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SYSTEMATIC REVIEW OF THE USE OF SCALES TO ASSESS THE RISK OF PRESSURE INJURIES IN NEONATES IN THE LAST 10 YEARS

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Abstract: Pressure injuries or pressure ulcers can affect all hospitalized users, regardless of age. However, at extreme ages, neonates and the elderly, they can become more harmful, directly affecting the user's recovery, increasing hospital stay, and increasing the economic cost. For this reason, strategies for its prevention have been implemented worldwide, such as metric scales to assess the risk of pressure injuries, but most of them have been investigated and validated in the adult population, and only for a few years have the importance that this type of problem deserves, in the pediatric and neonatal population, creating scales that evaluate this risk and conducting research in this regard. In Chile, the prevention of pressure injuries is part of the quality and safety of user care, and therefore the use of metric scales is recommended for their assessment, but there is no consensus on which scale can be used in the neonatal population. Nor are validated scales found in this type of population, since neonates, especially premature ones, are users who, due to their physical characteristics, are more prone to acquiring this type of injury. For this reason, in order to contribute to updating knowledge on this matter and directly or indirectly influence the management of nursing care for neonatal patients, this descriptive systematic review is carried out, under the Prisma P methodology, analyzing prospective studies. from different databases that study pediatric and/or neonatal scales, in such a way as to carry out an analysis, and according to the results, recommend the most appropriate scale to use to prevent pressure injuries in this type of users.

INTRODUCTION

At present, nursing is a practical science that has enormous implications in the health sector worldwide, nursing management has been essential to improve health care

processes, related to quality and safety in care, participating in training and organization of committees, creation of protocols, among other tasks.

Health quality is fundamental, since it allows the delivery of user care based on updated scientific knowledge, efficiently and safely, aiming to generate a maximum degree of patient satisfaction (1).

Quality care is that which "identifies the health needs of individuals or the population in a complete and precise manner and allocates the necessary resources (human and other) to these needs in a timely manner and as effectively as the current state of the health system." knowledge allows" (1). In Chile, with the new health reform, quality health care is part of this model of health guarantees, in the context of Law No. 20,584 of 2012, which regulates the rights and duties that people have in relation to with actions related to their health care. Exempt Resolution No. 1031 of 2012 of MINSAL (2), approved protocols and regulations on Patient Safety and Quality of Health Care.

The skin of a newborn is more edematous in the first days of life, but the degree of development of this varies according to the gestational age that the newborn presents at the time of birth, the stratum corneum and other systems of the body in premature infants. poorly developed, compared to a term newborn. Ergo, in all neonates there is greater exposure to humidity, since there is no control of the bladder or fecal sphincter, nor can the neonate change body position by itself, even this can vary depending on its severity (3). Being hospitalized, these patients are often classified as having a high risk of acquiring a pressure ulcer, without considering the aforementioned factors, because there is no unification or consensus on which scale can be used to measure the risk of pressure injuries. This evaluation is subject to the

personal criteria of the nursing professional. There are precedents that some hospitals use a scale designed for the neonatal population, but this has not been validated in the Chilean context either.

To measure risk in hospitalized patients, the Chilean Ministry of Health recommends the use of instruments, which currently in Chile are the Braden, Norton, and Emina scales, all of them validated and designed for adults (4).

In accordance with the aforementioned, the need arises to carry out a systematic review, to provide a scientific analysis, a critical assessment of the scales and a synthesis of scientific evidence in such a way as to contribute to the improvement in the quality and efficiency of the care of these users, providing a guide on which instrument is most suitable for use in the neonatal population, and thus continue promoting safe practice in the care provided to patients

Therefore, the purpose of this research was to carry out a systematic review of the use of scales to assess the risk of pressure injuries in neonates in the last 10 years, with the following research question: Which of the metric scales to measure pressure injury risk? Pediatric and neonatal pressure injuries is more valid and reliable to be applied in neonatal clinical practice within the Chilean context?

The general objective of the research was to analyze the validity and reliability of pressure injury risk assessment scales used in pediatric and neonatal patients.

PATIENTS AND METHODS

TYPE OF STUDY

Descriptive systematic review of the scientific literature at the national and international level of articles published from 2010 to 2020, where scales are analyzed or

validated to assess the risk of pressure injury in the neonatal and pediatric population.

Population: neonatal and pediatric.

STUDY DESIGN

This research was structured according to the Prisma P (5) methodology, which consists of a checklist with 17 items, classified into seven sections that allows planning the systematic review, under a protocol and thus reducing bias in the selection of studies.

