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Original article

Evaluación continua del dolor en la unidad de terapia intensiva del Centro Médico Naval: un acercamiento a métodos de valoración y escalas

Continuous assessment of pain in the intensive care unit of the Naval Medical Center: an approach to assessment methods and scales

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Resumen

Introducción: el dolor es *"una experiencia sensitiva y emocional desagradable que se asocia a una lesión tisular real o potencial"*.[1] La Organización Mundial de la Salud establece una clasificación del dolor de acuerdo a sus múltiples características. Asimismo, existen distintas escalas validadas a nivel internacional para establecer niveles de dolor.

Objetivo: evaluar mediante tres escalas el nivel de dolor de pacientes en estado crítico con ventilación mecánica y protocolo de sedoanalgesia durante la realización de cuatro procedimientos, con el fin de conocer si las medidas analgésicas empleadas son eficientes para mitigarlo o suprimirlo.

Material y métodos: se evaluó el nivel de dolor en procedimientos como aspiración de secreciones, movilización, instalación de sondas y catéteres, y curación de heridas. La valoración incluyó la analgesia farmacológica de base y la administrada en bolos, además, se midieron las variables fisiológicas 5 minutos antes, durante y 10 minutos después de la realización de los procedimientos. Las puntuaciones obtenidas se clasificaron conforme tres escalas indicadoras de dolor (BPS, CPOT y ESCID).

Resultados: Antes del procedimiento la mayoría de los pacientes tenían una expresión facial relajada (48.4%, n=14), durante, predominó una expresión facial parcialmente contraída (48.3%, n=14), y además se presentaron seis casos en que se observaron muecas de dolor (20.7%). Después del procedimiento la expresión facial de los pacientes volvió a estar en su mayoría relajada (75.9%, n=22). Se observó que los picos de dolor se presentan principalmente durante los procedimientos

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pese a la administración de medidas farmacológicas; se encontró un comportamiento similar según las escalas ESCID y CPOT.

Conclusión: Los procedimientos que con más frecuencia causan dolor son la movilización y aspiración de secreciones; el que produce menos dolor es la instalación de sondas. Las escalas CPOT y ESCID suelen ser más precisas, pues cuentan con una mayor cantidad de categorías de clasificación. La escala BPS contabilizó al total de la muestra como sin dolor, mientras que la CPOT sólo colocó en esta categoría a 18 personas.

Palabras clave: dolor, Unidad de Cuidados Intensivos, escalas de valoración del dolor, BPS, ESCID, CPOT, analgesia.

Abstract

Introduction: Pain is *"an unpleasant sensory and emotional experience that is associated with actual or potential tissue injury"*.[1] The World Health Organization establishes a pain classification according to its multiple characteristics. Likewise, there are different internationally validated scales to establish pain levels.

Objective: to evaluate the pain level of critically ill patients with mechanical ventilation and sedoanalgesia protocol during four procedures using three scales, to determine whether the analgesic measures used efficiently mitigate or suppress pain.

Material and methods: The pain level in procedures such as secretion aspiration, mobilization, catheter and catheter installation, and wound healing was evaluated. The assessment included basic pharmacological analgesia and bolus analgesia, and physiological variables were measured 5 minutes before, during, and 10 minutes after the procedures were performed. The scores obtained were classified according to three pain indicator scales (BPS, CPOT, and ESCID).

Results: Before the procedure, most patients had a relaxed facial expression (48.4%, n=14). During the procedure, a partially contracted facial expression predominated (48.3%, n=14), and there were also six cases in which pain grimaces were observed (20.7%). After the procedure, the facial expression of the patients was mostly relaxed again (75.9%, n=22). It was observed that pain peaks occurred mainly during the procedures despite the administration of pharmacological measures; similar behavior was found according to the ESCID and CPOT scales.

Conclusion: The procedures that most frequently cause pain are mobilization and aspiration of secretions; the procedure that causes the least pain is the installation of probes. The CPOT and ESCID scales tend to be more accurate, as they have more classification categories. The BPS scale counted the entire sample as pain-free, while the CPOT only placed 18 people in this category.

