

Validation of critical care pain observation tool in patients hospitalized in surgical wards

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ABSTRACT

Background: Application of a reliable and authentic behavioral tool for measuring patients' pain, hospitalized in intensive care units who are not able to establish relationship, is needed severely. Therefore, this study is conducted with the aim of validating Critical Care Pain Observation Tool (CPOT) in patients hospitalized in surgical wards.

Materials and Methods: CPOT was first translated into Persian and was psychometrically measured in terms of content. Then, this study was conducted as cross-sectional study on 60 patients who were hospitalized in surgical wards. The degree of pain was measured by the patients using a self-report pain tool (NRS) and with the help of two nurses using CPOT during two painful and nonpainful procedures. Eventually, diagnosed validity and reliability was studied.

Results: It should be noted that the content validity of CPOT was approved by panel of specialists. In addition, validity of this tool was confirmed with high internal cluster correlation (nonpainful procedure (0.997) and painful procedure (0.726)). The diagnostic validity was supported with the increased CPOT score during position change and its constancy during the measurement of blood pressure ($P < 0.001$). Despite higher NRS scores than CPOT, CPOT criterion validity was confirmed due to the correlation between the scores obtained by these two tools ($P < 0.001$).

Conclusions: CPOT is a valid and reliable tool to study pain in patients hospitalized in intensive care units.

Key words: Critical care, pain assessment, validity

INTRODUCTION

Pain is an unpleasant physical and mental feeling and is a very complicated phenomenon.^[1] International Association of Pain defines pain as follows: "Pain is

an unpleasant psychic and mental experience which has direct relationship with the possible or actual damage of tissue and/or these types of injuries are appeared in some specific periods."^[2]

Pain is an experience that is repeatedly experienced by patients hospitalized in intensive care units (ICU).^[3] Approximately five million patients are hospitalized in ICUs annually, and 71% of them vividly remember their painful experience at the time of their hospitalization. An interview with patients discharged from ICUs after five days showed that 63% of patients hospitalized in ICUs estimated severity of their pain from mild to severe.^[4]

Given the above issue, it can be said that pain is known as a great and predominant stress and is the worst memory of patients hospitalized in Intensive Care Unit (ICU).^[5]

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Severity of pain from mild to severe is not an abnormal phenomenon in ICUs and experiencing severe to mild pain in ICU is a common phenomenon.^[6] Its physical and physiological injuries are one of the main reasons of significance for controlling and managing pain in ICU. Pain can increase unpleasant and mortality rate and/or can reduce the speed of recovery and convalescence of patient after undergoing surgical operation and dimensions related to the health of quality of life.^[3]

Despite considerable progress in the field of care, insufficient soothing of pain still remains a problem.^[7] There are several evidences that show that the health team usually estimate the pain of patients less than its actual rate.^[8]

Moreover, the health team do not usually use sedative and painkiller drugs after surgical operations sufficiently because effective management of pain is possible only with one reliable and authentic evaluation method.^[3]

The effective management of pain is possible through one reliable and authentic evaluation method,^[3] which requires accurate measurement of pain for guiding the treatment team toward decision making for the selection of type and accurate dose of the drug.^[9]

Although accurate evaluation of pain has been emphasized, its execution is not possible as evaluation of other vital signs because pain is a subjective and mental experience and there are no objective tools to measure it.^[10]

According to the International Association of Pain, reporting pain by the patient is still considered as the golden tool in order to study pain. Pain is defined as what patient states and its quality is the same thing that patient experiences or feels.^[1]

However, evaluating and managing pain in patients hospitalized in ICUs is a difficult task due to the lack of enough consciousness, deterioration and severity of disease, connection to ventilator device, and using painkillers and sedatives.^[3]

Therefore, when a patient, suffering from his pain severely, cannot declare his or her pain, evaluation of pain should be conducted objectively with observation of symptoms and signs of pain.^[4] Under such circumstances, patient uses behavioral and physical reactions for declaration of his or her pain. Consequently, nonverbal contact can be used to study and diagnose pain among these patients.^[1]

The following is suggested by the US Association of Pain for managing pain in intubated or unconscious patients:

1—Reporting pain by the very patient (if possible); 2—Studying potential reason of pain; 3—Observing behavior of patients instead of self-reporting (using objective tools); 4—using painkillers and sedatives.