For the definition of the research question and keywords, the PICO format was established, including as a search strategy, combinations of the keywords defined for the study and incorporating Descriptors in Health Sciences (DeCS) and Medical Subject Headings (Mesh) along with AND and OR Boolean operators.

SEARCH STRATEGY

A bibliographic search was carried out among all the scientific production related to the risk assessment of pressure ulcers or pressure injuries in the neonatal and pediatric population, from November 1, 2020 to November 30, 2020, without language restriction. The following databases were consulted: Cochrane, Pubmed, Science Direct, Scopus, EBSCO, WOS, Scielo, Virtual Health Library.

The terms used as search descriptors were: pressure ulcer or skin ulcer, validation or validity or validation studies, infant or baby or newborn or neonate, risk assessment, as well as the Boolean operators OR and AND.

SELECTION OF DOCUMENTS

To analyze the validity and clinical effectiveness of the scales and compare them with clinical judgment, the following were included: Controlled clinical trials and prospective cohort studies, studies that did not exceed 25% of patients lost to follow-up,

investigations that have provided validity data predictive of the scales (sensitivity and specificity) and/or predictive capacity (RR) and/or reliability, scientific articles that are fully available for reading and analysis.

ITEM EXCLUSION CRITERIA

Articles not published in scientific journals were excluded, as there was no guarantee of having passed an initial methodological quality filter from the reviewers of scientific journals. In addition, studies that did not present description and/or validation data of the scales were excluded.

The EndNote bibliographic manager was used to order the articles.

The initial search generated 73 results. In a second instance, a pre-selection was made, according to the inclusion and exclusion criteria, which could be found in reading the abstract of each article.

In the pre-selection of articles, 2 articles were excluded due to lack of abstracts, 5 due to being based on expert opinion, , 11 due to main topic outside the study objective and 9 retrospective studies.

The final selection of the studies was made through the construction of a decisional matrix, characterizing each document according to whether or not it met the defined inclusion criteria.

ANALYSIS OF THE INFORMATION

After the selection of the articles according to the inclusion criteria, the critical reading of each investigation began, using the CASP (Critical appraisal skills program) checklist tool for cohort studies, which consists of 12 questions, divided into three large sections to help analyze the research, and facilitate objective evaluation and possible methodological and results biases (6).

RESULTS AND DISCUSSION

Of the 12 selected studies (See Table 5, summary results in Annex 1), the most researched scales are Braden Q(7,8), Glamorgan(9,10), Braden Q neonatal/infant(11,12), NSRAS(13,14,15).

Chiari (7) and Carvalho (8) validated the Braden Q scale in the population of infants and children, although the study by Carvalho(8) obtained better general statistical results, and both resulted in a valid and reliable scale, according to the results obtained by age group in Chiari's research (7), it would be better to use it in children than in infants, and therefore it is not one of the scales that would be recommended for use in the evaluation of pressure injuries in the neonates.

Most of the studies on the Glamorgan scale have been carried out in the population of children and young people, so it would not be advisable to use it in the neonatal population either, in addition, the Kottner (10) study did not obtain good inter-rater reliability results.

Lima (11) and Baltaci (12) in their studies carried out in Brazil and Turkey, respectively, with the neonatal/infant Braden Q scale, found high interobserver reliability indices and good intraobserver reliability. The instrument obtained content and nominal validity according to a group of professionals in Brazil, likewise in the Turkish research it had good internal consistency. Although the scale was valid and reliable in both studies, the study carried out by Lima (11) had a very small sample of participating subjects.

García-Molina, Sari, Martins (13, 14, 15) carry out research in the neonatal population to validate the NSRAS scale in different cultural contexts (Spain, Turkey and Portugal) and with an adequate sample size, in all the studies it was a valid instrument and reliable. All the authors obtain similar values in the statistical analyses, which show the high reliability of the scale, good internal consistency, and good

Table 1: RESEARCH QUESTION (PICO FORMAT)	
Question: RESEARCH QUESTION (PICO FORMAT)	
Research question	Which of the scales to measure the risk of pediatric and neonatal pressure injuries is more valid and reliable to be applied in neonatal clinical practice within the Chilean context?
Population	Result
Intervention	Pressure injury risk measurement
Comparator	Assessment scales for ulcers or pressure injuries
Result	Results of validation studies