Keywords: pain, Intensive Care Unit, pain rating scales, BPS, ESCID, CPOT, analgesia.

Introduction

One of the most widely accepted definitions of pain is provided by the International Association for the Study of Pain: *"an unpleasant sensory and emotional experience that is associated with actual or potential tissue injury"*.[1] These sensations are intimately related to the pain receptors of the nervous system, known as nociceptors. The presence of pain constitutes both an afferent and efferent pathway, and certain stimuli, including physical, chemical, or even psychological, can precipitate the onset or prolongation of pain.[2]

Shahnaz Ayasrah points out that critically ill patients hospitalized in intensive care units (ICU) have uncontrolled pain rates of 50% even at rest. Likewise, the performance of multiple, continuous, and frequent processes, such as mobilization, transfer to other areas, installation of probes or catheters, in addition to physical examination, nursing care, and waiting time for diagnostic interventions, as well as the underlying health condition, is related to a significant increase in the pain process.[2]

Types of pain

The importance of recognizing and classifying pain according to its characteristics is that it can be treated specifically, using pharmacological and non-pharmacological measures, to reduce it if the underlying cause cannot be eliminated.[3]

The World Health Organization (WHO) establishes a series of useful elements to classify pain according to several aspects.[3]

Table 1. Classification of types of pain based on WHO criteria.

Duration	Acute	Limited concerning time and with little psychological component.
	Chronic	Unlimited in duration and accompanied by a psychological component.
Pathogenesis	Neuropathic	Caused by a direct stimulus of the central nervous system or by injury to the peripheral nerve pathways.
	Nociceptive	Somatic: occurs due to abnormal excitation of superficial or deep somatic nociceptors. It is characterized by being localized, throbbing, and radiating along nerve pathways.
Course	Continuous	It does not disappear throughout the day and is persistent.
	Irruptive	It is a transient exacerbation of pain in well-controlled patients with stable background pain.
Intensity	Slight	When normal activities can still be carried out.
	Moderate	When it requires treatment with minor opioids and causes interference with usual activities.
According to pharmacological treatment	Responds well to opioids	For visceral and somatic pain.
	Partially sensitive to opioids	Bone pain and pain due to compression of peripheral nerves; it is convenient to make associations with other analgesic groups, such as NSAIDs or steroids.
	Low sensitivity to opiates	Pain due to spasms of the striated musculature and infiltration or destruction of peripheral nerves; tends to respond to antidepressant or anticomic drugs.

Note: Adapted from the WHO classification and according to the characteristics of each category.[3]

As previously mentioned, proper identification of the mechanisms of pain and its classification will allow the establishment of adequate therapeutic measures to achieve its reduction or remission.

Pain is a condition suffered by most patients admitted to an intensive care unit. It is frequently associated with the pathophysiological conditions in which they find themselves, in addition to the fact that, due to their critical condition, they are subjected to prolonged invasive procedures (mechanical ventilation, placement of catheters, probes, drains, mobilizations, among others) or periods of sedation or anxiolysis. For these reasons, patients temporarily lose the ability to express themselves verbally. Different studies have shown that this loss is the main reason why pain assessment tends to be displaced to the background.

Pain assessment scales

The assessment of pain in a critically ill patient who cannot express himself verbally involves the difficulty of determining the presence or even the level of pain. Through the application of assessment scales, a trained health professional will provide care focused on limiting this condition's onset and its physiological consequences. This method is of utmost importance, as it allows providing adequate care to refer to the painful condition and eliminate its source. The treatment of pain often involves the prescription of analgesics, taking into account the age and sex of the patient, the triggering etiology, and the clinical variables that may lead to prolonging the pain.