Also, a method is defined for measuring the degree of pain using physiological indicators in this respect.^[11]

Considering the abovementioned suggestions by the US Association of Pain, routine and disciplined use of objective tools for measuring pain can help reduce the length of hospitalization in ICUs, reduce mechanical ventilation period, and increase satisfaction of patients, their families, and health companions.

Face, leg, activity, cry, and Consolability (FLACC) behavioral scale is of the main objective tools which has been constructed for this purpose. This objective tool is applied commonly for measuring pain among infants. Among the other scales, Behavioral Pain Scale (BPS), Nonverbal Pain Scale (NVPS), Critical Care Pain Observation Tool (CPOT), and Nonverbal Pain Assessment Tool (NPAT) are noteworthy.

Different studies such as the studies conducted by Li^[12] and Varnik^[13] show that CPOT has more validity and reliability than other tools and has priority among patients hospitalized in ICUs who are not able to establish relationship verbally. On the other hand, despite special emphasis on the ability of diagnosis of pain among these patients, a fixed criterion cannot be used for all of them because behaviors of pain are not identical in all communities and cultures.^[14]

Therefore, pain is a complicated and complex experience which originates from various variables. The nature and behavior related to pain is inspired by genetic, cultural, and social factors of the individuals as well as his or her individual experiences.

Considering that the behaviors of patient is the basis of objective tools for measuring pain, it is better that the validation of the desired tool should be conducted based on the culture and behaviors of pain among people of that country. Gélinas^[15] studied validity of the English version; Li *et al.*^[16] also confirmed validity of the Chinese version of CPOT. Moreover, Nürnberg Damström *et al.*^[17] confirmed the validity of the Swedish version of CPOT. It should be noted that these studies and many others introduced CPOT as a reliable and valid tool.

For this purpose, another study was conducted by Labus *et al.*^[18] in the United States of America. It should be noted that this study was a meta-analysis of 30 different studies reported from 1998 to 2002.

Unlike other studies that showed high correlation among scores of objective tools and self-report tools, this study showed that the pain score obtained from observation of behaviors of patient has direct relationship with the self-report score from pain averagely and this score can be either less, more or equal due to the situation.

Therefore, observation of behavior of pain does not necessarily indicate patient's personal report of pain. On the other hand, self-report of patient does not necessarily reflect his or her pain behaviors. This is more tangible among patients with chronic pains.^[18]

Therefore, this study was conducted with the aim of validating the Persian version of this tool due to the significance of estimation of pain among relief seekers, effect of various factors on pain, differences identified in self report of pain in patient and pain assessment by nurses in Iran without validation and necessity of measurement of its validity and reliability considering cultural of Iranian patients.

With the accurate evaluation of pain, it is hoped that results of this study will help better management of pain among patients. In addition, researchers of this study hope that this study will reduce pain of patients hospitalized in ICUs.

MATERIALS AND METHODS

This study is validation type study that was conducted on 60 patients hospitalized in the surgical wards of Al-Zahra Hospital (SA) of Isfahan in 2013.

The study included the following inclusion criteria: Being hospitalized in surgical wards of hospital following surgical operation in the area of abdomen and thorax in previous 12 h, having full knowledge of Persian language, having audiovisual potential, the ability to speak, and having full consciousness.

Exclusion criteria of this study included the following:

- Receiving clinical and medical treatment for chronic pain,
- Having psychiatric and heart problems,
- Addiction to alcohol and drug,
- Receiving nervous and muscular blockers following surgical operations,
- Emerging adverse effects after surgery (bleeding, delirium, and death)
- Lack of tendency to continue attending the research,
- Existence of spasm in body organs, and lack of feeling of pain during fulfillment of painful procedure.

All participants were briefed with regard to the study and finally, their satisfaction also was obtained.

