

Impact of a health care quality improvement intervention to prevent pressure ulcers in a Pediatric Intensive Care Unit

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ABSTRACT

Introduction. Among children hospitalized in the intensive care unit who have pressure ulcers (PUs), more than 50% are related to the sustained pressure from a device or equipment. PUs are an indirect indicator of the quality of health care.

Objective. To assess the impact of a health care quality improvement intervention on the development of PUs at the pediatric intensive care unit.

Materials and methods. Uncontrolled, before and after study. Pre-intervention: measurement of PUs; post-intervention: implementation of a bundle of measures (staff training, identification of patients at risk, and pressure relief by using antibedsores mattresses and polymer gel positioners) and the same measurements.

Results. A total of 152 patients were included: 74 before the intervention and 78 after the intervention. A significant reduction was observed in the incidence of PUs (pre-intervention: 50.60%; post-intervention: 23.08%; $p=0.001$). A higher risk score was seen in the post-intervention group (pre-intervention: 12.4 ± 1.9 ; post-intervention: 13.7 ± 2.1 ; $p=0.001$). No differences were observed in the risk score on the day of PU onset and the number of PUs. The risk-stratified analysis maintained the significant difference in the incidence of PUs (PIM2 < 5: 47.37%; 19.23%; $p=0.004$; and PIM2 \geq 5: 55.56%; 30.77%; $p=0.053$).

Conclusion. A lower incidence of PUs was observed after the implementation of the health care quality improvement intervention. No changes were detected in the number of PUs or the severity staging.

Key words: program assessment, pressure ulcers, quality improvement, pediatrics.

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INTRODUCTION

The skin is the largest tissue of the human body and works as a protective barrier against bacteria and physical and chemical substances while maintaining a stable internal environment (homeostasis). The skin receives one third of the circulating blood volume and is involved in several functions, including protection, immunity, temperature regulation, metabolism, communication, identification, and senses.

An injury that extends through the epidermis and dermis may lead to systemic infections, increased morbidity, higher health care costs, and negative psychosocial implications associated with ulcers and alopecia. These ulcers are areas of focal necrosis of the skin and underlying tissue, caused by the interruption of blood flow to the affected area, as a consequence of prolonged pressure between a bony prominence and the external surface.^{1,2}

The development of pressure ulcers (PUs) has been widely studied in children and adults, and has been described as typically occurring in adult patients. However, several risk factors have been described for the potential development of PUs in pediatric patients that are different from those observed in adult patients.³

The neonatal and pediatric population admitted to the critical care unit and children with chronic conditions, psychomotor deficits, neurological disorders or spinal cord injuries are the groups at higher risk and with a higher incidence of PUs. In critically-ill patients, the incidence of PUs has been reported to range from 18% to 27%.⁴

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In this population of patients, the development of PUs has been related to different clinical situations.⁵⁻⁸

PUs are an indirect indicator of health care quality and account for an increasing health problem because they affect the patient's quality of life, extend the length of stay in the hospital, increase mortality, and imply a high cost on the health system.

OBJECTIVE

The objective of this study was to assess the impact of a health care quality improvement intervention on the development of PUs at the pediatric intensive care unit (PICU).

MATERIALS AND METHODS

Design

Uncontrolled, before and after study.

The study was carried out in two phases. During the first phase ("before"), from March to September 2014, baseline data were analyzed. Based on analyzed data, prevention measures were proposed. As of April 2016, a health care improvement intervention was implemented to reduce the incidence of PUs at the PICU (implemented bundle of measures: see *Annex 1*). During the second phase ("after"), from May to September 2016, the intervention continued and its results on PU incidence were measured.

Upon admission, all children were assessed for the risk of PU using the Braden Q scale and subjected to a comprehensive examination of the skin, including a thorough examination of the areas at a higher risk, such as under braces or

orthoses, tracheostomy tubes, etc.; results were documented in a data collection record.

This procedure was repeated on a daily basis; if any ulcer was observed, the location, size, and stage were recorded.

Description of the study setting

The study was carried out at the PICU of Hospital General de Niños Pedro de Elizalde (HGNPE). This unit has 11 medical surgical beds, with no cardiovascular surgery.

Sample

All children older than 1 month admitted to the PICU of HGNPE during the period between March and September 2014 and the period between May and September 2016.

