immaturity of the skin at early or extreme ages, which means that it cannot act as a 100% skin barrier and, therefore, is more sensitive to the effect of irritant dermatitis due to the continuous contact of urine, feces and cleaning products with the skin. The neonatal patient has thinner and more fragile skin, especially in preterm infants, since the cornification process begins at gestational weeks 20 - 24, and extreme preterm infants have thinner and more fragile skin, with limited barrier effect and increased transepidermal water loss (TEWL) with its consequent repercussions on the development of IAD, increased percutaneous absorption of toxins and microorganisms and decreased skin resistance to the aggressiveness of substances present in the stool, such as digestive enzyme residues. Alkalinization of the skin can also lead to imbalances in the cutaneous microbiota with the potential to cause skin infections [15,16]. Another element to take into account is the effect of processes such as teething that may involve the secretion of substances with aggressive potential in the digestive tract, and therefore in the feces [17].

As with adult hospital populations, there are hardly any epidemiological data on the prevalence of different skin damage beyond PI, hence the need and relevance of research on this topic.

Aim of the Study

The main aims of the present investigation were (1) to determine the prevalence of skin integrity damage injuries in hospitalized paediatric patients and (2) to differentiate prevalence by types of PI, unit and typology.

Materials and Methods

Coinciding with the 6th National LPP Prevalence Study of the GNEAUPP (6th ENPUPP-GNEAUPP), and as part of its data collection, a descriptive and cross-sectional study was conducted to establish the prevalence of Pi, IAD and incontinence, surgical wound complications, medical related adhesive skin injuries (MASRSI) and skin lesions due to extravasation in paediatric hospitalisation units.

The context of the study was a third level maternal-child university hospital, leader and reference for paediatric and obstetric-gynaecological care, a university hospital with high technology and specialisation. It is a hospital of proximity for the Baix Llobregat area in Barcelona and a regional reference for Catalonia and nationally for neurology, congenital cardiopathies, orthopaedic surgery, etc. It registers more than 25.000 discharges each year, receives more than 200.000 visits for outpatient consultations and attends 115.000 emergencies. It also attends more than 4.000 births each year and performs 14.000 surgical operations.

The hospital has 314 beds and 14 operating rooms in which annually (2021 data) we attend 3,442 deliveries, 116,945 emergencies, perform 23,108 hospitalizations (17,864 in the pediatric area and 5,244 in the Women's area), 6,292 major outpatient surgeries and 13,881 surgeries.

Since 2001 the hospital has had a chronic wound committee and since 2013 a specific wound clinic led by a pediatric nurse who is expert in the management of these injuries in the paediatric age group. The centre has a protocol for the prevention of PI which, among other measures, includes the assessment of the risk of PI with the NSRA scales for children under one month and premature infants, Braden Q for children between one month and fourteen years and Braden for children over fourteen years, as well as a specific pool of special surfaces for pressure management (SSPM) with viscoelastic foam systems and continuous low reactive pressure systems with special presentations for neonates, paediatric patients and adult patients.

For the classification of PI and IAD the definitions described by the GNEAUPP for the 6th ENUPP [4] were used. PI were classified based on the categories described in table 1 and further differentiated between patient support-related pressure injuries (PSrPI) and medical device-related injuries (MD-rPI). The prevalence of IAD was calculated in two scenarios, total population and incontinent population.

Pressure and shear injuries (PI)	Classification	Incontinence associated dermatitis (IAD)	Classification
Non-bleachable erythema	Category I	Category I (Erythema without loss of skin integrity)	I.a Mild moderate (pink skin)
Partial-thickness ulcer	Category II		I.b Intense (dark pink or red skin)
Total loss of skin thickness	Category III	Category II (Erythema with loss of cutaneous integrity)	II.a Mild/moderate (erosion of less than 50% of total erythema)
Total loss of tissue thickness	Category IV		II.b (erosion of 50% or more of the total erythema)

Table 1: *Classification of pressure and incontinence associated dermatitis injuries.*

Data collection was carried out in all paediatric hospitalisation units of the hospital analysed (8 paediatric hospitalisation units: general surgery; traumatology; neurosurgery; cardiac surgery; general paediatrics; otorhinolaryngology and emergency; oncological pediatric care center and intensives care units (3 paediatric and 3 neonatal critical care units) with a total of 249 theoretical beds. The data registration was performed by using an ad hoc instrument, collecting data unit by unit and reviewing clinical records and patients when required.

