



Suitability of CPOT and BPS to Assess Pain Response in Intubated Mohammad Hoesin Hospital Intensive Care Patients

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ABSTRACT

Background. Assessing pain in mechanically ventilated patients is an important thing for leads to improved outcome and better quality life of patients in the ICU. CPOT and BPS has been developed for measuring nonverbal patients.

Aims. To validate suitability the use of CPOT and BPS in ICU RSMH.

Methods. Observational analytic with cross sectional design was chosen for 50 samples conducted on July 2020 in ICU RSMH. Data was collected before and after pain procedure.

Result. From 50 patients mostly 27(54%) male with age majority > 30 years old 39 (78%). The lowest GCS 2 and the highest 10. Length of treatment in ICU was 1 – 20 days. Bleeding variations was 0 - 1200 cc. BPS average before painful procedure was 2 – 5 and after painful procedure was 5 – 7. CPOT average before painful procedure was 1 – 6 and after painful procedure was 3 - 8. Kappa before painful procedure are moderate (kappa=0,435) and after painful procedure are fair (kappa=0,248) with strongly correlated in Pearson correlation ($r = 0,644, r = 0,610$) ($p < 0,05$).

Conclusion. This study demonstrated that CPOT more detail than BPS for measuring pain in intubated patients.

Keywords. BPS, CPOT, ICU, Intubated, Pain

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Introduction

According to The International Association for the Study of Pain , pain is an unpleasant emotional and subjective sensory experience that associated with either tissue or potential damage, or describes the conditions in which the damage occurs. ^{1 , 2} Standard assessment of pain intensity is based on self-reported statements of the patient because pain is subjective. Changes in physiological variables such as heart rate, blood pressure, respiration rate, perspiration, pupil size can be used in response to nociceptive actions in the Intensive Care Unit (ICU).

The earliest and most tested pain scale assessment was the BPS developed by Payen et al. In 2001 based on the observation study of pain behavior by Puntillo et al. In 1997. Puntillo emphasized that there is a relationship between behavioral indicators and pain reported by these sufferers. Another recently developed tool for assessing pain behavior besides BPS is CPOT. ^{2 , 3}

According to clinical practice guidelines for the management of pain, agitation, and delirium in adult patients in the Intensive Care Unit in 2013, the most valid and reliable pain assessment instrument is CPOT. ² Rijkenberg et al (2017) have compared the validation and effectiveness between BPS and CPOT in calculating the pain scale, it is concluded that BPS and CPOT both have high validation with an *interrater reliability* value of 74% on BPS and 75% on CPOT. ^{5 , 6}

Pain in ICU patients can affect the hemodynamic condition of the patient, so it is important to do pain assessment in ICU patients in order to know the right pain management.

Moh hospital. Hoesin has been using the BPS pain scale in ICU patients, but in the last 6 months BPS has begun to be abandoned because it is considered inaccurate in assessing the pain scale of intubated patients, whether on a ventilator or not. ⁷

Methods

Observational analytic with cross sectional design was chosen for 50 samples. Data were taken directly to patients by *consecutive sampling* in the ICU using a pain scale assessment questionnaire during July 2020. Data were analyzed using kappa and pearson. Samples were hemodynamically stable and still able to respond to pain. Patients with quadriplegia, impaired peripheral neuropathy and agitation were not included in this study.



The assessment is carried out 2 times a day by an assessor who is a PPDS Anesthesiology and Intensive Therapy student who has been given training. Assessment using BPS and CPOT was carried out simultaneously before the pain procedure and the time after the pain procedure (suction for 2 minutes).

Results and Discussion

During the July study period, 50 patients met the inclusion criteria. Approximately 27 (54%) male and 23 (46%) female, the majority aged > 30 years of 39 (78%). The GCS sample in this study was median 10 with the lowest GCS 3 palinglana and the highest GCS 10. The sample with severe GCS was more dominant (84%) of the sample. The average patient was admitted to the ICU with median 2, the quickest stay in the ICU; 1 day and the longest; 20 days. The mean BPS values before pain procedures were median; 3, minimum score; 2, and maximum score; 5. After the pain procedure median; 7, minimum score; 5 and maximum score; 11. The mean CPOT before pain procedures was median; 2 with minimum score; 1 and maximum score; 6, and after the pain procedure was median; 4, minimum score; 3, and maximum score; 8. Can be seen in Table 1.