Tools of research and method of fulfillment of processes

In this study, two tools named NRS and CPOT were used. NRS is one of the most common tools for measuring the severity of pain. This tool includes a horizontal line as long as 10 cm which is divided into 10 equal parts. For this purpose, patient explains his or her pain orally and/or with marking beside the desired number. The "zero" score in the end of the left part of tool implies lack of existence of pain whereas score 10 shows the highest and maximum degree of pain. CPOT or tool for measurement of pain in patients hospitalized in ICU is a tool used for measurement of pain among patients who are not able to explain their pain verbally. This tool includes four parts; 1—facial mode, 2—movements of body, 3—stiffness of muscle, and 4—way of speaking by patient with extube or war with ventilator among intube patients.

In each part, scores from 0 to 2 were given with regard to the severity of pain in patient. Therefore, severity of the patient's pain can be scored from 0 to 8 using this tool. Data were analyzed after being collected and coded in the Statistical Package for the Social Sciences (SPSS) version 18.

Four objectives were considered for this study. (1) Studying content validity in order to collect views of experts regarding the efficacy of content of tool and degree of its proportion with the specifications and conditions of Iranian patients; this activity was conducted in the presence of a number of specialists (including physicians, nurses in ICU, and veteran nurses) for translating tools into Persian and discussing on various components of CPOT using expert-panel meeting. Eventually, its main structure was not changed. (2) Studying diagnostic validity in order to determine the ability of CPOT for diagnosing and differentiating painful procedure from nonpainful procedure. (3) Studying criterion validity in order to determine the correlative degree of CPOT with a self-reporting tool (NRS). (4) Studying reliability of views of assessors in order to determine the ability of attaining identical and equal results in using by different assessors.

To determine criterion validity, diagnostic validity, and reliability of tool, researcher along with a cooperater (nurse) embarked on evaluating 60 patients hospitalized in the surgical wards of Al-Zahra Hospital (SA) of Isfahan. The work procedure was as follows: After receiving written letter of consent from patient or from patient's family, when patient regained his or her consciousness after surgical operation completely, two procedure were carried out on patient: (1) Painful Procedure (change of position) and (2) nonPainful Procedure (taking non-defensive blood pressure).

In each of the two procedures, degree of pain was registered and measured by the patient using the

self-reporting tool of pain measurement in NRS and by the researcher along with his colleague using CPOT before, during, and 20 min after undergoing surgical operation. After collecting pain scores (six scores related to patient, six scores related to 1st assessor, and six scores related to 2nd assessor), statistical analyses were conducted for the desired objective. To assess diagnostic validity, the scores given by assessors were compared in three sections as well as in two painful and non-painful procedures. To study criterion validity, scores of patient and assessors were compared with each other in three time sections. To study the reliability of view of assessors, the scores given by the assessors were compared with each other in a time interval.

It should be noted that application of this tool (CPOT) in suitable situation and also coincidence of using a self-reporting tool to compare with this objective tool is a prerequisite for the mental measurement of this tool. On the other hand, to apply self-reporting tool (NRS), patients were required to be completely consciousness. Therefore, patients, who underwent abdominal or thoracic surgical operations after consciousness and had been transferred to the surgical operations were used as sample for the study. It should be mentioned that this activity (Validation of CPOT in surgical ward) is not incompatible with the application of this tool in ICU.

Statistical analysis

CPOT diagnostic validity was studied by determining trend of changes of scores of patient's pain severity based on CPOT in three time sections in painful and nonpainful procedures using repeated analysis of variance (ANOVA). To determine CPOT criterion validity, score of severity of patient's pain was conducted based on NRS and CPOT in three time intervals in two procedures using paired *t*-test while determination of severity of correlation between the duo was conducted using the Pearson correlation test.

It should be noted that reliability of CPOT's assessors was calculated between scores obtained from assessment of researcher using determination of Internal Cluster Correlation (ICC).