Exclusion criteria:

- Length of stay in the PICU of less than 48 hours.
- Presence of ulcers at the time of admission.

Data collection instrument

The data collection record consisted of 3 parts (see *Annex 2*):

- Epidemiological data.
- Assessment of the risk for PUs: the Braden Q scale⁹ was administered at the time of admission of the child to the PICU and on a daily basis (see *Annex 3*).
- PU staging: the 4-stage system from the National Advisory Group for the Study of Pressure Ulcers and Chronic Wounds (Grupo Nacional para el Estudio y Asesoramiento en Úlceras por Presión y Heridas Crónicas, GNEAUPP)⁵ was used (see *Annex 4*).

TABLE 1. Composition of patient groups before and after the intervention

Outcome measure	Pre-intervention group	Post-intervention group	p
Number of patients	74	78	
Occupancy percentage	80.6%	91.3%	
Weight (kg)	8 (5-15)	7 (4.7-10)	0.169
Age (months old)	8.5 (3-36)	6 (3-20)	0.119
Days of AMV	7 (3-13)	7 (4-11)	0.738
PIM2	4.83 (1.48-10.16)	2.35 (1.19-6.18)	0.011
Length of stay in the PICU (days)	9 (5-16)	8 (6-12)	0.516
Diagnosis:			
Respiratory	60%	64.5%	
Cardiovascular	0%	3.8%	
Neurological	7%	2.5%	
Sepsis	14%	13.9%	
Postoperative period	10%	7.6%	
Other	9%	7.6%	

AMV: assisted mechanical ventilation; PIM2: Pediatric Index of Mortality 2; PICU: pediatric intensive care unit.

Statistical analysis

Data were described as mean and standard deviation or as median and interquartile range (IQR), depending on distribution. Before and after data were compared using Student’s t test or the Wilcoxon rank-sum test, depending on normality and the χ^2 test. Data were analyzed with the STATA 10.1 software (Statistics/Data Analysis Stata Corporation 4905 Lakeway Drive College Station, TX, USA).

Sample size

Eighty patients were estimated per phase to identify a minimum 20% difference between groups (baseline incidence of 40% versus final incidence below 20%), with a power over 80%, a p value < 0.05, and a 15% lost-to-follow-up.

Ethical considerations

In this study, patients were not identified by name or medical record number; they were coded. PU care and prevention has been a standard of care at the PICU as of May 2016. Based on this, we considered that it was not necessary to obtain an informed consent.

RESULTS

A total of 152 patients were included in the study; 74 in the pre-intervention period and 78 in the post-intervention period. Patients’ median age was 7 months (IQR: 4.7-27.5). The median Pediatric Index of Mortality 2 (PIM2) score was 3.71 (IQR: 1.29-8.18). The median number of days of assisted mechanical ventilation (AMV)

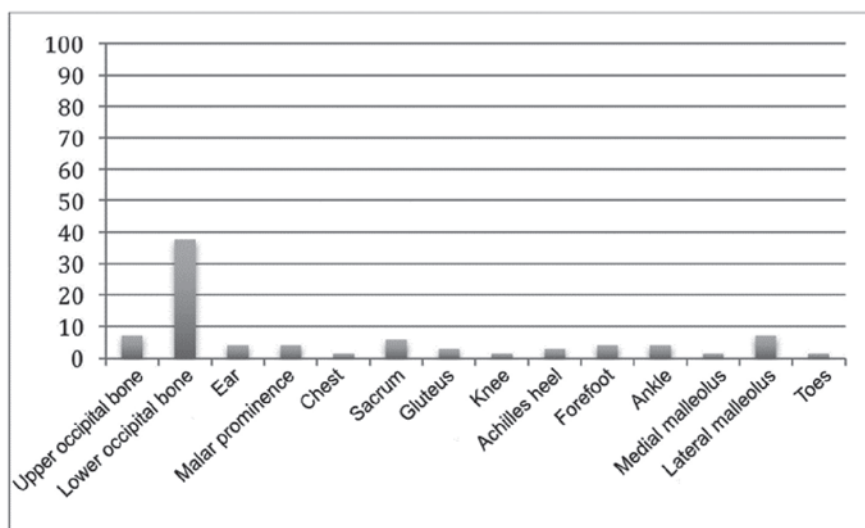
was 7 (IQR: 4-7) and the median length of stay in the PICU was 8 days (IQR: 6-14). No significant differences were observed in terms of age, weight, days of AMV, length of stay in the hospital, and diagnosis at the time of admission or between the pre-intervention and post-intervention groups. A higher severity score –PIM2– was observed in the pre-intervention group (4.88 [1.36-10.7]; 2.35 [1.19-6.18]; p= 0.012) (Table 1).

