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Methods of pain assessment in adult intensive care unit patients — Polish version of the CPOT (Critical Care Pain Observation Tool) and BPS (Behavioral Pain Scale)

Katarzyna Kotfis[1], Małgorzata Zegan-Barańska[1], Łukasz Szydłowski[1], Maciej Żukowski[1], Eugene W. Ely[2]

[1]Department of Anaesthesiology, Intensive Care and Acute Poisonings, University Hospital no. 2, Pomeranian Medical University in Szczecin, Poland
[2]Vanderbilt University School of Medicine, Medicine/Allergy, Pulmonary, and Critical Care, Veteran's Affairs Geriatric Research Education Clinical Center (GRECC) for Tennessee Valley, Nashville, Tennessee, USA

Abstract

Many patients treated in the intensive care unit (ICU) experience pain that is a source of suffering and leaves a long-term imprint (chronic pain, post-traumatic stress disorder). Nearly 30% of patients experience pain at rest, while the percentage increases to 50% during nursing procedures. Pain in ICU patients can be divided into four categories: continuous ICU treatment-related pain/discomfort, acute illness-related pain, intermittent procedural pain and pre-existing chronic pain present before ICU admission. As daily nursing procedures and interventions performed in the ICU may be a potential source of pain, it is crucial to use simple pain monitoring tools. The assessment of pain intensity in ICU patients remains an everyday challenge for clinicians, especially in sedated, intubated and mechanically ventilated patients. Regular assessment of pain intensity leads to improved outcome and better quality of life of patients in the ICU and after discharge from ICU. The gold standard in pain evaluation is patient self-reporting, which is not always possible. Current research shows that the two tools best validated for patients unable to self-report pain are the Behavioral Pain Scale (BPS) and the Critical Care Pain Observation Tool (CPOT). Although international guidelines recommend the use of validated tools for pain evaluation, they underline the need for translation into a given language. The authors of this publication obtained an official agreement from the authors of the two behavioral scales — CPOT and BPS — for translation into Polish. Validation of these tools in the Polish population will aid their wider use in pain assessment in ICUs in Poland.

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The International Association for the Study of Pain (IASP) defines pain as "an unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage" [1]. The definition emphasises the subjective nature of pain and suggests that its intensity can be assessed only by someone experiencing it. It is obvious that many patients treated in intensive care units (ICUs), particularly those intubated and mechanically ventilated, do not fit this definition as they cannot self-report pain sensations or assess their intensity. The assessment of pain in ICU patients is a daily challenge for therapeutic teams, especially in patients who are endotracheally intubated, mechanically ventilated or analgosedated. Additional difficulties are co-existing neurological and mental disorders (e.g. aphasia, dementia, critical condition-related delirium, psychoses).

As daily nursing procedures and interventions in ICUs can be a potential source of pain, easy and simple tools for pain assessment are required. The guidelines of management published by the international circle of experts recommend minimising pharmacological sedation and administering ventilation therapy without or with minimal sedation, or only with analgesia. The Pain Agitation Delirium Guidelines of the Society of Critical Care

Medicine (PAD SCCM) of 2013, Delirium Agitation Sedation (DAS) Guidelines of 2015 and early Comfort using Analgesia, minimal Sedatives and maximal Humane care (eCASH concept) of 2016, clearly recommend providing adequate analgesia first (before sedation) to humanise intensive care [2–4]. Moreover, the above guidelines highlight the role of pain, agitation and delirium monitoring (called the ICU triad) in critically ill patients using dedicated scales validated for individual populations of patients [2].

The current clinical observations and results of prospective observational studies indicate that the incidence of pain in patients subjected to endotracheal intubation and mechanical ventilation is underestimated, hence left untreated or improperly treated. Considering the severity of conditions of ICU patients, as the issue of pain is not always of utmost importance, not enough attention is paid to it. The introduction of system solutions for pain assessment improves the quality of care of critically ill patients, enables them to inform one about their needs and improves prognosis. However, prospective randomised studies are needed to conclusively dispel doubts regarding the usefulness of such scales in various clinical situations.