As a sign of subjective nature, the classification of pain has resorted to instruments that make it a measurable element.[4]

Behavioral Pain Scale (BPS)

The Behavioral Pain Scale is an assessment tool for patients undergoing mechanical ventilation and deep sedation. It is widely used and its degree of reliability has been validated

Table 2. Items evaluated according to the Behavioral Pain Scale (BPS)

Facial expression	*Score*
Relaxed	1
Partially contracted	2
Strongly contracted	3
Grimace of pain	4
Upper limb movement	***Score***
No movement	1
Partially flexed	2
Strongly flexed with finger flexion	3
Permanently flexed	4
Adaptation to mechanical ventilation	***Score***
Tolerates mechanical ventilation	1
Coughs, but tolerates MV most of the time	2
Fights with the fan	3
Impossible to ventilate	4

Note. Score indicates: greater than or equal to 6 = presence of pain; greater than or equal to 7 = excruciating pain; less than 6 = objective.

by multiple studies. The scale assesses the items shown in Table 2.

The BPS represents one of the most appropriate scales in terms of its psychometric properties and high-reliability score. Likewise, its use facilitates decision-making concerning pain management interventions, and constitutes a parameter linked to the titration of analgesic drugs and to the duration of mechanical ventilation, sedation, and days of in-hospital stay.[5]

Critical-Care Pain Observation Tool (CPOT)

This scale was developed based on a series of multicenter studies conducted by Gélinas (2007), in which a total of 93 patients were interviewed about their experience with pain in the Intensive Care Unit. About 65.6% of the patients reported having had mechanical ventilation, and about 77.4% recalled having pain during the time of the procedure.[6]

Table 3. Items evaluated according to the Critical-Care Pain Observation Tool (CPOT)

Facial expression	***Score***
Relaxed	0
Tense	1
Grimaces	2
Body movement	***Score***
No movement	0
Slow and cautious, asks for attention	1
Restless, pulls the tube	2
Muscle tone	***Score***
Relaxed	0
Tense, rigid	1
Very tense or stiff	2
Adaptation to the fan	***Score***
Adapted	0
Coughs, but tolerates	1
Fights with the fan	2
Vocalization (extubated)	***Score***
Speaks in a normal tone	0
Sighs, moans	1
Screams, cries	2

Note. The score indicates: 0 = minimum pain; 8 = maximum pain.

Pain Indicator Behavior Scale (ESCID)

Scale created in 2011 by Latorre,[7] defines in a precise and quantified way each of its items to minimize the subjectivity of the observer

Table 4. Items evaluated according to the Pain Indicator Behavior Scale (ESCID)

Musculatura facial	***Score***
Relaxed	0
Tense, frowning	1
Habitual frowning, clenched teeth	2
Peace of mind	***Score***
Relaxed, normal movements	0
Occasional fidgeting, restlessness and/or posturing	1
Frequent movements, including head and limbs	2
Muscle tone	***Score***
Normal	0
Increased flexion of fingers and toes	1
Rigid	2
Adaptation to mechanical ventilation	***Score***
Tolerates mechanical ventilation	0
Coughs, but tolerates mechanical ventilation	1
Fights with the fan	2
Comfort	***Score***
Comfortable, quiet	0
Calms to touch and/or voice. Easy to distract	1
Difficult to control by touch or speech	2

Note. The score indicates: 0 = no pain; 1-3 = mild to moderate pain; 4-6 = moderate to severe pain; 6 = very severe pain.

Scales are a valuable tool for assessing pain in patients hospitalized in the intensive care unit. Since it represents a sensitive topic, further studies are required.

Material and methods

A descriptive and longitudinal study was carried out, in which a pain assessment was applied to critically ill patients, with mechanical ventilation and sedoanalgesia protocol, of the ICU. Three scales were applied (BPS, CPOT, and ESCID), which together with the recording of physiological variables, helped to determine the presence of pain during the performance of four potentially painful procedures, including aspiration of secretions, mobilization, wound healing and installation of probes or catheters. The information was compiled in an Excel

spreadsheet for subsequent analysis in the IBM Statistics SPSS 22.0 program. All changes obtained in the score of the different scales were entered on a record sheet, in addition to the patient's sociodemographic data. The type of pharmacological analgesia the patient was undergoing as part of his or her treatment and the type of administration used to achieve analgesia were also included. Likewise, analgesic boluses and continuous intravenous infusion during the procedure were recorded and the patient's level of sedation was included according to the Richmond Agitation-Sedation Scale (RASS), which is useful and accurate for measuring such levels and is valid for both ventilated and non-ventilated patients.

