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A study on the Comparison of Pain Assessment Scales used in a Tertiary Care Centre.

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ABSTRACT

Pain is a major public health issue throughout the world and represents a major clinical, social and economic problem. It is a single centre, prospective, observational study done at Apollo hospitals, Jubilee hills, Hyderabad for a period of 6 months (January'17-June'17). A total of 121 patients were considered of the age group (18-80) years with complaints of pain admitted in Medical ICU, Neurology ICU, Surgical ICU, Cardiac ICU and General wards. The cases were observed for types of pain and to compare the agreement between the Numerical Rating Scale (NRS), Visual Analogue Scale (VAS), Verbal Rating Scale (VRS) & Faces scale in non- sedated patients & Critical Care Pain Observation Scale (CPOT) & Behavioral Pain Scale (BPS) in sedated patients. Out of 121 patients the most common type of pain was nociceptive pain. Kappa test was used to assess agreement between scales. A substantial agreement of 0.63 was seen between NRS and Faces (uni-dimensional scale) in non-sedated patients while almost perfect agreement of 0.92 was seen between CPOT and BPS (multi-dimensional scale) in sedated patients. On comparing scales it was observed that greater agreement was between NRS and Faces while assessing pain in non-sedated patients and CPOT and BPS while assessing pain in sedated patients. Therefore, it can be said that the association or use of these scales might improve in better pain score assessment which would ease the pain management practices in a hospital setting.

Keywords: NRS, VAS, FACES, CPOT, BPS, Pain.

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INTRODUCTION

Pain is a major public health issue throughout the world and represents a major clinical, social, and economic problem [1]. According to The International Association for the Study of Pain (IASP), *Pain* is defined as an unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage. Pain is an individual and subjective experience modulated by physiological, psychological and environmental factors such as previous events, culture, prognosis, coping strategies, fear and anxiety. So, health professionals rely on the patient's own description of the type, timing, and location of pain [2]. It is estimated that up to 50% of Americans experience chronic pain or intermittent repeating pain during their lifetime. According to the National Ambulatory Medical Care Survey pain complaints account for more than 40% of all symptoms related to outpatient visits or over 100 million ambulatory encounters in the US alone each year [3]. Pain is one of the most common complaints evaluated by physicians/nurses. It is the presenting symptom of myriad medical conditions. Some of these conditions are curable but in many cases the role of the physician is not to cure the disease but to control the pain associated with it [4]. The under-treatment of pain was first documented in a landmark study by Marks and Sachar in 1973 [5]. Underassessment of pain is a major cause of inadequate pain management. In fact, the most common reason for the under treatment of pain in hospitals is the failure of clinicians to assess pain and pain relief. This situation has prompted recent efforts to raise clinicians' awareness of the importance of pain assessment [6]. The types of pain are: *1) Acute Pain* that is usually transient in nature lasting for several minutes to several days. Is caused by tissue damage and is often associated with some degree of inflammation [2]. *2) Chronic Pain* defined as pain that has persisted for at least 3 months [7]. *3) Mixed* pain which involves both nociceptive and neuropathic types of pains [2]. Pain assessment should be ongoing, individualized and documented [5]. Most measures of pain are based on self-report. These measures lead to sensitive and consistent results if done properly. There are no objective measures of 'pain' but associated factors such as hyperalgesia (e.g. mechanical withdrawal threshold), the stress response (e.g. plasma cortisol concentrations), behavioral responses (e.g. facial expression), functional impairment (e.g. coughing, ambulation) or physiological responses (e.g. changes in heart rate) may provide additional information [2]. The American Pain Society suggests that pain be the fifth vital sign as a means of prompting nurses to reassess and document pain whenever vital signs are obtained. Documentation also is important as a means of monitoring the quality of pain management within the institution [5]. Selecting the pain assessment tool should be a collaborative decision between

patient and health care provider. When this is done during the preoperative period it ensures the patient is familiar with the scale. If the nurse selects the tool, he or she should consider the age of the patient his or her physical, emotional, and cognitive status and preference. We tend to think of these intensity scales as verbal but patients who are alert but unable to talk (e.g., intubated, aphasic) may be able to point to a number or a face to report their pain. The pain tool selected should be used on a regular basis to assess pain and the effect of interventions. It should not, however, be used as the sole measure of pain perception [5]. In non-sedated patients the uni-dimensional scales incorporated for pain assessment are as follows:

Numerical Rating Scale (NRS):

It involves asking the patient to rate his or her pain by describing their current pain from 0 to 10 (11 point scale) with the understanding that 0 is equal to no pain and 10 is equal to worst possible pain. This does not require the patient to write and provides a verbal response which the healthcare provider can then document. The NRS is extremely easy to administer and score and therefore can be used among older adults and patients with motor problems) [8].