INCIDENCE OF PAIN IN ICU PATIENTS

The estimates of the World Health Organisation (WHO) demonstrate that almost 83% of the world population live in countries with poor or no access to pain management [5]. Pain experienced by ICU patients is common and well documented. During ICU treatment, up to 40–70% of patients experience pain (moderate to severe) [6, 7]. According to some authors, almost 30% of patients experience pain at rest and 50% during various nursing interventions [8]. The majority of patients discharged from an ICU identify the pain experienced as a huge source of stress [9–11]. Most of them are not able to self-assess their pain (verbally) due to consciousness-related changes, mechanical ventilation, and high doses of sedatives or relaxants [12].

An overriding principle of effective pain management is proper identification of the problem. The inability to communicate verbally does not negate that a patient is experiencing pain and is in need of proper analgesic treatment. Therefore, the role of clinicians is to assess reliably the pain in patients with limited possibilities of communication by evaluating pain substitutes [13]. Identification, measurement and proper pain management in critically ill patients is a priority and has been studied for the last 20 years [14].

TYPES OF PAIN IN CRITICALLY ILL PATIENTS

The pain experienced by critically ill patients occurs at rest, can be associated with surgical procedures, injuries, burns, neoplastic diseases or nursing-therapeutic interventions [15–18]. Pain can be divided into 4 categories [4]:

I. Persistent pain associated with invasive procedures/ /discomfort.
II. Acute pain related to an ongoing disease.
III. Intermittent pain associated with ICU procedures.
IV. Chronic pain occurring before ICU admission.

The following procedures and interventions that can potentially cause pain or discomfort include changes in positions, sucking of the oral cavity and bronchial tree, wound care, removal of drains or insertion of catheters, intravenous accesses or intubation [18]. An additional issue is prolonged acute pain, which substantially worsens the quality of life of patients treated in ICUs and after discharge. The pain associated with ICU procedures is still an essential issue in critically ill patients [19]. It varies with age and gender, depends on the level of pain before interventions and, most importantly, is treated only in 25% of patients; therefore, it requires special attention and pre-emptive treatment [19, 20].

CONSEQUENCES OF PAIN IN CRITICALLY ILL PATIENTS

The negative physiological and psychological consequences associated with inadequate management of pain are long-term and extremely serious. It has been known for years that the majority of patients identify the pain they experienced during ICU treatment as a source of sleep-related problems after discharge from the ICU [21]. The available study findings indicate that up to 82% of ICU-discharged patients remember the pain or discomfort associated with the presence of endotracheal tubes while 77% recollect continuous moderate to severe pain [22]. According to Granja *et al.* [23], 17% of patients remember severe pain during ICU treatment lasting up to 6 months after discharge while 18% have a high risk of post-traumatic stress disorder (PTSD). Schelling *et al.* [24] have demonstrated that in a group of 80 patients under long-term observation (4 years on average) who underwent ICU treatment due to ARDS, the percentage of chronic pain and PTSD was higher (by 38% and 27%, respectively); likewise, the quality of life in this group was lower (by 21%), as compared to the control group.

The pain-induced stress response can lead to disastrous consequences [25], including increased concentrations of catecholamines, vasoconstriction, impaired tissue perfusion and decreased partial pressure of oxygen in the tissues [26]. The other disorders triggered by pain are hypermetabolism leading to hyperglycaemia, lipolysis or protein catabolism, which results in impaired wound healing and increases the risk of infections [26]. Pain leads to immune system disorders by inhibiting the NK cell activity, decreasing the cytotoxic T lymphocyte count and reducing the phagocytic activity of neutrophils [27–29]. Finally, acute pain experienced by

patients in various situations can be the essential risk factor of chronic pain, often neuropathic in nature.