The classification and typing of lesions was performed in accordance with the methodology established by the GNEAUPP and specifically with the material generated for the 6th ENPUPP-GNEAUPP [15,18]. The study was carried out under the ethical auspices of the aforementioned national prevalence study (authorisation of the ethical committee of the University of Jaén), within the framework of the periodic collection of epidemiological indicators of patient safety at the centre, guaranteeing the anonymity of the patients and the confidentiality of the information at all times. The data were exported to a database and statistically analysed using descriptive statistics with the software IBM SPSS Statistics v.25.

Results

The prevalence cut-off was performed in December 2022. At the time of the study, 212 of the 249 theoretical beds in the units studied were occupied (85.14% occupancy). The prevalence of PI in the inpatient hospital units was 1,92% and in the intensive care units it was 14,29%. Table 2 presents data on the prevalence of the different types of injuries studied in the paediatric inpatient units as well as the data for the intensive care units (neonatal and paediatric).

	Theoretical beds Occupied beds Occupancy rate	Incontinent patients prevalence and incontinence	Prevalence Incontinence associated dermatitis (IAD)	Prevalence pressuire injury (PI)	Patients with medical adhesive related injuries (MARSI)	Patients with extravasation injuries	Patients with surgical wound complications
Paediatric inpatient units (6 pieces)	134 theoretical beds 127 beds occupied 94.78% occupancy rate	62 42,82%	3 patients 2,36% (4.84% in incontinent people)	2 patients 1,57%	0 0%	7 patients 5,51%	0 0%
Pediatric Care Center (2 pieces)	45 theoretical beds 29 beds occupied 64.44% occupancy	11 37,93%	2 patients 6,9% (18.18% in incontinent people)	1 patient 3,45%	1 patient 3,45%	1 patient 3,45%	1 patient 3,45%
Total hospitalisation units	179 theoretical beds 156 beds occupied 87.15% occupancy	73 46,79%	5 patients 3,21% (3.42% of incontinent children)	3 patients 1,92%	1 patient 0,64%	8 patients 5,13%	1 patient 0,64%

***Table 2**: Prevalence data of different types of injuries and conditions in paediatric inpatient units.*

Table 3-6 summarise the information on the different types of PI by unit and typology. In relation to PI, the 11 prevalent patients were all incident. These patients had a total of 18 PI. 11 were related with patient support (PSSrPI) and 7 were medical related PI (MDrPI).

	Theoretical beds Occupied beds Occupancy rate	Incontinent patients Prevalence and incontinence	Prevalence IAD	Prevalence PI	Patients with MARSI	Patients with extravasation injuries	Patients with surgical wound complications
Neonatal ICU (3 units)	43 theoretical beds 33 beds occupied 76.74% occupancy rate	33 100%	2 patients 13,33%	5 patients 15,15%	0 0%	0 0%	0 0%
Paediatric ICU (3 units)	27 theoretical beds 23 beds occupied 85.19% occupancy	20 37,93%	3 patients 13,04% (15% in incontinent)	3 patients 13,04%	0 0%	1 patient 4,35 %	0 0%
Total intensive	179theoretical beds 156 beds occupied 87.15% occupancy	73 85,19%	5 patients 8,93% (9.43% of incontinen infants)	8 patients 14,29%	0 0%	1 patient 1,79%	0 0%

***Table 3:** Prevalence data on different types of injuries in neonatal and paediatric intensive care units.*

Hospitalisation units	PI category II for medical device (elastic suture) in forearm, 1-day evolution in a 5 years old girl.
	PI category II by medical device (Non Invasive Ventilation) in the nose, 5-days evolution in 4 years boy
	LPP of category II for support in a 17 year old patient in the sacral area of 60-days of evolution.
2 medical device related PI	2 category II
1 support PI	1 category II

Table 4: *Data on PI in inpatient units.*

Neonatal ICU	10 PI	3 PI category I for support (prone) in a 17-day-old baby on foot and knees (2 injuries) of 1 and 2 days of evolution respectively.
		2 PI, 1 category IV for occipital support 25 days evolution and 1 PI for medical device in the abdomen (catheter) category II 5 days evolution in a 19 day old girl.
		1 category III PI for support in the occipital area, 7 days evolution in a 23-day-old girl.
		3 category III PI for support in the occipital area, 14 days evolution in a 30-day-old girl.
		1 category III PI for medical device (Prongs NIVs) in the nose of 45 days evolution in a 45 day old child
8 PI for support	3 Category I 4 Category III 1 Category IV	5 occipital region, 2 knees, 1 foot
2 PI due to medical device	1 category II 1 category III	1 vascular access (abdomen) 1 prongs NIVS (nose)