The most common PU location was the lower occipital region, followed by the lateral malleolar and the upper occipital regions (Figure 1).

After the intervention period, a significant reduction was observed in the incidence of PUs (pre-intervention: 50.60%; post-intervention: 23.08%; p= 0.001). In the pre-intervention group, 81.9 PUs were observed over 1000 days of hospitalization; 1 corresponded to stage III; 7, to stage II; and 70, to stage I; whereas in the post-intervention group, 29.3 PUs were observed over 1000 days of hospitalization; none corresponded to stage III; 2, to stage II; and 26, to stage I (Figure 2). The risk score for PUs at baseline was higher in the post-intervention group (pre-intervention: 12.4 ± 1.9 ; post-intervention: 13.7 ± 2.1 ; p= 0,001); no changes were observed in the risk score on the day of PU onset between both groups (pre-intervention: 13.1 ± 1.9 ; post-intervention: 13.3 ± 1.4 ; p= 0.754). The number of PUs per patient was similar in both groups (Table 2).

A higher PIM2 score was recorded for the pre-intervention group, so a risk-stratified analysis was conducted. The PIM2 score

FIGURE 1. Anatomic distribution of pressure ulcers



was dichotomized into ≥ 5 and < 5 . After the stratification, a significant difference was still observed in the incidence of PUs (PIM2 < 5 : 47.37%, 19.23%; $p= 0.004$; and PIM2 ≥ 5 : 55.56%, 30.77%; $p= 0.053$).

DISCUSSION

PUs are common adverse events in association with the care of hospitalized patients which, many times, can be prevented. At present, PUs are indicators of health care quality in critically-ill patients. According to the reports, the incidence of PUs in the pediatric population ranges from 10.2% to 33%.^{7,10-13} The incidence observed at the PICU of HGNPE in the first phase of the study was higher than that reported by other authors. However, once the analysis was discriminated by stage, it was observed that some studies did not include stage I PUs. In our series, only 1 stage III PU was recorded in the pre-intervention period and none in the post-intervention period.¹⁴ The National Quality Forum considers that stage III, IV, and unstageable PUs developed after admission are a preventable serious adverse event.¹⁴

The risk factors associated with the development of PUs in critically-ill children

include use of AMV, length of stay in the PICU for more than 4 days, need for inotropic support, cardiorespiratory arrest after a cardiovascular surgery, use of extracorporeal membrane oxygenation (ECMO), immobility, nutritional deficiency, and prolonged exposure to hospital devices or invasive catheters and tubes (non-invasive ventilation masks, tracheostomy tubes, etc.).^{5,6,11,15} A large number of PUs (50-60%) in the pediatric population are associated with hospital devices.^{3,16,17}

The most common PU location in our study was in the lower occipital region, followed by the lateral malleolar and the upper occipital regions. This is consistent with the bibliography reports in children younger than 3 years.¹⁸

In our hospital, a bundle of measures was implemented to reduce the incidence of PUs, which included staff training, identification of patients at risk, and pressure relief by using antibedsores mattresses and polymer gel positioners. After the implementation, PU incidence reduced significantly in the post-intervention period, which is consistent with the bibliography.³ No significant differences were observed between the pre-intervention and the post-intervention groups in terms of