The data collection sheet included a section to specify what type of procedure was being performed in the pain assessment:

1. Mobilization due to lateralization or for hygiene (change of sheets).
2. Healing of wounds, regardless of their location.
3. Aspiration of tracheobronchial secretions.
4. Catheter or catheter installation: urinary drainage catheter, orogastric catheter, nasogastric catheter or transrectal catheter installation, central venous catheter installation.

The last section included a space for recording the patient's physiological variables, considering:

1. Heart rate
2. Respiratory frequency
3. Blood pressure
4. Diaphoresis
5. Lacrimation

Data were collected from a sample of 29 patients, obtained through convenience sampling and according to inclusion and exclusion criteria. The patient admission criteria of the NOM-025 SSA-2013, specific for the organization and operation of intensive care units,8 were also considered.

Results

Sociodemographics

A prevalence of male patients was observed (51.7%), as well as an age range from 28 to 83 years with a mean of 56.9 years and a standard deviation of 17.79 years. The main pathologies (Table 5) were grouped in the category Other (44.8%), and included polytrauma, renal and hepatic failure; the rest of the sample presented some type of shock or sepsis (17.2%) or had been admitted for post-surgical care (17.2%). The length of in-hospital stay ranged from 3 to 10 days.

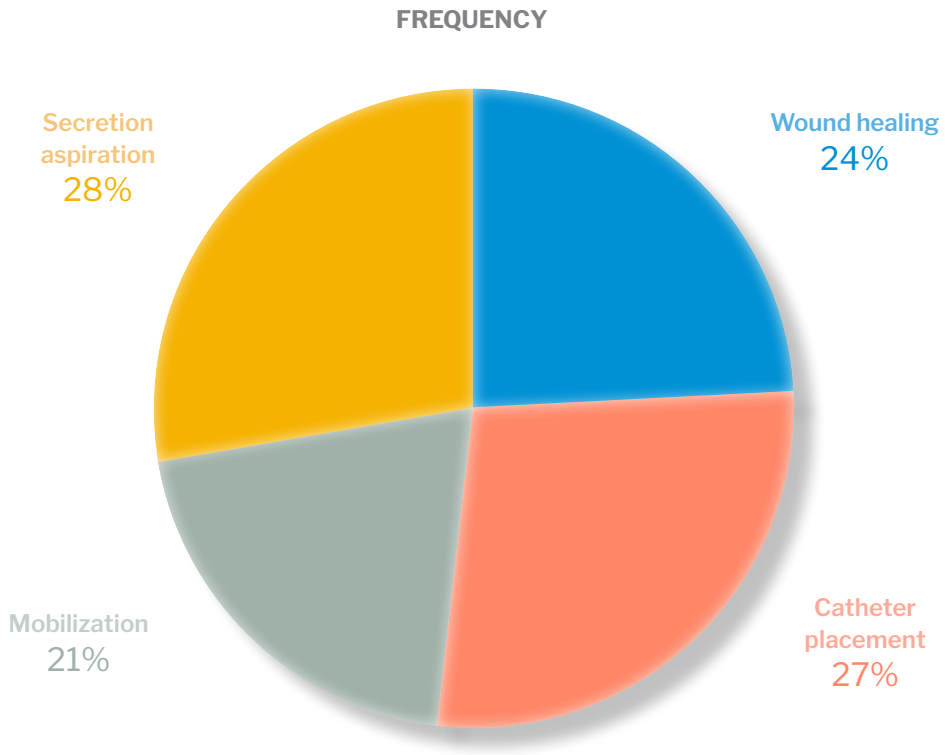
Table 5. Main pathologies of the patients included in the study

Diagnosis	*Frequency*	*Percentage*
Metabolic syndrome	2	6.9
Severe cranioencephalic trauma	4	13.8
Shock/sepsis	5	17.2
Others	13	44.8
Post-surgical	5	17.2
Total	**29**	**100**

Procedures

On examining the four procedures in the study, it was found that the installation of probes and catheters and secretion aspiration were the most common, with a total of eight cases each (Graph 1). However, taking the three scales as a cut-off point, secretion aspiration and mobilizations showed more pain.