Table 2: Keywords (pico format)	
	Keywords (pico format)
Acronyms	Palabras DeCS/MeSH
P	Infant, baby, newborn, neonate
I	Risk assessment
C	Pressure ulcer, skin ulcer
O	Validation, validity, validation studies

Table 3: bibliographic search bases			
bibliographic search bases			
Database	Total number of articles	Pre-selected articles	Selected articles
EBSCO	20	11	9
Pubmed	13	3	1
Sciadirect	9	1	0
Scopus	10	1	1
Web of Science	8	0	0
Biblioteca virtual en Salud	10	0	0
Scielo	2	1	1
Cochrane	1	0	0
Total	73	17	12

Table 4: Articles excluded in the phase of pre-selection

Articles excluded in the phase of pre-selection

Database	Without access to abstract	Articles focused on opinion or improvement of practice	Doubled	Main topic outside the scope of the review	Articles with retrospective study
EBSCO	2	2	0	3	2
Pubmed	0	2	6	0	2
Scencedirect	0	0	1	7	0
Scopus	0	0	7	0	2
Web of science	0	0	7	0	1
Biblioteca virtual en salud	0	1	7	0	2
Scielo	0	0	0	1	0
Cochrane	0	0	1	0	0
Total	2	5	29	11	9

sensitivity and specificity values.

CONCLUSIONS

The importance of quality and user safety in health care leads us to consider the relevance of the risk of pressure injuries in hospitalized patients.

In this descriptive systematic review, 12 prospective studies from different databases were selected and analyzed, where the psychometric properties of different pressure risk assessment scales in neonates and/or pediatric users were analyzed. The methodological quality of the studies found was reviewed using the Critical Appraisal Skills Program (CASP) guideline for clinical trials or cohort studies. Although the studies

found use different statistical analysis methodologies, it has been considered that, according to the sample size, the participating subjects, data collection, statistical values, among other aspects, the most recommended scale to use to assess the risk of pressure injuries in neonates is the NSRAS.

Therefore, responding to the research question posed at the beginning of this review, it would be advisable to use the NSRAS in hospitalized neonates, but a cross-cultural adaptation must be carried out in the Chilean context, in order to validate this scale in the country, and thus improve the quality and safety of user care, also promoting research at the Latin American level and thus enriching the management of nursing care.

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ANNEX 1: Table 5 summary results

SCALE	NSRAS		
INVESTIGATION	Sari, Altay. Turquía, 2017	Martins, Curado. Portugal, 2017	García-Molina, et al. España, 2018
POPULATION AND SAMPLE SIZE	17 neonatos hospitalizados en UCIN, de un hospital en Turquía (130 observaciones)	131 neonatos hospitalizados en distintos centros de salud de Portugal	336 neonatos en la primera etapa y 268 en la etapa 3, de distintos hospitales de España
METHODS AND STATISTICAL RESULTS	<ul style="list-style-type: none"> • Content validity with Davis technique • Construct validity with KMO:0.73 test and Bartlett's sphericity test. • Internal consistency: Cronbach's alpha 0.88 • ROC (sensitivity and specificity) sub-elements with ROC greater than 0.7 • Inter-rater reliability with Spearman's correlation coefficient 0.95. Confidence interval 0.95% 	<ul style="list-style-type: none"> • Interobserver reliability, concordance greater than 80%. • Sensitivity of the items was evaluated by coefficient of asymmetry and kurtosis and the respective critical reasons. Factor weights greater than 0.4 • Convergent validity by variance extracted from the average 0.524 • Set point value 15 <p>The reliability of the NSRAS factor, according to Cronbach's alpha 0.787, construct reliability 0.865</p>	<ul style="list-style-type: none"> • Content validation, Aiken coefficient 0.93 • Construct validity per KMO: 0.74 • Internal consistency with Cronbach's Alpha 0.73 for the first factor and 0.74 for the second. • ICC interobserver reliability 0.97 (95% CI) and ICC intraobserver reliability 0.93. • ROC curve 0.84 • Sensitivity 91.18% • Specificity 76, 50% • Positive predictive value 36.05% • Negative predictive value 98.35% Set point value 17