Ethical considerations

Before starting work, the aim of study and the method of interventions was explained for all patients and written testimonial was taken them. also It was explained that all information will remain confidential. In addition to change of position as a painful procedure(Although is a necessary procedure after surgery) was done according to the patients physical condition and their consent.

RESULTS

Most samples included females (70%) with diploma degree (38%) who lacked history of previous surgical operations (55%) (abdominal or thoracic surgery).

In studying content validity, English version of CPOT was translated into Persian. According to the individuals who participated in the session, any change was not observed in its main structure.

In studying the diagnostic validity of CPOT, repetitive sizes were specified according to ANOVA that the average change of score of severity of pain given by two observers had significant difference in painful procedure in three time sections ($P < 0.001$).

Considering the abovementioned issue, this procedure was not consistent with nonpainful procedure in a way that average changes of score of pain severity had no significant difference in three time sections ($P = 0.321$).

In addition, the results showed that effect of procedure and interaction effect of time and procedure is significant ($P < 0.001$). That is to say that patient's pain score increased with the fulfillment of painful procedure using CPOT and it is reduced once again after fulfillment procedure but scores of pain relatively remains "constant" and "fixed" in nonpainful procedure. The said issue shows the ability of CPOT in the diagnosis of degree of patient's pain [Table 1].

In studying CPOT criterion validity, according to paired *t*-test, average scores of severity of patient's pain had significant difference based on NRS and CPOT before, during and 20 min after conducting painful procedure ($P < 0.001$).

Therefore, the pain score given to patient by nurse using CPOT was found less than that that of the score given by the patient to his or her pain using NRS [Table 2].

On the other hand, it was specified that severity of correlation of scores of severity of patient's pain was significant based on NRS and CPOT before, during and 20 min after fulfilling painful procedure using Pearson correlation test ($P < 0.001$) [Table 2].

In studying the severity of reliability, view of assessors was specified according to the estimation of ICC. The mean (min-max) for non-painful procedure were 0.997 (0.996-0.998; $P < 0.001$) accordingly and for the painful procedure also 0.726 (0.369-0.868; $P < 0.001$).

Table 1: Assessment of diagnostic validity based on variance analysis of repetitive sizes

	Before fulfilling procedure Mean (SD)	During fulfilling procedure Mean (SD)	20 min after fulfilling procedure Mean (SD)	Time effect F (P value)	Time effect × procedure F (P value)	Effect of procedure F (P value)
Non-painful procedure	1.37 (1.72)	1.38 (1.72)	1.37 (1.72)	1 (0.321)	117(P<0.001)	18.69 (P<0.001)
Painful procedure	1.37 (1.72)	5.1 (1.43)	1.39 (1.74)	329.35 (P<0.001)	117 (P<0.001)	18.69 (P<0.001)

SD: Standard deviation

Table 2: Comparing average scores of patient's pain based on NRS and CPOT and correlation between them in each of three time situation in painful procedure

	Type of tool	Mean (SE)	t	P	Correlation coefficient between NRS and CPOT
Before fulfilling painful procedure	NRS	3.79 (0.34)	9.63	<0.001	0.67 (P<0.001)
	CPOT	1.37 (0.22)			
During fulfilling painful procedure	NRS	7.03 (0.29)	7.85	<0.001	0.55 (P<0.001)
	CPOT	5.13 (0.18)			
20 min after painful procedure	NRS	3.67 (0.32)	9.12	<0.001	0.65 (P<0.001)
	CPOT	1.40 (0.22)			

NRS: Self-report pain tool, CPOT: Critical care pain observation tool

DISCUSSION

Validation of CPOT was discussed in the present study. The Persian version of this tool was measured in terms of content, diagnostic, and criterion psychometric. On the other hand, its reliability was obtained using high ICC coefficient (nonpainful procedure of 0.997 and painful procedure of 0.726). The results of this study are similar to the results of the study conducted by Gélinas^[15] on patients hospitalized in ICUs. In this study, diagnostic validity, criterion validity, and CPOT reliability were confirmed. Similarly, the results obtained from this study were consistent with the results obtained by Gélinas and Johnson^[15] on patients hospitalized in ICU after open-heart surgical operations. Similarly, the result of the study conducted by Nürnberg Damström for validation of Swedish version of CPOT in 2011 was consistent with the results of the present study.^[17]

It should be kept in mind that despite validation of CPOT in different countries, the results of these studies cannot be used for application of this tool in Iran because understanding identity and behaviors related to the pain is influenced by individual experiences in the genetic predisposition, cultural and social fields of the individual. In other words, although stimulation of pain fibers, that transmit message to the brain, is identical for all human beings, understanding and controlling it differs from one society to another society.