FIGURE 2. Number and stage of pressure ulcers by period

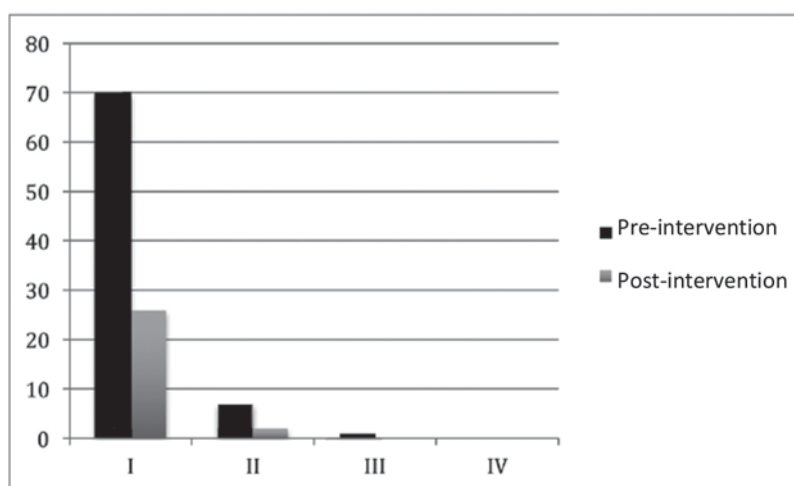


TABLE 2: Intervention results among patient groups

Outcome measure	Pre-intervention group	Post-intervention group	
Ulcers	51.35%	23.08%	$p= 0.001$
Baseline risk score	12 (11-13)	14 (12-14)	$p= 0.001$
Risk score on the day of ulcer onset	13 (12-14)	13 (12-14)	$p= 0.589$
Day of ulcer onset	5 (2-6.5)	4 (3-6)	$p= 0.949$
Highest ulcer stage	1.1 \pm 0.37	1.1 \pm 0.31	$p= 0.477$
Number of ulcers per patient	2.03 \pm 1.16	1.55 \pm 0.69	$p= 0.155$

age, weight, diagnosis at the time of admission, days of AMV or length of stay in the hospital. The only difference between the groups was in relation to the PIM2 score, which was higher in the pre-intervention group; for this reason, a risk-stratified analysis was done. The PIM2 score was dichotomized into ≥ 5 and < 5 . After the stratification, a significant difference was still observed in the incidence of PUs.

The implementation of continuous quality improvement programs, including staff training, better communication, identification of patients at a higher risk for PUs, and the standardization of health care and management procedures, has shown to reduce PU incidence.^{3,12,15,16,19}

In the field of pediatrics, few studies have been published on the implementation of a bundle of measures aimed at decreasing PU incidence. These include the study by Visscher et al.,³ who reported a 50% reduction in the incidence of PUs (pre-intervention: 14.3 x 1000 patient-days; post-intervention: 3.7 x 1000 patient-days, $p < 0.05$) after the implementation of a quality improvement program that included frequent skin assessments and staff training and empowerment. The authors implemented the same program at the neonatal intensive care unit, where it failed to reduce the incidence of PUs, which was explained as a result of introducing a new blood oxygen saturation model in the unit during the same measurement period.

Another study was conducted by Schindler et al.,¹⁵ who reported a reduction in the PU incidence at a PICU in the USA, from 18.8% to 6.8%, after the implementation of a quality improvement program that included staff training, frequent position changes and support surface inspection, and adequate nutrition.

Boesch et al.¹⁶ designed a strategy to reduce the incidence of PUs associated with tracheostomy tubes. The strategy consisted in frequent assessment of the skin and device, reduction of surface moist, and preventing device pressure on the skin. The implementation of the bundle of measures reduced the incidence of PUs (pre-intervention: 8.6%; during the intervention: 2.6%; post-intervention: 0.3%).

Among adults, the studies on quality improvement projects to reduce PU incidence have also reported successful results.^{12,18}

After the implementation of the improvement program, no changes were observed in the rate of higher stage PUs at our unit. This is different from what Tayyib et al.¹² reported in two intensive

care units (ICUs) from Arabia, who reported a reduction in the higher stage PUs in the post-intervention period.

In our study, no significant differences were observed in the day of ulcer onset in both study phases or in the number of ulcers per patient. Coyer et al.¹⁹ reported, in an ICU from Australia, a lower number of PUs per patient and a later PU development during the length of stay in the ICU.

The limitations of this study are, first of all, that this study was carried out at a single site. Second of all, it should not be ruled out that the change in the staff's behavior during the second part of the research was due to their awareness of being actively observed (Hawthorne effect). In the third place, there is no certainty that results are associated with the implemented intervention, given the lack of a control group. In the fourth place, the study periods did not match accurately, although both corresponded to the winter months. Fifthly, although the intervention was fully implemented, the adherence to the bundle of measures was not estimated. Finally, the study does not assess the persistence of the benefit observed in the study over time.