Verbal Rating Scale (VRS):

It is a scale composed of 4-5 levels of verbal adjectives to describe the increasing intensity of pain. To record pain response a 4 point scale is used, which contains: no pain, mild pain, moderate pain, severe pain. Patients are asked to choose the appropriate word which describes their current pain [8].

Visual Analogue Scale (VAS):

It consists of a straight 10 cm line with the endpoints defining extreme limits such as ‘no pain at all’ and ‘pain as bad as it could be.’ The patient is asked to mark his pain level on the line between the two endpoints [9, 10].

Wong-Baker Faces Pain Rating Scale:

The Wong Baker Faces Scale is extremely helpful in assessing pain in children (ages three years and older), non-English speaking and mentally impaired adults. The scale consists of six faces numbered as 0, 2, 4, 6, 8 and 10 where 0 equals no pain and 10 equals hurting the worst. The patient is asked to choose the facial expression that best depicts how they feel [11].

For sedated patients the Multi-Dimensional Scales are used for pain assessment as follows:

Behavioral Pain Scale (BPS):

As shown in Figure 1, it is an observational pain scale preferably applied by the attending nurse. It has been validated for use in deeply sedated, mechanically ventilated patients. Easy to use and well accepted by nurses, the BPS contains 3 subscales: facial expression, upper limb movements, and compliance with mechanical ventilation. Each subscale is scored from 1 (no response) to 4 (full

response). Therefore, BPS scores range from 3 (no pain) to 12 (maximum pain). A BPS score of 6 or higher is considered to reflect unacceptable pain [12].

Behavioral Pain Scale (BPS)

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).

Figure 1: BPS

Critical-Care Pain Observation Tool (CPOT):

As in Figure 2 it has 4 sections each with different behavioral categories: facial expression, body movements, muscle tension, and compliance with the ventilator for intubated patients or vocalization for extubated patients. Items in each section are scored from 0 to 2, with a possible total score ranging from 0 to 8 [13].

Indicator	Description	Score	
Facial expression	No muscular tension observed	Relaxed, neutral	0
	Presence of frowning, brow lowering, orbit tightening, and levator contraction	Tense	1
	All of the above facial movements plus eyelid tightly closed	Grimacing	2
Body movements	Does not move at all (does not necessarily mean absence of pain)	Absence of movements	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	2
Muscle tension	No resistance to passive movements	Relaxed	0
Evaluation by passive flexion and	Resistance to passive movements	Tense, rigid	1
extension of upper extremities	Strong resistance to passive movements, inability to complete them	Very tense or rigid	2
Compliance with the ventilator (intubated patients)	Alarms not activated, easy ventilation	Tolerating ventilator or movement	0
	Alarms stop spontaneously	Coughing but tolerating	1
	Asynchrony: blocking ventilation, alarms frequently activated	Fighting ventilator	2
OR			
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, range			0-8

Figure 2: CPOT

Pain assessment is critical for optimal pain management interventions. The history and physical examination help to identify different types of pain, because different types of pain tend to respond to different treatments. Hence the type of pain identification during pain assessment is important [5].

MATERIALS AND METHOD

Study Objectives:

To analyze the severity of pain observed in sedated and non-sedated patients in the hospital. To evaluate the agreement between Numerical rating Scale, Visual Analogue Scale, Verbal Rating Scale and Faces Pain Scale assessment reported by nurse in Non-sedated patients. To evaluate the agreement between Critical Care Pain Observation Scale and Behavioral Pain scale assessment reported by nurse in sedated patients.

Ethics Statement:

The final full board approval was obtained from the institutional ethics committee for the project reference number SVCP/2017/46.

Study Methodology:

It is a single centre, prospective, observational study done at Apollo Hospitals, Jubilee hills, Hyderabad. All patients of ages 18-80 years with complaints of pain admitted to in patient departments were included in the study. Data was collected from Medical ICU, Neurology ICU, general ward, Surgical ICU and cardiac ICU. Exclusion criteria consisted of cancer pain patients, pediatrics, pregnant women and lactating mothers, self harm admissions. The sample size comprised a total of 121 cases, consisting of 60 Sedated Patients and 61 Non-Sedated Patients admitted in the hospital. The study duration was for 6 months (January 2017 – June 2017).

A structured data collection form (DCF) was designed to collect the demographic details of the patient. A standard pain assessment form was used to assess the severity and nature of pain according to various pain scales as NRS, VRS, VAS, Wong baker for non-sedated patients and BPS, CPOT for sedated patients.

An Informed Consent Form was prepared which includes two parts where part 1 is patient information sheet regarding details of the study. Part 2 is Patient consent form containing data regarding patient participation and willingness. Strict privacy and confidentiality was maintained during data collection.