SCALE	BRADEN Q NEONATAL/INFANTIL	
INVESTIGATION	Lima et al. Brasil,2016	Baltaci et al. Turquía,2020
POPULATION AND SAMPLE SIZE	50 neonates hospitalized in the NICU, from a hospital in Brazil.	114 neonates from an intensive care unit of the medical faculty of the University of Ege (201 evaluations).
METHODS AND STATISTICAL RESULTS	<ul style="list-style-type: none"> • Reliability with Pearson's correlation coefficient (r) and the intraclass kappa correlation coefficient, inter-rater 0.98, intra-rater 0.79. • Nominal validity, as well as content validity by multidisciplinary team. The average content relevance index was > 4.0 • Construct validity was assessed by convergent and discriminant validity analysis (Manne-Whitney U test). • Internal consistency with Cronbach's Alpha 0.939 Confidence interval 0.95 	<ul style="list-style-type: none"> • Content validity, Davis technique • Confidence interval 0.95 • Internal consistency by Cronbach's Alpha 0.896 • There was no significant difference in the mean scores of the median and the interquartile range on the interobserver scale, nor in the total score. The correlation coefficient between the two scales (compared to the NSRAS) of the measures of nurses and responsible nurses with test-retest was high and the correlation between them was highly significant (p <0.001).

SCALE	BRADEN QD	
INVESTIGATION	Curley et al. Estados Unidos,2018	
POPULATION AND SAMPLE SIZE	625 subjects, neonates, and youth hospitalized at 8 pediatric centers in the United States (2049 observations).	
METHODS AND STATISTICAL RESULTS	<ul style="list-style-type: none"> • Cut-off value of 13 • AUC was 0.72 (95% CI 0.67 to 0.78) • Sensitivity 86% • Specificity 59% • PPV 0.15 • NPV 0.98 Children older than 8 years (AUC 0.83); and non-intubated patients (AUC 0.77).	

SCALE	SRMAT	
INVESTIGATION	Broom et al. Australia,2019	
POPULATION AND SAMPLE SIZE	63 neonates from a tertiary NICU in Australia (248 evaluations)	
METHODS AND STATISTICAL RESULTS	<ul style="list-style-type: none"> • 95% confidence interval • AUC 0.936 • Cutoff value 19 points • Sensitivity 90% • Specificity 88.46% 	

SCALE	BRADEN QD AND GLAMORGAN COMPARISON	
INVESTIGATION	Willock et al.2016	
POPULATION AND SAMPLE SIZE	212 neonatal and pediatric patients from a hospital in Jordan and 301 from a hospital in Australia	
METHODS AND STATISTICAL RESULTS	<ul style="list-style-type: none"> • AUC: Braden Q (0.820) Glamorgan (0.748) 95% confidence intervals overlapped considerably: Glamorgan 0.673,0.822 and Braden Q 0.760, 0.880.	

SCALE	BRADEN Q	
INVESTIGATION	Chiari et al. Italia, 2012	Carvalho et al. Brasil, 2015
POPULATION AND SAMPLE SIZE	157 patients, infants and children hospitalized in intensive and sub-intensive care of Italian hospitals. (524 observations)	79 patients, infants and children hospitalized in two Pediatric Intensive Care Units in two public hospitals in Brazil.
METHODS AND STATISTICAL RESULTS	<ul style="list-style-type: none"> • Internal consistency with Cronbach's Alpha 0.71 • Cutoff value 20 points • AUC: Children 3 to 8 years 0.714 Infants: Very varied, not useful • Sensitivity 72% sub-intensive care unit. • Specificity 92% • PPV 76% • NPV 90% Confidence Interval 95 	<ul style="list-style-type: none"> • Internal consistency with Cronbach's Alpha 0.915 • Cutoff value 17 points • AUC:0.77 • Sensitivity 81.82% • Specificity 69.35% • PPV 32.14% • NPV 95.56% • Confidence interval 95% • ICC 0.82

	GLAMORGAN SCALE	
INVESTIGATION	Willok J. Reino Unido,2013	Kottner et al. Alemania,2014
POPULATION AND SAMPLE SIZE	27 children and young people (open data) 55 children and young people (concealed data), admitted to a university hospital in the United Kingdom.	30 children, hospitalized (90 observations) in Hospital de Alemania.
METHODS AND STATISTICAL RESULTS	<ul style="list-style-type: none"> • Spearman's correlation 0.976(open data) and 0.727(concealed data) • Cohen's kappa coefficient 0.867 (open data) and 0.763 (concealed data) • Sensitivity 98.4% • Specificity 64.7% • Cut-off value of 15 points. • AUC 0.92 	<p>ICC of 34%.</p> <p>Concordance for the scores of the sum of the scale was 48%.</p> <p>Construct validity was shown by means of a scatter diagram and by Pearson's r it was 0.68 (it was correlated with a visual scale)</p>