CONCLUSION

A reduction in the development of PUs was observed at the PICU of HGNPE after the implementation of a health care improvement intervention. No changes were detected in the number of PUs or the severity staging. Very few PUs corresponded to stage III or higher. ■

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ANNEX 1: BUNDLE OF MEASURES FOR IMPLEMENTATION

1. TRAINING PROGRAM: 30-minute sessions; participants: all physicians, nurses, and physical therapists working at the department.

It included information on the following:

- PU etiology and risk factors.
- Use of assessment tools, such as the Braden Q scale, to predict the risk for PUs.
- Use of risk assessment categories to establish specific risks and warrant an effective health care planning.
- Skin assessment.
- PU staging.
- Selection and/or use of support surfaces.
- Development and implementation of an individualized skin care program.
- Demonstration of transfer and position changes to reduce the risk for tissue damage.
- Instructions on the accurate documentation of relevant data.
- Roles and responsibilities of health care team members in relation to the assessment and prevention of PUs.
- Skin care.

- *Skin care:*

- The status of the skin should be examined at least once a day.
- The patient's skin should be maintained dry and clean at all times.
- pH neutral soaps or low-irritating cleansing products should be used.
- The skin should be cleaned with warm water, rinsed, and dried carefully without rubbing.
- No alcohol (cologne, etc.) should be used on the skin.
- Bony prominences should not be massaged directly.
- The areas where previous pressure injuries occurred should be closely assessed because these are at a high risk for new injuries.
- Moist, diapers, drains, and vascular accesses should be supervised.
- Pressure should be controlled using the following principles: mobilization, position changes, special support surfaces, and local protection against pressure.
- Position should be changed every 2 hours, avoiding shear and friction.
- Pressure on risky areas should be redistributed: occipital bone, sacrum, ears, heels, nose, etc.
- Linen should be changed daily and as necessary to keep it dry and crease-free.
- The location of monitoring devices should be modified.

2. PRESSURE RELIEF: Using special surfaces to manage pressure; antibedsores mattresses and polymer gel positioners were acquired.

Details of new materials:

- 2 antibedsores air mattresses with adjustable pump, 190 x 80 x 6 cm.
- 12 mini heel positioners, 15 x 8.3 x 4.5 cm.
- 2 donut pillows for pediatric patients, external diameter 14 cm x internal diameter 5.7 cm x height 3.2 cm.
- 2 horseshoe cushions for pediatric patients, external diameter 14 cm x internal diameter 7.5 cm x height 3.2 cm.
- 2 hip/shoulder blade pads, 50.8 x 50.8 x 1.3 cm.

3. ASSESSMENT OF RISK FOR PUs: The Braden Q scale was introduced for daily use. The purpose of the Braden Q scale was to:

- Identify patients at risk for PUs in an early manner.
- Provide an objective criterion for the implementation of preventive measures based on the risk.
- Ensure the effective and efficient allocation of scarce preventive resources.

ANNEX 2. DATA COLLECTION RECORD

SHEET 1

NAME:

AGE:

WEIGHT:

DIAGNOSIS:

BRADEN Q RISK ASSESSMENT SCALE

	Intensity and duration of pressure				
	SCORE				
	MOBILITY	ACTIVITY	SENSORY PERCEPTION		
1	Completely immobile	Bedfast	Completely limited		
2	Very limited	Chair fast	Very limited		
3	Slightly limited	Walks occasionally	Slightly limited		
4	No limitations	Walks frequently	No limitations		
	Tolerance of the skin and supporting structure				
	MOISTURE	FRICTION	NUTRITION	PERFUSION	
1	Constantly moist	Probably important	Very poor	Extremely compromised	
2	Frequently moist	Problem	Inadequate	Compromised	
3	Occasionally moist	Potential problem	Adequate	Adequate	
4	Rarely moist	No problem	Excellent	Excellent	

SCORE: 16-23, at risk; 13-15, moderate risk; 10-12, high risk; < 9, very high risk.

SHEET 2

Date of admission:...../...../.....