Table 5: *Data on PI in neonatal ICU.*

Neonatal ICU	PI: 2 LPPs due to support and 3 LPPs due to clinical arrangement	1 PI category II for support in a 7 year old boy in the occipital area of 6 days old
		3 PI, 1 category IV for occipital support, 60 days evolution, 1 category IV for clinical device in the nose (NIVS), 7 days evolution and 1 category III for clinical device in the abdomen (vascular access), 2 days evolution in a 5 year old child.
		1 category I PI by medical device (NIVS) in the nose, 2 days evolution in a 13-year-old girl.
2 LPPs due to support	1 category II 1 category IV	2 occipital area
3 LPP due to clinical device	1 category I 1 category II 1 category IV	2 NIVS (nose) 1 vascular access (abdomen)

Table 6: *Data on PI in paediatric ICU.*
NIVS: Noninvasive Ventilation System.

In the group of the 11 supportive PSrPI, 3 were category I (27.27%), 3 category II (27.27%), 4 category III (36.36%) and 1 category IV (9%).

Regarding the 7 clinical MDrPI, 1 was category I (14.3%), 4 were category II (57.14%), 1 category III (14.3%), 1 category IV (14.3%).

In terms of anatomical location, 7 LPPs occurred in the occipital area (38.88%), 4 in the nose (22.22%), 2 in the abdomen (11.11%), 2 in the knees (11.11%), and 1 each in the sacrum (5.55%), forearm (5.55%) and foot (5.55%).

In relation to IAD 10 skin injuries, 5 occurred in inpatient units and the other 5 in intensive care units. 4 (40%) were classified as 1A category, 2 (20%) as 1B, 2 (20) as 2A and the remaining 2 (20%) as 2B. 8 of the 9 extravasation injuries occurred in inpatient units as well as the surgical wound complication.

Discussion

The present study is the second to report data on the prevalence of PI, incontinence and IAD and other DSRI in a highly complex maternal and child acute care institution in Spain. A comparison with data from the study performed in the same centre in 2018 shows a slight increase in the prevalence of PI then were estimated as 8% in the Paediatric Intensive Care Unit (PICU), 0% in the Neonatal Intensive Care Unit (NICU) and 1.12% in paediatric inpatient units. However, in contrast to the 2018 study, the research presented here takes into account other skin damage such as MARSI, extravasations and surgical wound complications [19].

The majority of PI, regardless of their cause, are located in the occipital area (38.8%), followed by the nose (22.2%), a fact that is quite common in the case of the paediatric population due to the anatomical and skin characteristics of this population and which coincides with a recent systematic review that estimated an overall prevalence of pressure injuries of 13.5% [20].

As for their severity, these differ depending on the mechanism that generates them, with 36.36% in category III in the support group versus 57.14% in category II in the devices group. These data coincide with others previously reported research [10,19] and emphasise the need to include category I PIs in prevalence studies to avoid underestimating the epidemiological extent of the PI problem as much as possible.

Another important aspect to take into consideration as a risk factor is the relationship between the appearance of LPP and the use of clinical or medical devices, first reported in paediatric intensive care by Curley in 2003 [21-23]. These types of lesions are more frequent in paediatric and neonatal patients than in the adult population, due to the peculiarities and developmental conditions of the skin, which can affect its protective barrier function [22,23].

A recent systematic review by Jackson., *et al*. estimates the incidence of medical device-related PI at 12%, with respiratory devices, cervical collars, tubes and intravenous catheters causing the most injuries [24]. In addition to this fact, these injuries can sometimes be aggravated and even masked by the effect of accidental or voluntary manipulation by the patient of the medical device and its fixation system and by the effect of the removal of the fixation, anchoring and protection systems of the medical devices (plasters, dressings, etc.) by the professionals, which can be confused or masked with injuries caused by adhesives (MARSI) [25]. Apart from the pressure, these devices can alter both the skin conditions, due to the heat and moisture exerted under them, and the condition of the skin in the area to which they are attached [26], making it in many cases more susceptible to skin lesions and PI. The NPIAP defined medical device related PIs as "pressure injuries resulting from the use of devices designed and applied for therapeutic or diagnostic uses. The resulting injury is usually confined to the pattern or shape of the device" [1]. According to the NPIAP, these types of injuries should be classified according to the established categories of PI, and a specific category for mucosal PI has been defined by this organization as "those pressure injuries

occurring on mucous membranes with a history of clinical device use at the site of injury. Due to the anatomy of the tissues, these lesions cannot be classified into stages and should be referred to as mucosal pressure injuries" [27].