The pain assessment was carried out by nurses from the time of admission to the discharge. Pain assessment was done in all in-patients as mentioned in inclusion criteria. The pain scores were observed and documented by nurses who assessed the pain by noticing all clinical and medical situations of the patient. In case of Non-sedated patients the study was started after a detailed explanation given to the nurse about the various pain scales assessment format. The nurse then interviewed the patient or LAR (legally authorized representative) for one to two minutes regarding pain-related details and the four pain scales (NRS, VRS, VAS, Faces Pain Scale) were assessed and marked accordingly. Further, the assessment reported was recorded by the research candidates for study. In case of sedated and critically-ill patients the research candidates gave a detailed explanation to the nurse on the process to assess the multidimensional pain scales. The nurse then observed the patient on his physical and pain-related condition for about two-three minutes. Later, CPOT and BPS scales were assessed and marked accordingly. Further, the assessment reported was recorded by the research candidates for study.

Statistics:

Descriptive statistics was used. Data analysis was done by using statistical methods such as

frequency, percentage, mean and standard deviation. Kappa test was used to assess agreement between the scales in sedated and non-sedated patients. Level of acceptability was considered from 0.41-1.0 as per standard Cohen's kappa scale.

RESULTS AND DISCUSSION

A total of 121 cases were collected. Among the 61 non-sedated patients maximum were males of (44 cases, 72%) and (28%, 17 cases) were female patients. In 60 sedated patients (30 cases, 50%) were males and other (30 cases, 50%) were females.

Table 1: Age wise distribution of cases

Age (years)	No. of Sedated patients(n=60)	Percentage of Sedated patients	No. of Non-Sedated patients(n=61)	Percentage of Non-Sedated patients.
18-35	12	20%	16	26%
36-53	11	18%	18	30%
54-71	33	55%	19	31%
72-89	4	7%	8	13%

The majority of patients (55%, 33 cases) sedated and (31%, 19 cases) non-sedated belonged to the age group (54-71) years among the 121 cases collected as shown in Table 1.

It was observed that among non-sedated cases maximum patients were from medical wards (51 cases, 83%), followed by patients from neurological ICU (4 cases, 6%), surgical ICU (3 cases, 5%), medical ICU (2 cases, 3%) and cardiac ICU (1 case, 2%). Among sedated cases maximum patients belonged to surgical ICU (21 cases, 35%), neurological ICU (17 cases, 28%), medical ICU (10 cases, 17%), cardiac ICU (8 cases, 13%) and medical wards (4 cases, 7%). Among the non-sedated cases the site of pain documented maximum cases was of limb pain (35%) followed by neurological pain (16%), chest pain and abdominal pain (13% each), back pain (11%), groin pain and generalized pain (10% each). Among sedated patients the site of pain documented for maximum cases was of chest pain (32%), neurological pain (28%), limb pain (12%), back pain and generalized pain (8% each), abdominal pain (7%) and groin pain (5%).

Table 2: Types of Pain

Types of Pains	No. of Sedated cases(N=60)	Percentage of Sedated cases	No. of Non-Sedated cases(N=61)	No. of Non-Sedated cases(N=61)
Chronic Pain	4	7%	16	26%
Nociceptive Pain	38	63%	25	41%
Neuropathic Pain	18	30%	20	33%

Among all the cases the most common type of pain observed was nociceptive pain (63%) in sedated patients and 41% in non-sedated patients as seen in Table 2.

Table 3: Severity of Pain in Uni Dimensional Pain Scales

Severity of pain	NRS (N=61)	VRS (N=61)	VAS(N=61))	Faces scale (N=61)
No pain (0)	0 cases	0 cases	0 cases	0 cases
Mild pain	16 cases, (26%)	17 cases, (28%)	14 cases, (22%)	16 cases, (26%)
Moderate pain	32 cases, (53%)	12 cases, (20%)	23 cases, (38%)	32 cases, (53%)
Severe pain	13 cases, (21%)	25 cases, (40%)	24 cases, (40%)	13 cases, (21%)
Very severe pain	0 cases	7 cases, (12%)	0 cases	0 cases
Worst possible	0 cases	0 cases	0 cases	0 cases

The severity of pain was assessed and documented by nurses based on ratings given by using various pain scales on sedated and non-sedated patients. In non-sedated patients the NRS and Faces pain scales showed maximum patients experienced moderate pain (53%) for each scale. The VRS and VAS pain scales showed maximum patients (40%) to have experienced severe pain and remaining 60% patients' experiencing mild and moderate pain as shown in Table 3.