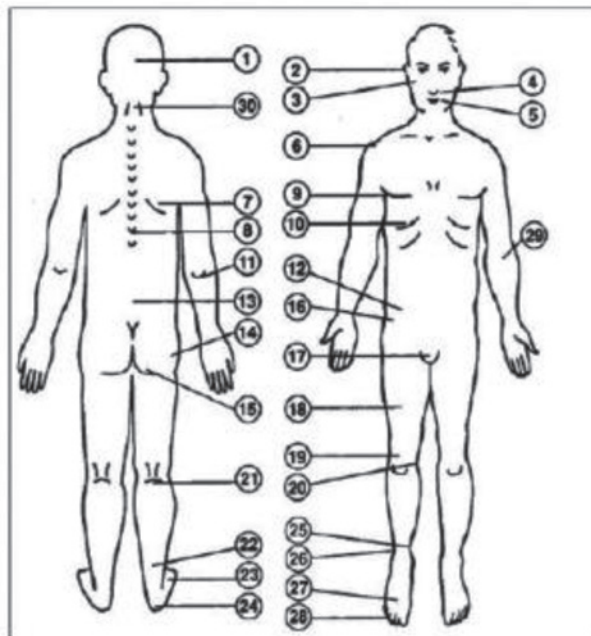
Prior injuries

.....
.....
.....

Remarks

.....
.....
.....

FIGURE 1. Location of pressure ulcers



ANNEX 3: BRADEN SCALE

<i>Intensity and duration of pressure</i>					Score
MOBILITY (The ability to change and control body position)	1. Completely immobile: Does not make even slight changes in body or extremity position without assistance.	2. Very limited: Makes occasional slight changes in body or extremity position but unable to completely turn self independently.	3. Slightly limited: Makes frequent though slight changes in body or extremity position independently.	4. No limitations: Makes major and frequent changes in position without assistance.	
ACTIVITY (The degree of physical activity)	1. Bedfast: Confined to bed.	2. Chair fast: Ability to walk severely limited or non-existent. Cannot bear own weight and/or must be assisted into chair or wheelchair.	3. Walks occasionally: Walks occasionally during day, but for very short distances, with or without assistance. Spends majority of each shift in bed or chair.	4. All patients too young to ambulate or walks frequently. Walks outside the room at least twice a day, and inside room at least once every 2 hours during waking hours.	
SENSORY PERCEPTION (The ability to respond in a developmentally appropriate way to pressure-related discomfort)	1. Completely limited: Unresponsive (does not moan, flinch or grasp) to painful stimuli due to diminished level of consciousness or sedation. Or limited ability to feel pain over most of body surface.	2. Very limited: Responds to only painful stimuli. Cannot communicate discomfort except by moaning or restlessness. Or has sensory impairment that limits the ability to feel pain or discomfort over half of body.	3. Slightly limited: Responds to verbal commands, but cannot always communicate discomfort or need to be turned. Or has sensory impairment that limits the ability to feel pain or discomfort in one or two extremities.	4. No limitations: Responds to verbal commands. Has no sensory deficit that would limit ability to feel or communicate pain or discomfort.	
<i>Tolerance of the skin and supporting structure</i>					
MOIST (Degree to which skin is exposed to moisture)	1. Constantly moist: Skin is kept moist almost constantly by perspiration, urine, drainage, etc. Dampness is detected every time patient is moved or turned.	2. Very moist: Skin is often, but not always, moist. Linen must be changed at least every 8 hours.	3. Occasionally moist: Skin is occasionally moist, requiring linen change every 12 hours.	4. Rarely moist: Skin is usually dry. Routine diaper changes; linen only requires changing every 24 hours.	
FRICTION AND SHEAR (Friction: Occurs when skin moves against support)	1. Significant problem: Spasticity, contracture, itching or agitation leads to almost constant	2. Problem: Requires moderate to maximum assistance in moving. Complete lifting without sliding against sheets is	3. Potential problem: Moves feebly or requires minimum assistance. During a move skin probably slides to	4. No apparent problem: Able to completely lift patient during a position change. Moves in bed and in	