The present study has identified the frequency of use of different types of clinical devices capable of producing PI that largely coincide with those described by Curley, Black and Jackson [21,22,24].

Even so, it is important to note that using prevalence as an indicator does not allow us to estimate the importance of the problem of this type of injury in the same way as incidence studies do. Taking into account the potential risk of developing medical device related PI and the fact that they are frequently used in the paediatric critical care setting, it is very important to define specific strategies for the prevention of this type of injury, taking into account the most commonly used clinical devices and their peculiarities [27,28].

Finally, if we focus on the prevalence of incontinence, the present study provides information about the extent of incontinence in two types of populations for which there are hardly any data published in the scientific literature: acute care settings and paediatric intensive care units.

The high prevalence of incontinence that has been identified highlights the importance of a comprehensive approach to this problem in paediatric acute patients, given the prevalence figures obtained, which are five times higher in the case of critical and neonatal patients or three times higher in the case of acute hospital inpatients than those obtained (19.7%) by Junkin., *et al*. in 2007 in a sample of acute patients aged 4 to 80 years [29], those reported by Campbell., *et al*. (24%) in acute patients older than 18 years [30] and close to the 42.5% reported by Hall., *et al*. in adult patients admitted to a critical and semi-critical neurotrauma unit [28].

Conclusion

The present investigation shows that there continues to be a high prevalence and incidence of PI in the paediatric population attended in PICU an NICU especially as a result of the clinical characteristics of the patients and the use of therapeutic management devices. For this reason, it is considered essential that PICU and NICU must be aware of this situation and implement systems for reporting and monitoring the incidence of these adverse events, with emphasis on appropriate assessment using valid and reliable instruments adapted to the different age ranges. At the same time, individualised measures adapted to the causative agents must be implemented in order to reduce the occurrence of PI.

The integration of PI within the framework of patient safety in a Culture of Safety environment can be far more effective than individual or piecemeal approaches to this important health issue and challenge.

Disclosure

The authors declare that they have all participated in the preparation of the research, the analysis of the results and the drafting of the report and that they have no conflict of interest related to the subject matter of the research.

Bibliography

1. National Pressure Ulcer Advisory Panel, European Pressure Ulcer Advisory Panel and Pan Pacific Pressure Injury Alliance. Prevention and Treatment of Pressure Ulcers: Clinical Practice Guideline. Emily Haesler (Edition.). Cambridge Media: Osborne Park, Western Australia (2014).

2. National Pressure Ulcer Adivisory Panel. NPUAP Pressure Injury stages (2023).

3. Torra-Bou JE., *et al.* "Las úlceras por presión como problema de seguridad del paciente". *Gerokomos* 27.4 (2016): 161-167.

4. García-Fernández FP., *et al.* "Escalas de valoración del riesgo de desarrollar úlceras por presión en la infancia". *Gerokomos* 22.1 (2011): 26-34.

5. García-Fernández FP., *et al.* "Valoración del riesgo de desarrollar úlceras por presión en unidades de cuidados críticos: revisión sistemática con metanálisis". *Gerokomos* 24.2 (2013): 82-89.

6. Willock J., *et al.* "Pressure sores in children – the acute hospital perspective". *The Journal of Tissue Viability* 10.2 (2000): 59-62.

7. Torra -Bou JE. "Incidencia de úlceras por presión en unidades de cuidados intensivos". Revisión sistemática con meta-análisis. Tesis doctoral. Universidad de Alicante, Febrero (2016).

8. Razmus I., *et al.* "Pressure ulcer development in infants: State of the Science". *The Journal for Healthcare Quality (JHQ)* 30.5 (2008): 36-42.

9. Huffines B and Logsdon MC. "The neonatal skin assessment scale for predicting skin breakdown in neonates". *Issues in Comprehensive Pediatric Nursing* 20.2 (1997): 26-31.