ASSESSMENT OF PAIN IN CRITICALLY ILL PATIENTS

Monitoring of pain in critically ill patients is rarely documented using validated tools. Observation of physiological indices (heart rate, arterial pressure, respiration rate) is misleading as they can depend on the underlying cause of exacerbation (e.g. sepsis, haemorrhage, hypoxia). Additionally, although it should be stressed that changes in basic vital parameters can only suggest the presence of pain and necessity to use a suitable tool for its identification, in the majority of studies devoted to this issue, increased arterial pressure or tachycardia were not found to be associated with the occurrence of pain. Heart rate and arterial pressure may increase both during painful and painless procedures. Moreover, these parameters are not correlated with the patient`s assessment of pain and results of behavioural tests [30–32]. Therefore, they should not be used as a basis for the assessment of the occurrence and intensity of pain in patients treated in ICUs.

Regular assessment of pain intensity improves the pain management and quality of life of patients in ICUs and after discharge. The management of pain in dependent patients, i.e. critically ill patients hospitalised in ICU, is based on reliable and repeatable measurements of pain intensity and pain monitoring in time to evaluate the extent and level of interventions required for its treatment. The gold standard of management is the patient`s self-assessment; thus, self-assessment should always be considered and patients involved in determining the level of pain intensity.

The best tools to assess pain are those based on patient`s self-assessment, e.g. the visual analogue scale (VAS) or the numeric rating scale (NRS), which, however, assume patient-caregiver cooperation. Additional difficulties are the effects of sedation, delirium, delirium treatment and other factors affecting the central nervous system. It is worth remembering that even the best tool may be unsuitable for certain groups of patients , e.g. 1) children , 2) patients who cannot communicate verbally, 3) those with dementia or 4) patients with mental illness. In many cases, as patients cannot self-assess pain due to the above factors, some other tools have been designed which are based on clinical observation of the patient`s condition by nurses and physicians.

According to Chanques *et al.* [33], who studied the group of 100 patients, the use of NRS was the most reliable tool for the assessment of pain intensity among five scales designed for this purpose. However, when the patient`s self-assessment is not possible, a validated, reliable and easy-to-use tool should be applied [34]. The role of behavioural scales is emphasised, which allow the routine and repeated assessment of pain intensity, irrespective of the person engaged in the assessment. It is essential to use scales translated from their original version, thus scales designated for individual populations of patients. Although the exact process of evaluation of the psychometric value of a test is complex and time-consuming, translations of the scales validated in their original language of publication should precede their implementation. The available study findings indicate that the use of behavioural scales of pain assessment improves nursing and therapeutic interventions in critically ill patients, introduces more effective protocols of pain management, reduces the consumption of sedatives and shortens mechanical ventilation [35, 36].

The authors of the PAD SCCM guidelines of 2013 analysed six behavioural scales: BPS-non-intubated (BPS-NI), CPOT, the Non-verbal Pain Scale (NVPS, NVPS-I, NVPS-R), the Pain Behavioral Assessment Tool (PBAT) and the Pain assessment, Intervention, and Notation (PAIN) algorithm [2]. In the view of the authors, the most reliable and best validated behavioural scales in patients who cannot self- report pain are the Behavioral Pain Scale (BPS) and Critical Care Pain Observation Tool (CPOT) [2]. It was recommended to translate them from French and English for their easier application; hence the scales available in various languages [37, 38].

The observational studies have demonstrated that BPS (3–12 total score) and CPOT (0–8 total score) have good psychometric indices as for the inter-observer agreement of assessments in medical, surgical and trauma patients; yet without cerebral stroke [30, 31, 39–41]. A CPOT score of > 2 indicates the presence of pain; the sensitivity of the test is 86% while its specificity is 78% for the assessment of severe post-surgical pain [42, 43]. The cut-off value suggested for BPS is >5 [44, 45].

SELECTED SCALES USED TO ASSESS PAIN INTENSITY IN THE ICU

As both the CPOT and BPS require only short theoretical and practical trainings, they can be easily used in clinical practice. In Poland, various English-language scales are used, including CPOT and BPS, which have not been translated or validated in the Polish population.