Graph 1. Percentage of the sample corresponding to each of the procedures.



The results of the three scales showed that secretion aspiration and mobilization were the procedures that caused more pain and greater intensity; on the contrary, the installation of probes caused less pain and less intensity. Also, it was observed that before the procedure most of the patients had a relaxed facial expression (48.4 %, n=14), while during the procedure a partially contracted facial expression predominated (48.3 %, n=14). In addition, in six cases pain grimaces were observed (20.7%). After the procedure, the facial expression of the patients was mostly relaxed again (75.9 %, n=22).

Behavioral Pain Scale (BPS)

A calculation was made of the mean with the score obtained according to the BPS before, during, and after the procedure. It was also identified that during the procedure the presence of pain was greater, since the mean was 7.07, while before and

after the procedure it was 5.69 and 2.83, respectively.

Table 6. Mean of the scores obtained with the application of the BPS

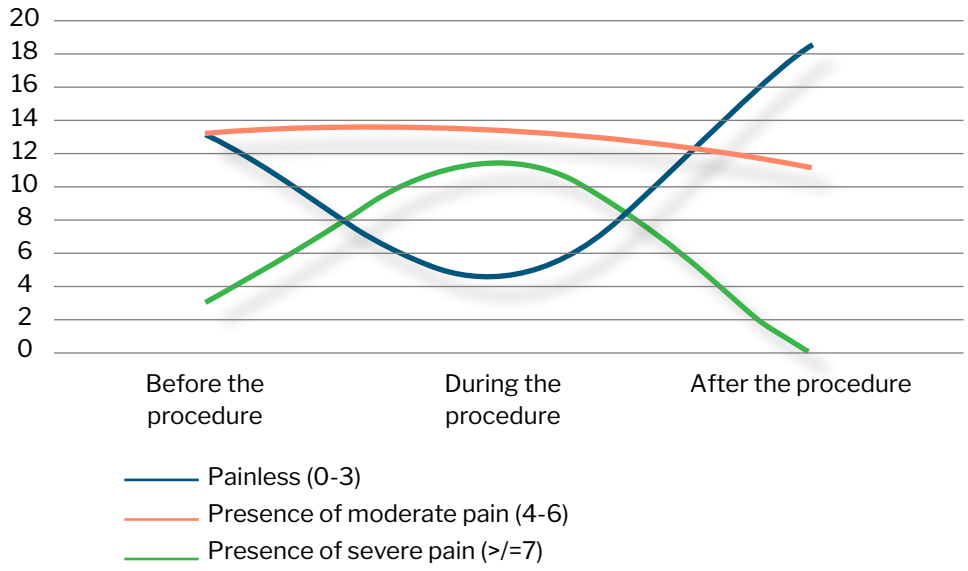
	N	*Minimum*	*Maximum*	*Media*	*Deviation*
Before the procedure	29	3	10	5.69	1.873
During the procedure	29	4	10	7.07	1.831
After the procedure	29	0	5	2.83	1.441

Before and after the procedure, the absence of pain predominated in the patients. During the procedure, the presence of pain was recorded in 75.9% (n=22).

Critical Care Observation Tool (CPOT)

The presence of severe pain was only present in three patients before the procedure, 10.3% of the total sample. However, during the procedure it increased, being present in 11 patients (37.9%). The presence of moderate pain remained constant before and during the procedure (44.8%). Finally, most patients did not present pain after the procedure (62.1%, n=18). As shown in Graph 2, the number of patients without pain predominated before and after the procedure. However, during the procedure the curve is inverted.

Graph 2. Presence of pain based on the CPOT scale.



Pain Indicator Behavior Scale (ESCID

Before the procedure, 37.9% of the patients were observed to have relaxed facial muscles; the same percentage showed tension or frowning. When the interventional procedure was performed, 41.4% of the participants showed tension and frowning and 58.6% presented clenched teeth; no patient showed a relaxed expression. At the end of the procedure, those with relaxed facial musculature predominated (62.1%, n=18).