Table 4: Severity of Pain in Multi-Dimensional Pain Scales

Severity of pain	BPS, No. of cases (n=60)	BPS, Percentage	CPOT, No. of cases (n=60)	CPOT, Percentage
Absence pain	54	90%	49	82%
Moderate pain	6	10%	11	18%
Severe Pain	0	0%	0	0%

In sedated patients the BPS and CPOT showed maximum cases reported to have experienced absence of pain (90% and 82%) respectively followed by moderate pain (10% and 18%) respectively and 0% severe pain, which is due to sedation with pain medication. This is shown is Table 4.

Table 5: Statistical Analysis between Uni Dimensional Pain Scales

NRS VS FACES		FACES			
		Mild	**Moderate pain**	**Severe pain**	Kappa Value
NRS	Mild	23 (85.2%)	6(21.4%)	0(0%)	0.63
	Moderate pain	4(14.8%)	20(71.4%)	2(33.3%)	
	Severe pain	0 (0%)	2(7.1%)	4(66.7%)	
	Total	27	28	6	
NRS VS VAS		VAS			
		Mild	**Moderate pain**	**Severe pain**	Kappa Value
NRS	Mild	21(95.5%)	8(25%)	0(0%)	0.61
	Moderate pain	1(4.5%)	22(68.8%)	3(42.9%)	
	Severe pain	0(0%)	2(6.2%)	4(57.1%)	
	Total	22	32	7	
NRS VS VRS		VRS			
		Mild	**Moderate pain**	**Severe pain**	Kappa Value
NRS	Mild	23(92%)	6(18.2%)	0(0%)	0.61
	Moderate pain	2(8%)	23(69.7%)	1(33.3%)	
	Severe pain	0(0%)	2(12.1%)	4(66.7%)	

	Total	25	33	3	
FACES VS VAS		VAS			
		Mild	**Moderate pain**	**Severe pain**	Kappa Value
FACES	Mild	19(86.4%)	6(18.8%)	2(28.6%)	0.55
	Moderate pain	3(13.6%)	23(71.9%)	2(28.6%)	
	Severe pain	0(0%)	4(9.4%)	2(42.9%)	
	Total	22	32	7	
FACES VS VRS		VRS			
		Mild	**Moderate pain**	**Severe pain**	Kappa Value
FACES	Mild	21(84%)	6(18.2%)	0(0%)	0.57
	Moderate pain	4(16%)	23(69.7%)	1(33.3%)	
	Severe pain	0(0%)	4(12.1%)	2(66.7%)	
	Total	25	33	3	
VAS VS VRS		VRS			
		Mild	**Moderate pain**	**Severe pain**	Kappa Value
VAS	Mild	19(76%)	3(9.1%)	0(0%)	0.56
	Moderate pain	6(24%)	25(75.8%)	1(33.3%)	
	Severe pain	0(0%)	4(15.2%)	2(66.7%)	
	Total	25	33	3	

Kappa Test was used to assess the agreement between all scales. On doing the statistical analysis for uni-dimensional scales, it was found that there was substantial agreement of NRS with Faces scale, VAS scale and VRS scale consisting of 0.63, 0.61 and 0.61 respectively. This was in co-relation with a study done by Williamson and Hoggart which demonstrated strong level of agreement between the scales [10]. A moderate agreement was observed between the scales of Faces with VAS, Faces with VRS and VAS with VRS of the kappa values as 0.55, 0.57 and 0.56 respectively as shown in Table 5.

Table 6: Statistical Analysis between Multi Dimensional Pain Scales

		CPOT		
		No pain	**Moderate pain**	Kappa Value
BPS	No pain	42(95.5%)	0(0%)	0.92
	Moderate pain	2(4.5%)	16(100%)	
	Total	44	16	

The same kappa Test was done for multi-dimensional scales and the agreement was found to be almost perfect between COPT and BPS of 0.92 as shown in Table 6. This was similar to a study done by Rijkenberg S et al., which showed that BPS and CPOT are reliable and can be used as a valid pain assessment tool in daily clinical setting [14]. Therefore, from the statistical analysis we can say that in uni-dimensional scales the NRS and Faces scales are helpful in giving a better pain score assessment in non-sedated patients and in multi-dimensional scales CPOT and BPS both can be used for pain score assessment in sedated patients as both scales have found to be having close agreement between them.

CONCLUSION

On comparing various scales it was found that, maximum agreement was seen between NRS and FACES pain scales in non-sedated patients and between BPS and CPOT pain scales in sedated patients. This shows that NRS and FACES pain scales are useful in appropriate pain assessment and can be relied on for necessary pain management. The use of these scales might improve efficiency in pain management in the hospital setting. Also, more medical practitioners and organizations should adopt systematic approach to assess pain, especially in older population. Involving physicians in updating pain management protocols to include interventions based on the pain scales scoring would be beneficial in achieving better pain-relief regimens and improving patient-outcomes.

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