CRITICAL CARE PAIN OBSERVATION TOOL (CPOT)

The CPOT was developed by Gelinas *et al.* [42] in French and shortly afterwards translated into and validated in other languages. The tool was designed to detect pain in critically ill patients and includes 4 behavioural categories — facial expressions, body movements, muscle tension, compliance with a ventilator (for intubated patients) or verbalisation (for extubated patients). Each category is scored on a scale of 0–2 (in total 0–8 points). According to the data reported by Gelinas *et al.*, [42], the cut-off point is 2–3, while a score

Table 1. The Critical-Care Pain Observation Tool (CPOT)

Indicator	Description	Score	
Facial expressions	No muscle tension observed	Relaxed, neutral	0
	Presence of frowning, brow lowering, orbit tightening and levator contraction or any other change (e.g. opening eyes or tearing during nociceptive procedures)	Tense	1
	All previous facial movements plus eyelid tightly closed (the patient may present with mouth open or biting the endotracheal tube)	Grimacing	2
Body movements	Does not move at all (doesn't necessarily mean absence of pain) or normal position (movements not aimed toward the pain site or not made for the purpose of protection)	Absence of movements or normal position	0
	Slow, cautious movements, touching or rubbing the pain site, seeking attention through movements	Protection	1
	Pulling tube, attempting to sit up, moving limbs/thrashing, not following commands, striking at staff, trying to climb out of bed	Restlessness/Agitation	2
Muscle tension	No resistance to passive movements	Relaxed	0
Evaluation by passive flexion and extension of upper limbs when patient is at rest or evaluation when patient is being turned	Resistance to passive movements	Tense, rigid	1
	Strong resistance to passive movements or incapacity to complete them	Very tense or rigid	2
Compliance with the ventilator (intubated patients)	Alarms not activated, easy ventilation	Tolerating ventilator or movement	0
	Coughing, alarms may be activated but stop spontaneously	Coughing but tolerating	1
OR	Asynchrony: blocking ventilation, alarms frequently activated	Fighting ventilator	2
Vocalization (extubated patients)	Talking in normal tone or no sound	Talking in normal tone or no sound	0
	Sighing, moaning	Sighing, moaning	1
	Crying out, sobbing	Crying out, sobbing	2
Total			0–8

Gélinas C, Fillion L, Puntillo KA, et al. Validation of the critical-care pain observation tool in adult patients. Am J Crit Care. 2006; 15(4): 420–427, indexed in Pubmed: 16823021. Table 1. Available at: http://ajcc.aacnjournals.org/content/15/4/420.short
CPOT Polish Translation: 16.10.2016, Katarzyna Kotfis MD, PhD

of > 2 indicates the occurrence of pain. The CPOT has good psychometric properties (Cronbach`s $\alpha = 0.89$) and moderate indices of inter-observer agreement ($\kappa = 0.52–1$; ICC = 0.80–0.93). The scale is a good tool in order to differentiate between pain-related procedures (e.g. changes in body position) and painless procedures (e.g. non-invasive arterial pressure measurement ($P \leq 0.001$). [42]

Unfortunately, the CPOT has not been officially translated into Polish. With the approval of the first author of CPOT (Celine Gelinas), we translated the scale first into Polish and then into English. Moreover, the translation and the use of the scale in further publications was approved by the American Associated of Critical Care Nurses. To date the scale has not been validated in the Polish population. The data of the ongoing study regarding the validation of POL-CPOT (ClinicalTrials.gov, NCT03024528) will be available in mid-2017. The details of Original Critical-Care Pain Observation Tool are presented in Table 1 and Figure 1.

BEHAVIORAL PAIN SCALE (BPS)

The BPS was developed by Paten *et al.* in order to assess pain in unconscious mechanically ventilated patients. The scale is based on three types (ranges) of behaviour: 1) facial expressions, 2) movements of the upper extremities and 3) compliance with a ventilatory [46]. The details are presented in Table 2.

The observer scores each range; the total score varies from 3 (no pain) to 12. The available study findings demonstrate that the BPS has good psychometric properties (Cronbach`s α 0.64–0.79) and moderate/high indices of inter-observer agreement ($\kappa = 0.67–0.89$; [ICC] = 0.58–0.95) [39, 46].