Table 7. Media de las puntuaciones obtenidas con la aplicación de la ESCID

	N	*Minimum*	*Maximum*	*Media*	*Deviation*
Before the procedure	29	0	9	3.72	2.644
During the procedure	29	1	10	6.38	2.382
After the procedure	29	0	6	2.55	1.920

Before the procedure, patients suffered mild to moderate pain in 37.9% of cases. During the intervention, the majority presented severe pain (51.7%, n=15) and moderate to severe pain (31%, n=9).

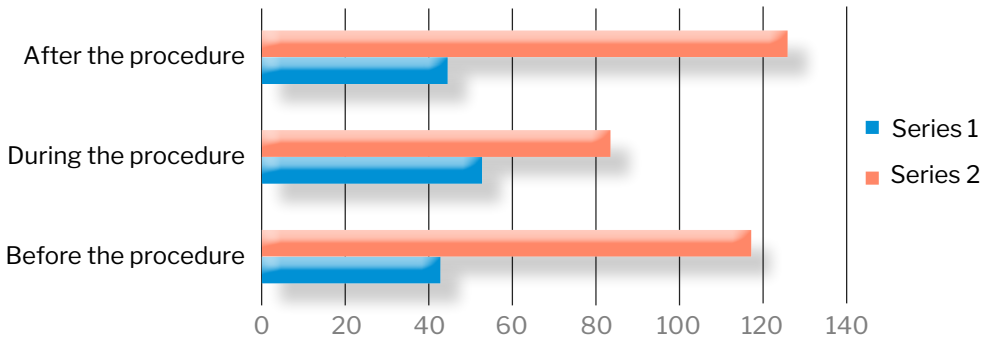
Use of drugs for analgesic measures

The drug most commonly used before, during, and after the procedures was buprenorphine, in 51.7, 51.7 and 62.1% of the cases, respectively. Continuous infusion as an analgesic measure was performed in all cases. Finally, intravenous bolus was used before, during, and after the procedures 31, 65.5, and 34.5% of the time, respectively.

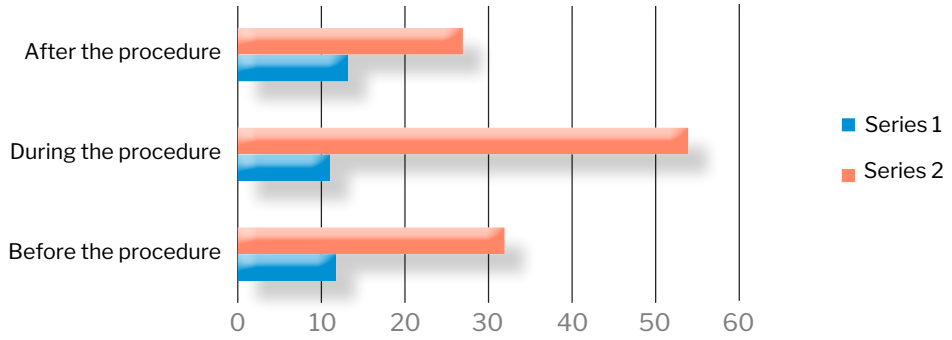
Physiological variables

The changes in heart rate showed that the increase was more evident during the procedure (Graph 3). Likewise, an increase in respiratory frequency was observed during the procedure (Graph 4).

Graph 3. Changes in heart rate



Graph 4. Changes in respiratory frequency



Based on the BPS cut-off points, the presence of pain was identified in 10.3% of the sample before wound healing, probe installation, and mobilization procedures; in the case of secretion aspiration, the percentage increased to 17.2%. During the performance of the procedures, the presence of pain increased in all cases. It was recorded in 17.2% for wound healing and probe installation and 20.7% for mobilization and secretions. After the procedures, no patient presented pain.

Regarding the CPOT test, it was identified that the procedures causing the most pain before its application were mobilization and probe installation. During the procedures, wound healing caused severe pain in four patients, while secretion aspiration did so in three cases. After the procedures, no participant presented severe pain.