Therefore, social and cultural factors constitute the basis of express the pain and its treatment and having affinity to a specific ethical group causes response to the pain and its different treatment.

Therefore, degree of understanding pain and method of its tool differs from various cultures and communities.

Considering nature of CPOT, because measurement of pain is based on behaviors of patient, each country should first use its own validation. Therefore, validation of Persian version of this tool was discussed among patients hospitalized in ICU in Iran due to the lack of validation of CPOT.

Considering the abovementioned issue, belonging to a certain ethical group causes different response to the pain and its treatment.^[19]

In studying content validity, experts have confirmed components of this tool with behaviors of pain among Iranian patients. In studying diagnostic validity, it was specified that score of patient's pain has been increased during fulfillment of painful procedure using CPOT but score of patient remained relatively "fixed" and "constant" during nonpainful procedure. Demonstration of diagnostic validity of CPOT implies that this tool is able to diagnose pain of patient and can differentiate and segregate painful and non-painful situations from each other. Since many patients hospitalized in ICU are not able to declare their pain and since using tool such as NRS are impossible in order to diagnose their pain, this behavioral tool, i.e., CPOT can be used to diagnose pain during fulfillment of procedures and also other occasions.

In addition, it was specified in criterion validity that scores of patient's pain based on NRS exceed as compared to CPOT. This issue indicates that the score patient has given to the degree of his or her pain exceeds the score given by nurse. Of course, result of this study are much more similar to the result of other studies, indicating that estimation of severity of pain by nurses is not consistent with the severity of pain reported by patients themselves. In other words, it can be concluded that estimation of severity of pain by nurses is not consistent with the severity of pain as experienced by the patients themselves. The said issue can be related to the skill of individual assessing pain or validity of tool for measurement of pain.

However, pain is a subjective phenomenon and cultural and ethical differences of both nurse and patient affect the estimation of pain considerably.

Deylamqani also is of the opinion that the difference between understanding of patient and nurse regarding pain may be created due to the certain suggestions, religious credence, or moral prejudgment.^[20]

With due observance to the said issue, correlation between two tools of CPOT and NRS was reported “satisfactory and good.” Therefore, with the increased rate of NRS, score of CPOT has also been increased and with the decreased rate of NRS, CPOT score has also been decreased.

NRS pain score is the most reliable and valid pain scale. Therefore, statistical correlation between CPOT and NRS indicates criterion validity of the tool. Therefore, this tool can be used in diagnosing pain of patients who are not able to declare their pain. Also, high ICC between scores given by two viewers indicates existence of strong relationship between the two, i.e. CPOT and NRS and this indicates existence of reliability of view of assessors in CPOT. Therefore, it can be said that CPOT is a simple and usable tool which can be used for diagnosing pain in intensive care unit. In addition, CPOT can be taught to the treatment and healthcare team.

CONCLUSION

Results of this study indicate that the Persian version of CPOT has the necessary validity and reliability criterion for studying pain among Iranian patients; the severity of pain among patient can be assessed using CPOT. Thus, when a patient is not able to report his or her pain, ICUs can be used instead. Proper study of pain is an important part of management and relief of pain. Because these patients could not express their pain verbally, using objective tools such as CPOT can help diagnose pain among such individuals in order to measure pain. In general, using this tool in ICU and including it in medical and nursing courses as well as offering it during discussions of in-service training at hospitals can help promote the quality of care and management of pain suitably.

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Conflicts of interest

There are no conflicts of interest.

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