According to the international guidelines, both scales should be validated in specific clinical settings. Thanks to this, intensive care teams (physicians, nurses, physiotherapists) will be provided with reliable tools while early identification of the problem will result in the quicker implementation of treatment. The patient`s family is of extreme importance for assessment of pain in ICU patients; the family identifies the

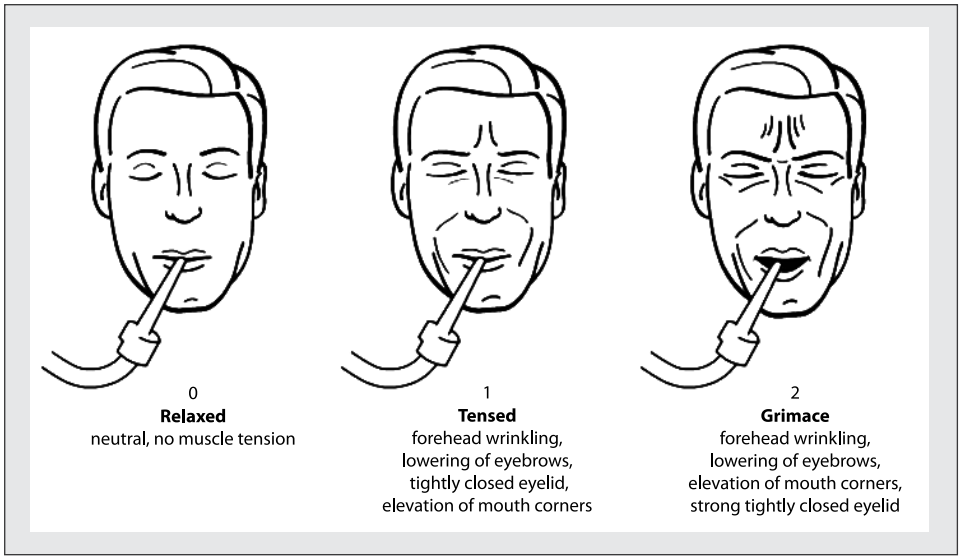

Figure 1. Facial expressions in Critical Care Pain Observation Tool (graphics by K. Kopczyński)

Table 2. Behavioral Pain Scale

Item	Description	Score
Facial expression	Relaxed	1
	Partially tightened (e.g., brow lowering)	2
	Fully tightened (e.g., eyelid closing)	3
	Grimacing	4
Upper limb movements	No movement	1
	Partially bent	2
	Fully bent with finger flexion	3
	Permanently retracted	4
Compliance with mechanical ventilation	Tolerating movement	1
	Coughing but tolerating ventilation for the most of time	2
	Fighting ventilator	3
	Unable to control ventilation	4
BPS score ranges from 3 (no pain) to 12 (maximum pain)		

Payen JF, Bru O, Bosson JL, et al. Assessing pain in critically ill sedated patients by using a behavioral pain scale. Crit Care Med. 2001; 29(12): 2258–2263, indexed in Pubmed: 11801819.

pain-related behaviours much quicker and should be involved in the assessment. Both the CPOT and BPS are easy to use and therefore are accessible for family members.

SUMMARY

1. Pain experienced by critically ill patients in ICUs has to be identified early in order to implement appropriate treatment.
2. The gold standard for the assessment of pain intensity is the patient`s self-reporting using the VAS or NRS.
3. In patients unable to self-report pain experiences, the behavioural scales (CPOT or BPS) are recommended; currently available also in Polish.
4. It is necessary to evaluate the correlation between the pain reported by the patient and the assessment by the experienced personnel in order to validate the CPOT and BPS in the Polish version.

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Corresponding author:
Katarzyna Kotfis MD, PhD
Department of Anaesthesiology, Intensive Care and Acute Poisonings
Pomeranian Medical University in Szczecin, Poland
e-mail: katarzyna.kotfis@pum.edu.pl

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