Table 1. General Sample Characteristics

Variable	n=50 (%)
Age	42,5(19-74) years
<30 Years	11(22%)
>30 Years	39(78%)
Gender	
Male	27(54%)
Female	23(46%)
GCS	10(3-10)
< 8	8(16%)
> 8	42(84%)
Total Days in ICU	2(1-20) days
BPS Before Pain Procedure	3(2-5)
BPS After Pain Procedure	7(5-11)
CPOT Before Pain Procedure	2(1-6)
CPOT After Pain Procedure	4(3-8)
MAP Before Pain Procedure	93(70-126)
HR Before Pain Procedure	90(60-122)
RR Before Pain Procedure	21(16-29)
Temperature Before Pain Procedure	36(36-37)
SpO2 Before Pain Procedure	99(96-100)
MAP After Pain Procedure	101(77-139)
HR After Pain Procedure	99(66-133)
RR After Pain Procedure	24(18-31)
Temperature After Pain Procedure	36(36-37)
SpO2 After Pain Procedure	99(96-100)

* Data categories n (%) and data is not normally distributed are presented with the median (min-max)



Table 2. Characteristics Description of the CPOT

CPOT	n=50 (%)
Before Pain Procedure	
Mild (≤ 3)	46 (92%)
Moderate (4-5)	2 (4%)
Severe (6-11)	2 (4%)
After Pain Procedure	
Mild (≤ 3)	14 (28%)
Moderate (4-5)	23 (46%)
Severe (6-11)	12 (24%)
More Severe (>11)	1 (2%)

The characteristics of the CPOT description can be seen in Table 2 , before the pain procedure, the sample was dominated by mild pain of 46 (92%), 2 (4%) moderate pain , and 2 (4%) severe pain. After the pain procedure, the sample was dominated by moderate pain of 23 (46%), 14 (28%) of the sample had moderate pain, 12 (24%) of the sample had severe pain , and 1 (2%) of the sample had more severe pain.

The results showed an increase in pain scores in patients before pain procedures and during post pain procedures. CPOT was developed by Gelinas et al in France and has been validated in various languages to detect patient pain in 4 categories, namely facial expressions , body movements, muscle tension in patients who are intubated on a ventilator or verbalization without intubation , so that CPOT is considered to represent a picture of pain felt by the patient .²² Rijkenberg et al and Kostfis also found that the average sample experienced mild pain at rest and severe pain during suction.^{5, 29}

Characteristics Description BPS

BPS description characteristics can be seen in Table 4.3. before the pain procedure, the sample was dominated by mild pain of 42 (84%), 8 (16%) moderate pain. After the pain procedure, the sample was dominated by severe pain in 49 (98%), and 1 (2%) sample had moderate pain.

Table 3. Characteristics Description BPS

BPS	n=50 (%)
Before Pain Procedure	
Mild (≤ 3)	42 (84%)
Moderate (4-5)	8 (16%)
After Pain Procedure	
Moderate (4-5)	1 (2%)
Severe (6-11)	49 (98%)



BPS description characteristics can be seen in Table 3. Before the pain procedure, the sample was dominated by mild pain of 42 (84%), 8 (16%) moderate pain. After the pain procedure, the sample was dominated by severe pain in 49 (98%), and 1 (2%) sample had moderate pain. BPS was developed by Paten et al. To develop a pain scale rating in unconscious and intubated patients with a ventilator machine.

The results showed that there was also an increase in the value of the patient's pain scale before the pain procedure to after the pain procedure. Rijkenberg et al. Obtained a sample mean assessed on the BPS scale in 34 patients, it was found that the average patient experienced moderate pain at rest and severe pain after pain procedures.⁵ Kotfis et al. Also obtained BPS mean scores on a moderate pain scale at rest and severe pain after pain procedures (suction).²⁹

The results of measuring the pain scale using CPOT showed an increase in pain scores from mild, moderate, severe to mild, moderate, severe, and very painful. The results of measuring the pain scale using BPS showed an increase in pain scores from mild, moderate to moderate, severe. The results of this study indicate that the CPOT score assesses the patient in more detail than the BPS. Previous research in 2016 by Severgnini also had similar results, in the form of an increase in pain scores before the pain treatment to the time after pain treatment.³⁰

The level of conformity of the results of the CPOT and BPS pain scale assessment was carried out using the Kappa test with 2x2 categorical data so that the CPOT and BPS grouping were made into moderate pain and severe pain. The numerical CPOT and BPS data were analyzed using the Pearson test.

Prior to the pain procedure, the suitability of the CPOT and BPS studies in the sample was dominated by moderate pain, amounting to 47 samples and one sample experiencing severe pain. The Kappa test results get a very significant value with moderate agreement (Kappa = 0.435).