10. Pancorbo-Hidalgo PL., *et al.* "Prevalence of pressure injuries and other dependence-related skin lesions among pediatric patients in hospitals in Spain". *EWMA Journal* 19.2 (2018): 29-37.

11. Pérez Acevedo G., *et al.* "Prevalencia de lesiones por presión, incontinencia, dermatitis asociada a la incontinencia y factores de riesgo para el desarrollo de lesiones por presión en un hospital materno-infantil de tercer nivel". *Gerokomos* 29.2 (2018): 83-91.

12. Braden B and Bergstron N. "A Conceptual schema for the study of the etiology of pressure sores". *Roles of the Rehab Nurse* 12.1 (1987): 8-16.

13. Coleman S., *et al.* "Patient risk factors for pressure ulcer development: Systematic review". *International Journal of Nursing Studies* 50.7 (2013): 974-1003.

14. Torra-Bou JE., *et al.* "Redefinición del concepto del abordaje de las lesiones por humedad. Una propuesta conceptual y metodológica para mejorar el cuidado de las lesiones cutáneas asociadas a la humedad (LESCAH)". *Gerokomos* 24.2 (2013): 90-94.

15. Rodríguez-Palma M., *et al.* "Conceptual Framework for Incontinence-Associated Dermatitis Based on Scoping Review and Expert Consensus Process". *Journal of Wound Ostomy and Continence Nursing* 48.3 (2021): 239-250.

16. Beele H., *et al.* "Incontinence-Associated Dermatitis: Pathogenesis, Contributing Factors, Prevention and Management Options". *Drugs Aging* 35 (2018): 110.

17. Torra-Bou JE and Pérez-Acevedo G. "Incontinence associated dermatitis". In: Ciprandi G. (editor). Neonatal and pediatric wound care. Edizione Minerva Medica. Torino (2022): 104-104.

18. García-Fernández FP., *et al.* "Clasificación-categorización de las lesiones cutáneas relacionadas con la dependencia. 3ª edición. Grupo Nacional para el Estudio y Asesoramiento en Úlceras por Presión y Heridas Crónicas". Logroño (2021).

19. Zhang H., *et al.* "Incidence and prevalence of pressure injuries in children patients: A systematic review and meta-analysis". *The Journal of Tissue Viability* 31 (2022): 142-151.

20. Curley MAQ., *et al.* "Pressure ulcers in pediatric intensive care: Incidence and associated factors". *Pediatric Critical Care Medicine* 4.3 (2003): 284-290.

21. Black JM and Kalowes P. "Medical device-related pressure ulcers". *Chronic Wound Care Management and Research* 3 (2016): 91-99.

22. Chandler AJ., *et al.* "Medical device-related pressure ulcers in premature babies". *Wounds UK* 12.4 (2016): 24-29.

23. Jackson D., *et al.* "Medical device-related pressure ulcers: A systematic review and meta-analysis". *International Journal of Nursing Studies* 92 (2019): 109-120.

24. Hitchcock J and Savine L. "Medical adhesive-related skin injuries associated with vascular access". *British Journal of Nursing* 26.8 (2017): S4-S12.

25. Murray JS., *et al.* "Medical device-related hospital-acquired pressure ulcers in children: An integrative review". *Journal of Pediatric Nursing* 28 (2013): 585-595.

26. Campbell N. "Electronic SSKIN pathway: reducing device-related pressure ulcers". *The British Journal of Nursing* 25.15 (2016): S14-26.

27. Barakat-Johnson M., *et al.* "Medical device-related pressure injuries: An exploratory descriptive study in acute tertiary hospital in Australia". *Journal of Tissue Viability* 26 (2017): 246-253.

28. Hall KD and Clark RC. "A prospective, descriptive, quality improvement study to decrease incontinence-associated dermatitis and hospital-acquired pressure ulcers". *Ostomy Wound Management* 61.7 (2015): 26-30.

29. Junkin J and Lerner Selekof J. "Prevalence of incontinence and associated skin injury in the acute care patient". *Journal of Wound Ostomy and Continence Nursing* 34.3 (2007): 2609.

30. Campbell N. "Electronic SSKIN pathway: reducing device-related pressure ulcers". *The British Journal of Nursing* 25.15 (2016): S14-S26.

Volume 12 Issue 5 May 2023