According to the ESCID scale, wound healing and secretion aspiration were the two procedures that caused the most pain before their application. It should be noted that wound healing, probe installation, and mobilization were the procedures that caused the most pain; no patient reported the absence of pain. After the different procedures, no patient showed intense pain. The results of the three scales suggest that secretion aspiration and mobilization cause more pain and greater intensity; on the contrary, the installation of probes causes less pain and less intensity.

Statistical tests were performed to determine associations between the pain scores obtained in the three scales and the type of analgesic used, use of infusion, and intravenous bolus. For this purpose, the distribution of the data was first evaluated using the Kolmogorov-Smirnov test, the results of which made it possible to identify the test to be used for the correlation of variables. In the case of BPS, an abnormal distribution was found before and during the procedures, and a normal distribution after the procedures. The distributions are abnormal in the CPOT scale during and after the procedure; before a normal distribution was shown. Finally, according to the ESCID scale, the distribution of the data was abnormal before and during the procedures and normal after the procedures.

Discussion

In a study carried out in an IMSS hospital in Ciudad Obregón, an incidence of pain was observed in 69.4% of hospitalized patients; of this percentage, 5.5% corresponded to mild pain and 63.8% to moderate-intense

pain.[9] If these results are compared with the proportion of patients with pain in the present study, significant differences are observed considering the three scales applied:

- According to the BPS, diagnosed pain in patients was lower, as people without pain accounted for 51.7, 24.1, and 100% of the sample before, during, and after the procedures, respectively.
- CPOT showed that the presence of pain was also lower before and after the procedures; however, during these procedures, patients presented pain in 82.9% of the cases, and in 37.9% the pain was intense.
- According to ESCID, the prevalence of pain was only lower than that observed in the Ciudad Obregón hospital after the procedures. During the procedures, pain was very intense (51.7%).

This comparison also makes it possible to see the difference between the results obtained on the three scales. It can be seen that CPOT and ESCID are more precise since they have more categories for classifying pain. It also shows that during the procedures the pain is comparable to the figures observed in the Ciudad Obregón hospital, i.e., at that stage, the pain seems to be more acute.

In a study carried out by the American Association of Critical-Care Nurses (AACN), the results were also different from those obtained here. This organization found that the procedure causing the most pain in patients is changing posture. In contrast, in CEMENAV patients, the aspiration of secretions causes the most pain, while mobilization was observed to cause the least pain. These differences may be attributed to the fact that the AACN had a larger sample size (6,000 patients).[10]

To conclude, several studies have shown that pain assessment and the consequent application of anesthesia produce beneficial effects in the reduction of pain and adverse reactions to these drugs. It is also mentioned that these procedures are frequently omitted.

Conclusion

The procedures that most frequently cause the most pain are mobilization and aspiration of secretions. The procedure that causes the least pain is the insertion of catheters. It is considered that this may be because catheter insertion is usually performed in more sedated patients. No correlations were found between the level of pain and the type of analgesic administered, the use of infusion or intravenous bolus. It is considered that the analgesics evaluated may have the same level of effectiveness as the infusion and intravenous bolus anesthetic methods, which would explain this lack of significant correlation.

Finally, it was observed that the CPOT and ESCID scales tend to be more accurate, as they have a greater number of categories for classifying pain. According to the BPS scale, the total sample did not present pain after the procedure, while according to the CPOT only 18 people were in that category and, according to the ESCID, six patients. This can be attributed to the fact that the ESCID is more specific for measuring pain since it has three cut-off points. In contrast, the BPS and CPOT scales have one and two cut-off points, respectively. All standardized scales for measuring pain have validated and reliable criteria to be applied; the important thing is to use them together with adequate analgesia.

Limitations of the study

The workload of the nursing staff sometimes

prevented the evaluation of all patients who met the inclusion criteria. Likewise, the hemodynamic status of the patient limited the evaluation of all those with acute complications. In general, staff routine and lack of time were factors that limited the length of observation periods and the number of participants.

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Complementary

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