Table 4. Compatibility of CPOT and BPS before pain procedures

BPS	CPOT		P*	Kappa
	Moderate	Severe		
Moderate	47 (97,9%)	1 (2,1%)	0,001	0,435
Severe	1 (50%)	1 (50%)		

Analysis using the Pearson correlation test obtained a high correlation value ($r = 0.644$) with a value of $p = 0.001$. The correlation between BPS and CPOT before pain procedures can be seen in the correlation graph in Figure 1.

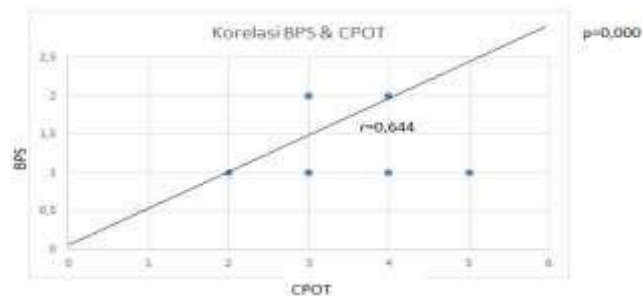


Figure 1. Pearson Correlation BPS and CPOT Before Pain Procedure

The results of kappa show moderate agreement, which means that the CPOT is sufficiently in accordance with BPS in assessing the pain of intubated patients in the ICU. The results of the correlation showed a positive correlation with $P < 0.05$, which means that the results of measuring pain using CPOT before the pain procedure were correlated with the results of measuring pain using BPS before the pain procedure.

After the pain procedure, the appropriateness of the CPOT and BPS assessments for the 3 samples with moderate pain and 14 samples experienced severe pain. The Kappa test results get a very significant value with a fair agreement (Kappa = 0.248).

Table 5. Compatibility of CPOT and BPS after pain procedures

	CPOT		P	Kappa
BPS	Mild	Moderate		
Mild	3 (100%)	-	0,045	0,248
Moderate	33 (70,2%)	14 (29,8%)		

Analysis using the Pearson correlation test obtained a high correlation value of $r = 0.610$ with a value of $p = 0.045$. The correlation between BPS and CPOT after pain procedures can be seen in the correlation graph in Figure 2.

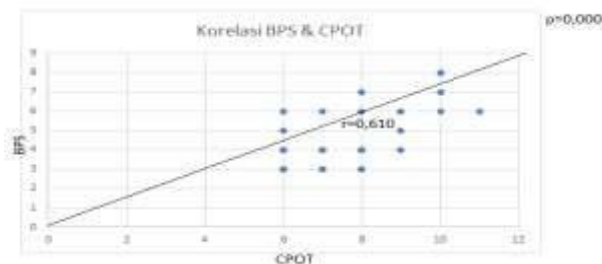


Figure 2. Pearson correlation BPS and CPOT after pain procedures



The results of kappa show fair agreement, which means that the CPOT is quite in accordance with the BPS in assessing the pain of intubated patients in the ICU. The correlation results showed a positive correlation with $p < 0.05$, which means that the results of measuring pain using CPOT after pain procedures were correlated with the results of measuring pain using BPS after pain procedures.

In this study, the suitability of CPOT and BPS based on the Kappa test before the pain procedure was moderate agreement (Kappa = 0.435) and after the pain procedure was fair agreement (Kappa = 0.248) with positive correlation results, namely the high and low pain scale measurement results using CPOT correlated with the height of the measurement results using BPS. Rijkenberg et al, Gélinas et al also found agreement with the moderate kappa test between CPOT and BPS and concluded that the CPOT was more detailed in assessing pain scales in intubated adult patients.⁴ Kotfis et al also concluded that CPOT and BPS can be used for intubated patients with high kappa suitability values and moderate correlation strength.²⁹

Conclusions

The results of measuring the pain scale using CPOT showed an increase in pain scores from mild, moderate, severe to mild, moderate, severe, and more severe. The results of measuring the pain scale using BPS showed an increase in pain scores from mild, moderate to moderate, severe. The results of this study indicate that the CPOT score assesses the patient in more detail than the BPS. The results of different kappa values can be influenced by several factors, including the inconsistent interater reliability of BPS, resulting in an ambiguous understanding of some of the indicators. BPS has more items in each indicator compared to CPOT, this also causes BPS to better assess pain response in the moderate category.

The difference in ability between one assessor and another assessor can be a factor in the bias in this study.

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