surfaces. <i>Shear</i> : Occurs when skin and adjacent bony surface slide across one another.)	thrashing and friction.	impossible. Frequently slides down in bed or chair, requiring frequent repositioning with maximum assistance.	some extent against sheets, chair, restraints, or other devices. Maintains relative good position in chair or bed most of the time but occasionally slides down.	chair independently and has sufficient muscle strength to lift up completely during move.	
NUTRITION (Usual food intake pattern)	1. Very poor: Nothing by mouth and/or maintained on clear liquids, or IVs for more than 5 days. Or albumin < 2.5 mg/dL or never eats a complete meal. Rarely eats more than half of any food offered. Protein intake includes only 2 servings or less of meat, fish or dairy products per day. Takes fluids poorly. Does not take a liquid dietary supplement.	2. Inadequate: Receives enteral nutrition (nasogastric tube [NGT]) or parenteral nutrition (intravenous), which provide inadequate calories and minerals for age. Or albumin < 3 mg/dL. Or rarely eats a complete meal and generally eats only about half of any food offered. Protein intake includes only 3 servings of meat, fish or dairy products per day. Occasionally takes a dietary supplement.	3. Adequate: Receives enteral nutrition (NGT) or parenteral nutrition (intravenous), which provide adequate calories and minerals for age. Or eats half of most meals. Eats a total of 4 servings of protein (meat, fish, dairy products) each day. Occasionally will refuse a meal, but usually takes a supplement if offered.	4. Excellent: Is on a normal diet providing adequate calories for age. For example, eats most of every meal. Never refuses a meal. Usually eats a total of 4 or more servings of meat, fish or dairy products per day. Occasionally eats between meals. Does not require supplementation.	
TISSUE PERFUSION AND OXYGENATION	1. Extremely compromised: Hypotensive (mean blood pressure [BP] < 50 mmHg; < 40 mmHg in newborn infants). Or the patient does not physiologically tolerate position changes.	2. Compromised: Normotensive; serum pH is < 7.40; oxygen saturation may be < 95%; or hemoglobin may be < 10 mg/dL; or capillary refill may be > 2 seconds.	3. Adequate: Normotensive; blood pH is normal; oxygen saturation may be < 95%. Or hemoglobin may be < 10 mg/dL; or capillary refill may be > 2 seconds.	4. Excellent: Normotensive; oxygen saturation may be > 95%; hemoglobin is normal; and capillary refill is < 2 seconds.	

SCORE: 16-23, at risk; 13-15, moderate risk; 10-12, high risk; < 9, very high risk. (The Braden Q scale was developed to identify the risk for pressure ulcers in children aged 21 days to 8 years old. It contains the 6 original sub-scales from the Braden scale for adults and a seventh sub-scale for tissue oxygenation and perfusion. The cut-off point to determine patients at risk is a score of 16.)

ANNEX 4: PRESSURE ULCER STAGING SYSTEM*

National Advisory Group for the Study of Pressure Ulcers and Chronic Wounds (Grupo Nacional para el Estudio y Asesoramiento en Úlceras por Presión y Heridas Crónicas, GNEAUPP). Pressure ulcer staging system.

STAGE I

An observable pressure-related alteration of intact skin manifested as a non-blanchable erythema of the skin; in darker skin tones, the ulcer may appear with persistent red, blue, or purple hues.

Compared to an adjacent or opposite area on the body not subjected to pressure, it may include changes in one or more of the following parameters:

- Skin temperature (warmth or coolness)
- Tissue consistency (edema, induration)
- And/or sensation (pain, itching)



STAGE II

- Partial thickness skin loss involving the epidermis and/or dermis.
- The ulcer is superficial and presents clinically as an abrasion, blister, or shallow crater.



STAGE III

- Full thickness skin loss involving damage or necrosis of subcutaneous tissue that may extend down to, but not through, underlying fascia.



STAGE IV

- Full thickness skin loss with extensive destruction; tissue necrosis; or damage to muscle, bone, or supporting structure (such as tendon, joint capsule, etc.).
- In this stage, as in stage III, injuries may occur with caverns, tunneling or sinuous paths.



In all cases, necrotic tissue should be removed before determining ulcer stage, if applicable.

* Pictures taken for teaching purposes as authorized by the National Advisory Group for the Study of Pressure Ulcers and Chronic Wounds (Grupo Nacional para el Estudio y Asesoramiento en Úlceras por Presión y Heridas Crónicas, GNEAUPP) Classification-Staging of Pressure Ulcers. Logroño. 2003. hup1/gneaupp.inrolsecclonlbanco-de-Imaga.,osl.